



# Virtual ARRL and TAPR Digital Communications Conference

By Steve Bible, N7HPR, President



We've successfully completed the very first virtual Digital Communications Conference (DCC) on Friday and Saturday, September 11th and 12th, 2020. It was a lot of fun to plan and produce. A much different experience than organizing the in-person DCC's we have been used to all these years.

We choose Zoom video conferencing for its webinar facility to conduct the conference and provide a chat feature. We wanted the conference to be interactive. Zoom also provided a way to send the conference to our YouTube channel to live stream the conference. There was a chat window on YouTube, however, the chat on Zoom and the chat on YouTube were not connected. Moderators had to keep their eyes on both channels.

We choose to follow a format that we learned from the QSO Today Expo: for the presenters to record their presentation ahead of the conference. This allowed a great deal of flexibility for the presenters, and it allowed for an easier transition between speakers as the conference was produced.

Presenters were given several weeks to make their recordings. This allowed them to practice and choose the best recording to send in. It also allowed some splicing of video and editing. In this manner, the resulting video could be a multimedia event. The best example of this is the talk by Rob Frohne, KL7NA and his electrical engineering students at Walla Walla University on Friday.

On conference day, the moderator would bring the presenter online (audio and video) and allow them to introduce themselves and give a brief introduction of their talk. Afterwards, their presentation would play. During the presentation, the presenter was active on the Zoom chat window answering questions from attendees. Then, after the presentation ends, there was a short 10-minute question and answer period. This technique proved to work very well giving attendees an interactive experience we had hoped for.

The virtual format allowed presenters from around the world. We were able to schedule their talks

Virtual ARRL & TAPR DCC	01
2020 BoD Election Results	03
Introducing the TAPR MagnetoPiHat for the Raspberry Pi	04
How We Did the TAPR Virtual DCC	09
AT Golden Packet Success	14
Seeking Someone to Improve D-Star	
Open-AMBE	15
Donate to TAPR	17
DCC Down Under	17
Good Reads	18
TAPR Wear Available	18
Write Here!	19
On the Net	19
The Fine Print	20
Our Membership App	21

at a time that best suited their home time-zone. We held the Virtual DCC on Eastern Daylight Savings (EDT) time. The choice of EDT was because the in-person DCC was to be held in Charlotte, North Carolina. We had speakers from Japan, Italy, France, United Kingdom, and Australia.

Attendance was excellent. The conference had a great turnout. The graphs below show the attendance by talk for both Zoom and YouTube.

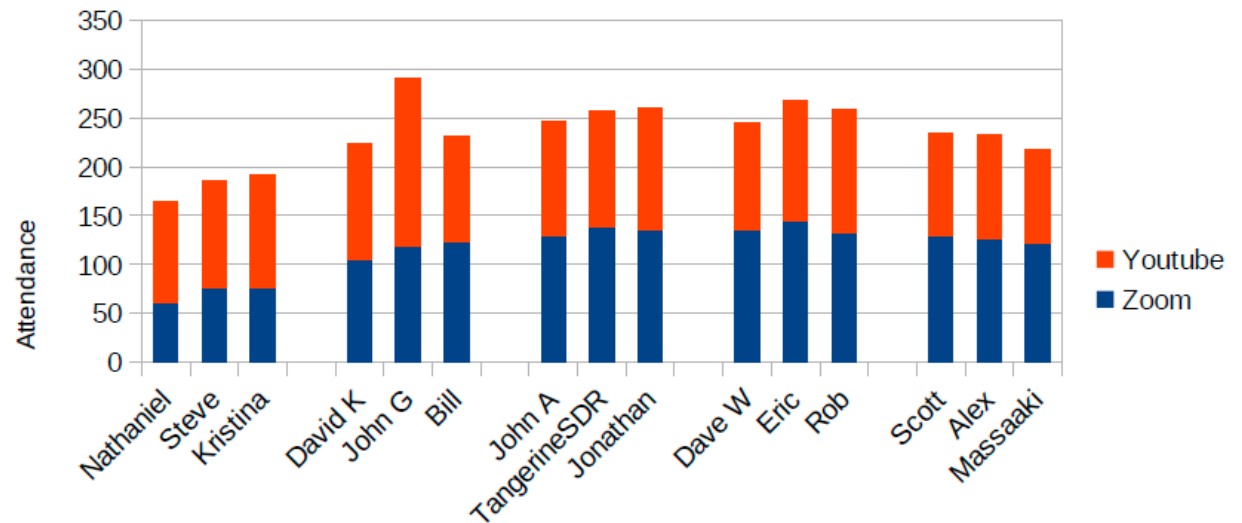
### Room for Improvement

Overall, the production of the virtual conference when very well. Naturally, we always have room for improvement. Some of the comments we received are:

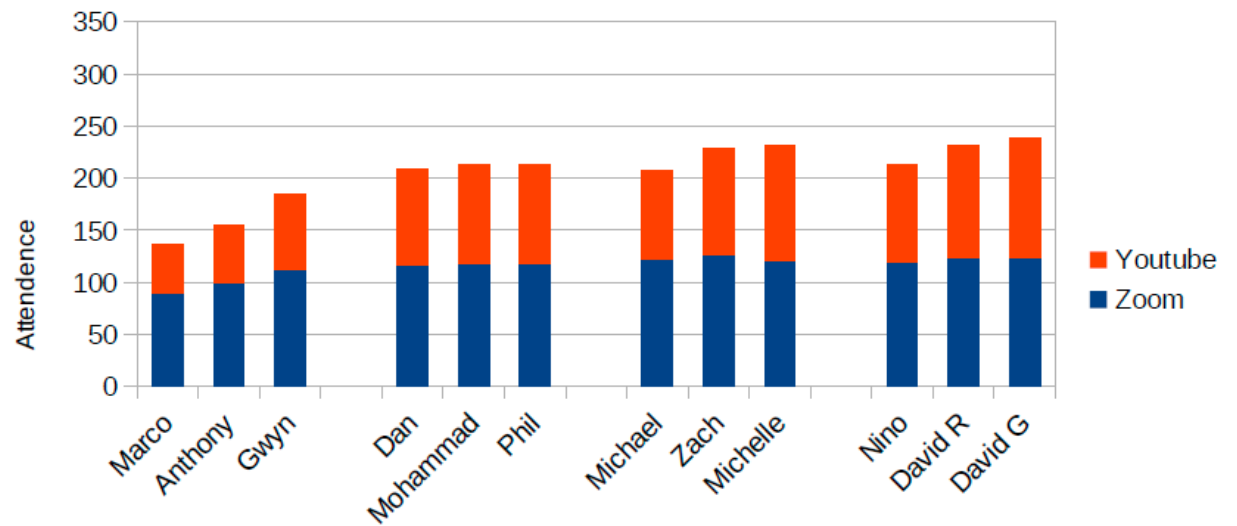
**1. Presenter Audio.** Some of the recorded presentations the audio was not as good a quality as we would like. It teaches us to preview the recordings before presenting them on conference days.

**2. Time Zone.** We're not able to analyze attendance by time zones. For some the conference either started too early or too late. This is one thing we cannot avoid with a virtual conference, and that is the fact time zones complicate matters. However, there ought to be an optimum time to start and end a virtual conference. We just have to figure out what it is.

DCC 2020 Day 1



DCC 2020 Day2



## Thoughts on the Future

With the COVID-19 pandemic upending just about every in-person conference or meeting, everyone is shifting to a virtual format. The good news is that people are getting used to it. In other words, meeting online for a conference or meeting is somewhat natural now. Thus, holding a virtual DCC was a little easier overall. Looking forward to the future, we may well expect and attend more virtual conferences as we learn their benefits.

Even when the pandemic slowly fades into our past, we may find ourselves continuing to attend virtual conferences. The conference software will continue to improve. We've already seen that in the past year.

Next year, if all goes well, we'll hold our 2021 DCC in-person in Charlotte, North Carolina. The dates are September 17-19, 2021. We are already anticipating that we'll hold a hybrid conference, a mix between in-person and virtual. It will be a fun experiment.

This year's virtual DCC taught us a lot of new things. We plan to continue learning and expanding. Our number one goal is to get the information out to the amateur radio world. There is a lot of great experimenting going on around the world. The ARRL and TAPR Digital Communications Conference will continue in its 40th year as a premier amateur radio technical conference.

You can watch recordings from the virtual DCC either on YouTube (all day Friday and Saturday) or from Jason Johnston's Ham Radio 2.0 site.

YouTube Channel: TAPR Digital: <https://tinyurl.com/yavcnkf9>

Jason Johnston, KC5HWB: <https://tinyurl.com/y4v57d84>

You may also order a printed copy of the Proceedings from the ARRL at <https://tinyurl.com/ydbtnahh>

Keep an eye on the 2021 DCC on the web page

<https://tapr.org/digital-communications-conference-dcc/>

###

## 2020 Board of Directors Election Results

Steven Bible, N7HPR, Stana Horzepa, WA1LOU and Darryl Smith, VK2TDS were the successful candidates for the three open Board of Director positions and will serve as Directors until 2023.

The results of the election were as follows:

Steven Bible, N7HPR	183 votes (30.7%)
Stana Horzepa, WA1LOU	183 votes (30.7%)
Darryl Smith, VK2TDS	150 votes (25.1%)
Brian Rogers, N1URO	81 votes (13.6%)

### Stats

493 eligible voters

209 ballots submitted (42% of those eligible)

Votes tallied: 597

Abstentions: 10.

###

# Introducing the TAPR MagnetoPiHat for the Raspberry Pi

By Scotty Cowling WA2DFI

## Introduction and Requirements

A reasonably sensitive magnetometer has been a requirement of the HamSCI Personal Space Weather Station (PSWS) (note 1) since the early days of the system specification in 2018. Inexpensive, low sensitivity magnetometers are often built into modern smart phones, but sensitivity of these units is insufficient for our use. Unfortunately, high-quality laboratory-grade magnetometers can be very expensive, running into thousands of dollars. What we needed for HamSCI was something in between the 50-cent detector present in modern cell phones and the budget-busting \$2,000 lab instruments.

At the HamSCI conference in Cleveland in 2019, a student group from Michigan was showing off a small magnetometer board that they had built from an integrated sensor available from PNI Sensor in Santa Rosa, California. After some investigation, it seemed like the RM-3100 sensor (note 2) would fit the bill for HamSCI in terms of cost and sensitivity. The RM3100 sensitivity specification was a respectable 13nT (nano-Tesla) when integrated over 200 samples. The cost was quite reasonable at \$15 for a chip set (the ASIC and three magnetic pickup coils) or \$20 for a postage-stamp sized evaluation board with the chip set pre-installed.

## Evolution

Dave Witten KD0EAG took up the initial challenge and ran with it. Several problems had to be overcome before we could even attempt a board design. First and foremost, the RM3100 sensor board had to

be mounted remotely outside. Too many interfering magnetic fields exist within buildings. The RM3100 I2C and SPI serial interfaces were designed for local connection (like 1 foot or less!) to a communications port master. The Raspberry Pi and its associated class of Single Board Computers (SBCs) have both SPI and I2C ports; all we needed was a way to extend them out to 100 feet or more of range.

Even though PNI claimed that the RM3100 was temperature compensated, we wanted to play it safe, so we needed a way to measure the temperature at the measurement point.

Lastly, we didn't want to have to build two different board designs, so a single PCB usable on either the local (Raspberry Pi) end or the remote (RM3100) end of the cable was highly desirable.

With these goals in mind, Dave came up with an initial design and built some prototypes. Note that the Pi Hat form factor was not yet settled on. The original concept was for a PMOD-sized module. The early prototype versions had a PMOD connector and additional connectors for flying leads so a Hat adapter and flying leads could be used from the RPi to the Magnetometer board. Dave got many of these early boards working and proved the design architecture was a viable one. In fact, many of them are still in use, because they work and the MagnetoPiHat is not quite available yet!

## Features

Take a look at the system block diagram in Figure 1. The same board is used at both local and remote ends of the CAT5 cable. We chose CAT5

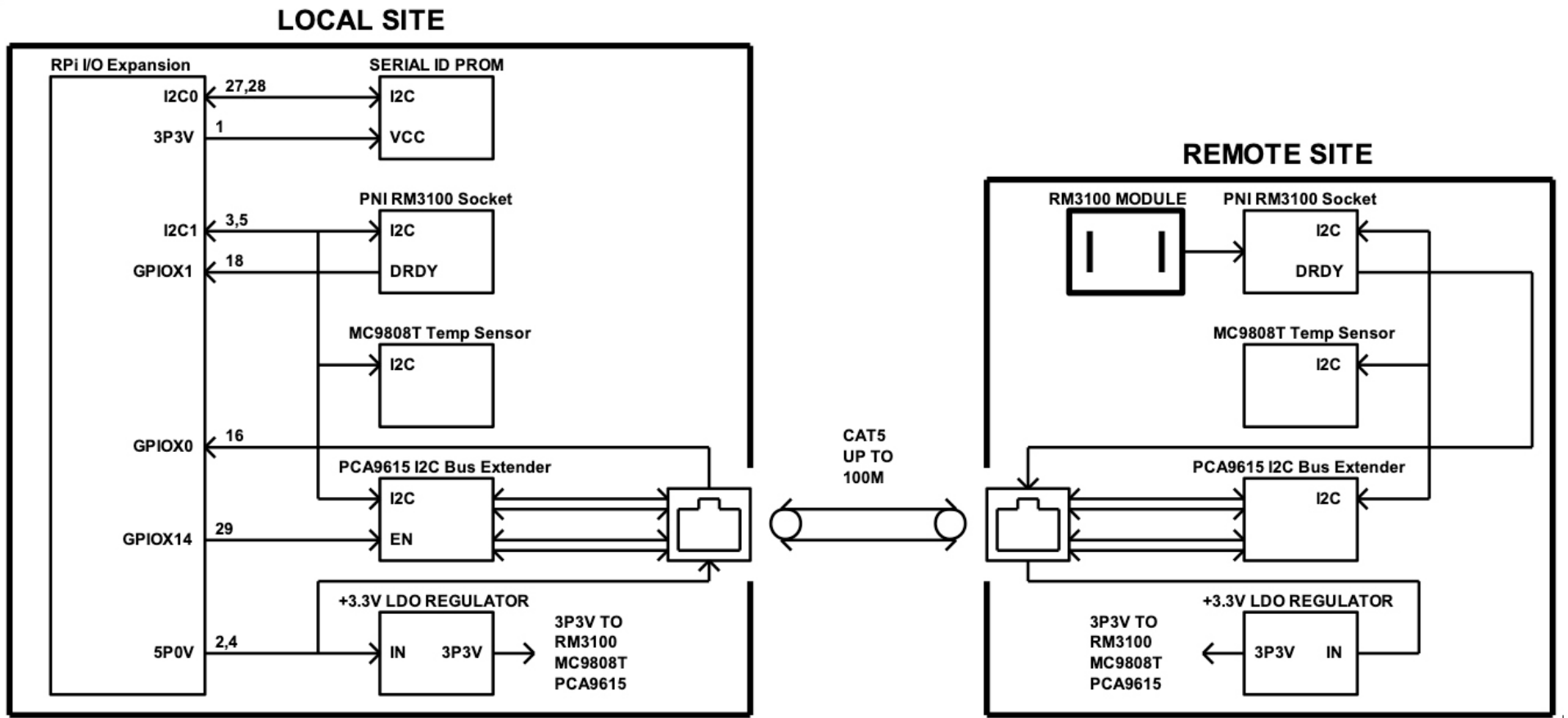


Figure 1. TAPR MagnetoPiHat Block diagram

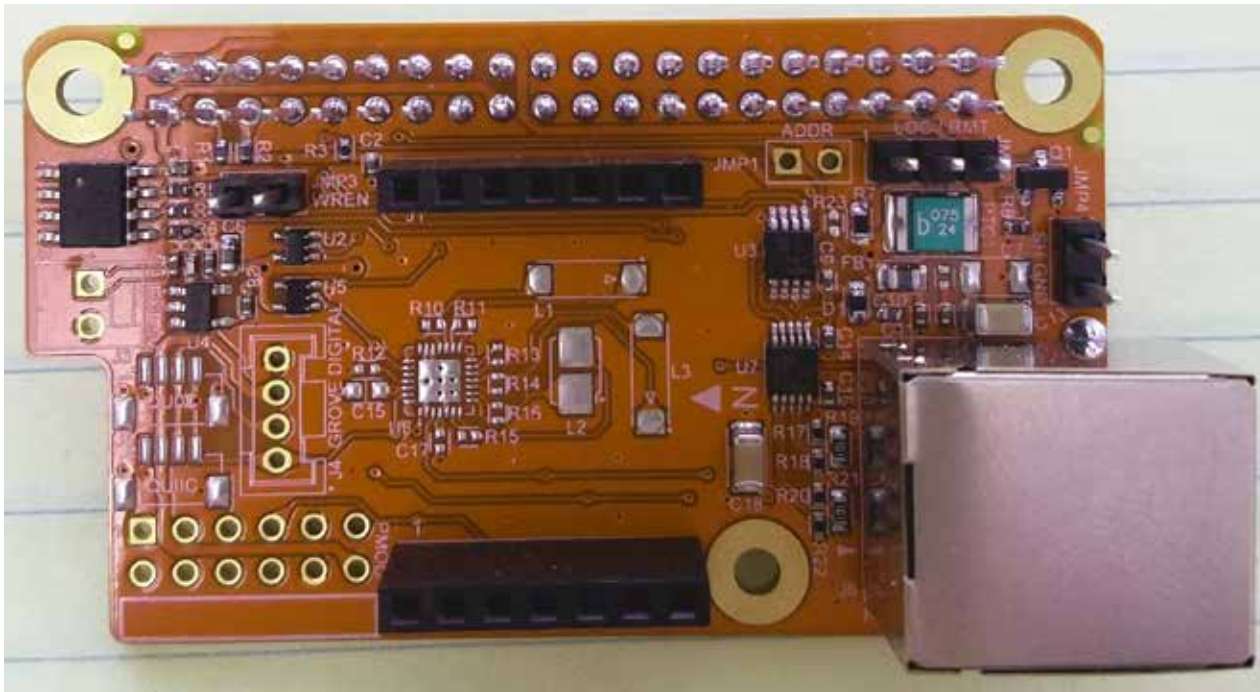


Figure 2. Closeup of MagnetoPiHat board

cable and connectors because both are cheap and plentiful. An RM3100 module is installed only at the remote end; since the MC9808 temperature sensor is soldered onto the board, we can measure board temperature at both ends! The PCA9615 extends the I2C bus out across the CAT5 cable on two differential pairs. We also send +5V power to the remote module and the RM3100 DRDY (data ready) line back to the local end over this same CAT5 cable. We use all 4 pairs in the cable.

Note that we use CAT5 cable and RJ45 connectors, but we are NOT using Ethernet signaling.

The board is shown in Figure 2. It is 65mm wide by 38mm high, which is more like a “half-Hat” since a standard Pi Hat is 65mm x 56.5mm. Maybe we should call it a RPi Visor instead! The expansion connector has long pins, so you can stack the MagnetoPiHat with other Hat boards. We even included an ID ROM in order to meet all the official Hat requirements!

More information on this and other TAPR SDR hardware can be found on the TangerineSDR web site (note 3).

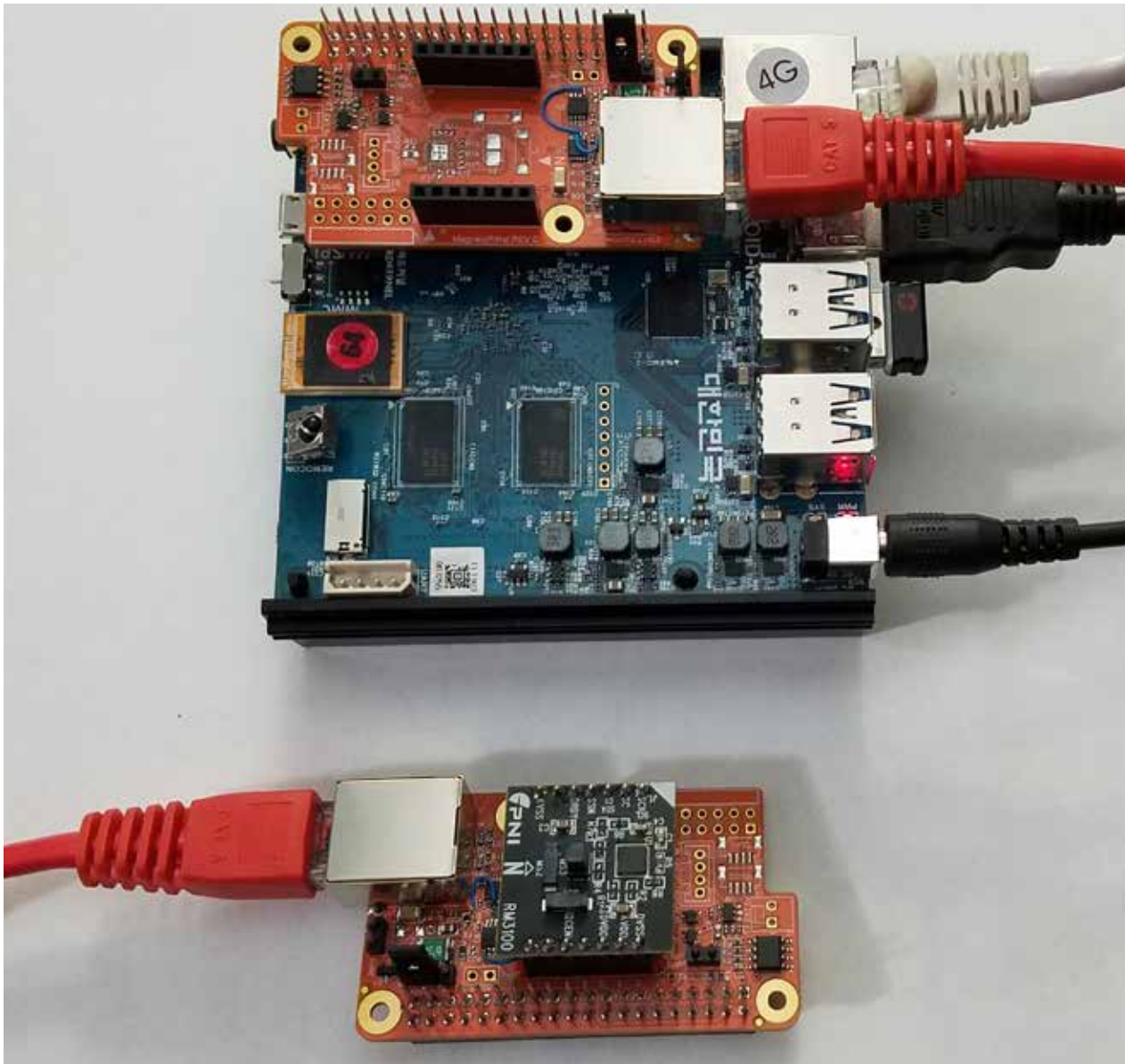


Figure 3. MagnetoPiHat setup with the Odroid N2 SBC

## Acknowledgements

I would like to thank Dave Witten KD0EAG for his work on the early versions of the Magnetometer. Without his work, we would likely still be back in the experimental stage.

I would also like to acknowledge support of this and other TangerineSDR projects under NSF grants AGS-2002278, AGS-1932997 and AGS-1932972.

TAPR would also like to acknowledge the generous ARDC grant in support of TangerineSDR prototype builds.

## Notes:

1. HamSCI information at <https://tinyurl.com/ya6glmev>
2. PNI RM3100 sensor data is available at <https://tinyurl.com/ydyst6te>
3. The TangerineSDR web site is <https://tinyurl.com/y8defd4l>

###

```
Startup UTC time: Sat Oct 17 18:46:04 2020
Device handle p->i2c_fd: 3
i2c_init OK!
```

```
Version = 0.0.9
```

```
Current Parameters:
```

```
RM3100 Detected Properly: REVID: 22.
Magnetometer revision ID detected: 34 (dec)
Log output path: FALSE
Log output: FALSE
Log site prefix string: (null)
Output file path: ./logs/
I2C bus number as integer: 2 (dec)
I2C bus path as string: /dev/i2c-2
Built in self test (BIST) value: 00 (hex)
NOS Register value: 00 (hex)
Post DRDY delay: 0 (dec)
Device sampling mode: POLL
Cycle counts by vector: X: 200 (dec), Y: 200 (dec), Z: 200 (dec)
Gain by vector: X: 75 (dec), Y: 75 (dec), Z: 75 (dec)
Read back CC Regs after set: FALSE
Software Loop Delay (uSec): 1000000 (dec)
Magnetometer sample rate: 200 (dec)
CMM magnetometer sample rate (TMRC reg): 150 (dec)
Format output as JSON: FALSE
Read local temperature only: FALSE
Read remote temperature only: FALSE
Read magnetometer only: FALSE
Local temperature address: 18 (hex)
```

```
Remote temperature address: 19 (hex)
Magnetometer address: 23 (hex)
Show parameters: TRUE
Quiet mode: FALSE
Hide raw measurements: FALSE
Return single magnetometer reading: FALSE
Read Simple Magnetometer Board (SMSB): TRUE
Read Board with Extender (MSBx): FALSE
Magnetometer configuration: Local standalone
Timestamp format: UTCSTRING
Verbose output: TRUE
Show total field: FALSE
```

```
RM3100 Detected Properly: REVID: 22.
Time: 17 Oct 2020 18:46:04, rTemp: 23.44, lTemp: 27.31, x: -24.640, y:
-1.053, z: 45.013, rx: -1848, ry: -79, rz: 3376
Time: 17 Oct 2020 18:46:05, rTemp: 23.44, lTemp: 27.31, x: -24.640, y:
-1.093, z: 45.000, rx: -1848, ry: -82, rz: 3375
Time: 17 Oct 2020 18:46:06, rTemp: 23.44, lTemp: 27.31, x: -24.653, y:
-1.080, z: 45.000, rx: -1849, ry: -81, rz: 3375
Time: 17 Oct 2020 18:46:07, rTemp: 23.44, lTemp: 27.31, x: -24.640, y:
-1.107, z: 45.013, rx: -1848, ry: -83, rz: 3376
Time: 17 Oct 2020 18:46:08, rTemp: 23.44, lTemp: 27.31, x: -24.667, y:
-1.080, z: 44.947, rx: -1850, ry: -81, rz: 3371
Time: 17 Oct 2020 18:46:09, rTemp: 23.50, lTemp: 27.31, x: -24.640, y:
-1.107, z: 44.987, rx: -1848, ry: -83, rz: 3374
```

Figure 4. Screen Capture of KD0EAG's Linux Test Software



# How We Did the TAPR Virtual DCC

By George Byrkit, K9TRV

The author, George Byrkit, K9TRV, is currently a TAPR board member, and has been a computer programmer for about 50 years. He has programmed just about everything, using ‘coding pads’, punch cards, paper or mylar tape, paper terminals (DecWriters, for example) and glass terminals. He has seen computers morph from room-filling monsters to Dick Tracy watches.

When the first hints that the COVID-19 pandemic would affect amateur radio events this year, I began to think what options there might be, and how they might be used. I was already familiar with GoToMeeting, Jabber, Microsoft Teams, and a few other platforms. But hadn’t yet considered how you might use them in the context of Amateur Radio. Fortunately for TAPR, HamSCI was holding its March conference right around the time in question. Being affiliated with the University of Scranton, they had access to an enterprise-grade Zoom license, internal tech support, and lots of possible volunteers and assistants called ‘students’ or ‘grad students.’

HamSCI used Zoom’s ‘webinar’ feature, which allows for many attendees, and directly facilitates streaming to YouTube Live. This should not be confused with Zoom Meeting, which has chat and breakout rooms, but does NOT facilitate live streaming to YouTube Live. Note that as time passes, the feature sets of both will change, and what I say here may well not be true by the time this article is published. Zoom Meeting has become ubiquitous during the work-from-home-if-you-are-able world of the COVID-19 stay-home mandates. Let’s say that Zoom offering a free level of its Meeting product license has been a boon to Zoom, as well as an introduction to modern video technology for people of all ages. It has also set certain expectations of ‘what Zoom is’ and ‘what Zoom does’ for

many people. But that’s Zoom Meeting, not Zoom webinar.

HamSCI’s Zoom-based conference went off very well. Most TAPR board members participated, either by presenting a talk, attending, or both. The HamSCI conference used live presenters making live presentations, sharing their own desktops to show their slides. They had brief, 5 minute long ‘poster sessions’ that were pre-recorded. For those of us who aren’t professional scientists, and haven’t presented at professional conferences, these are apparently standard fare, and represent a display space where people can put up a ‘poster’. The poster talks had live QA after the recorded talk. And Dr Nathaniel Frissell, W2NAF, pulled it all together seemingly in about two weeks. He was assisted by a significant group of people: other scientists, such as Dr Phil Erickson, W1PJE, the AuroraSaurus people, and many others. If only TAPR had such access to such a competent group of professionals, all seemingly well-versed in this new technology!

The result was that many of us now had Zoom ‘free’ Meeting accounts. That meant we could speak to one person for a very long time, or several people for up to 40 minutes. I upgraded my Zoom Free license to a Zoom Pro license, which TAPR then began to use to hold board conversations. As the time we would have been in Dayton for Hamvention approached, and with Hamvention being postponed to next year, TAPR needed a way to hold its planned several hour normally in-person board meeting. We had tried various audio+screenshare products that were out there. Normally, this worked poorly for us as most of us were in one room (like a hotel meeting room), and we were trying to loop in those directors or officers who were not able to attend in-person. The problems were 1) poor room acoustics, 2) bad microphones on our part, 3) slow or spotty internet

at the hotel (some hams have made presentations at DCC, previously, that show that WiFi is NOT a good choice for video streaming), and 4) the remote person was often using a cellphone to participate.

But, on the appropriate day (Hamvention Thursday, I believe it was), we had an all-day Zoom meeting that at one time or another had all TAPR officers and directors on the meeting. Because of the significant time difference for Darryl Smith, living in Australia, was able to join the Zoom board meeting only briefly. This worked well, and we discussed what we would do for DCC. We felt it prudent to strongly consider plans that would make DCC ‘virtual’ and not ‘physical’. We managed to get released from our contract with the hotel, provided that our next in-person DCC was in Charlotte, or strongly considered Charlotte, NC. And we decided that the future was ‘Virtual DCC’.

Next up was the Contest University session, presented by Tim Duffy et al, which was also a Zoom webinar with over 1000 attendees. They had a mix of live and prerecorded talks. I had never attended CTU, because I have been too busy with the Hamvention activities as a ‘TAPR Booth Troll’ (those of us who you always find in the TAPR booth when you come by), barely leaving time to see much else at Hamvention.

The TAPR board continued to hold monthly Zoom meetings, in addition to its regular use of the TAPR board mailing list, to keep abreast with all developments related to making the DCC a virtual conference. About this time, Eric Guth of QSO Today put forward his Amateur Radio convention, held on a private platform, but using Zoom meetings to conduct the QA sessions. The talks were all pre-recorded using Zoom Meeting. This is possible to do even with a Zoom free account. The wheels in our heads began turning... John Ackermann, N8UR, TAPR

Board member, past president, and Time Nut, presented there. He pre-recorded his talk using Zoom meeting, and uploading to I think Google Drive or maybe Dropbox, but to a folder that the event runners had created for his use, to upload his presentation MP4 file and a PDF of the slide deck for his talk.

We needed to sell tickets for the event. We are currently using a WordPress website using Woocommerce tools, hosted by <https://tinyurl.com/nmacdld>. Everything can be done by purchasing one or more \$59 plugins for either WordPress or Woocommerce (</sarcasm>). Some research showed that there was a very promising plugin to use. It allowed us to sell a ticket in our TAPR store, give a member discount to make DCC free (or sell you a TAPR membership on the spot), and send you to Zoom to finish the registration process and get your confirmed attendee link. Unfortunately, we didn’t get this installed before we started selling the packages on the TAPR store. That meant we’d have to circle back later, and that became a problem to solve within the last week before DCC! But after we had purchased a Zoom Webinar license (monthly), and gotten it integrated, the process worked well from then on.

With lots of inspiration from our predecessors, HamSCI, CTU, and the QSO Today Virtual Ham Expo, we went forward not knowing a lot that we would soon discover. For example, we eventually added 3 other license seats to the Zoom Pro account, for some very techy TAPR board members: Scotty Cowling WA2DFI, Dave Larsen KV0S, and John Ackermann N8UR. One thing that took a while to figure out was that, even though they were set as ‘admin’ users, and named as alternate hosts in the definitions of the meetings that I set up, at best they could only see the meeting details when the meeting was past! This meant that they couldn’t really ‘administer’ the meetings that I set up! Nor could any of

us administer the other's meetings! This was a rude shock. It also meant they couldn't do the same for webinars that I set up. I was to be the only person who could edit these settings, and that became a pain, as time moved on.

We wanted to be able to provide a chat space between talks, but that isn't part of a Zoom Webinar. It can be part of a Zoom meeting, so maybe we can use both platforms to accomplish this? No, not really. Let me explain. At any one time, with any one zoom login, you can be either on a Zoom meeting or a zoom webinar. Not only does it take two different zoom accounts, it requires two different devices, because you can't be logged in under two different zoom accounts at the same time on one device. That would also mean twice the bandwidth needed on your internet connection to manage both at once, not to mention maybe two heads and four hands? And how, exactly, would we get the people from the Meeting back to the Webinar at the right time for the conference to continue? This would have meant that the attendees had to sign into the meeting (and out of the webinar) to chat, and do the same to come back to the webinar. Awkward, anyone? Prone to error? Hard to manage?

We stuck with the less capability of the Zoom Webinar as far as chatting, which allowed the promotion of attendees to panelists so they could share video, or allowed the attendee managers to simply allow the attendees to raise hands and turn on their microphone and ask questions and chat a bit during break time. It wasn't as much as we wanted, but it was what we could deliver within the platform that was chosen.

### **What, you may ask, did we go with?**

- 1) Zoom webinar. Initially purchased a 100 seat license, and then

just before the DCC, updated that to a 500 seat license (the next level.) The license seat count limits the number of simultaneous users (attendees) who can be logged in. We then set Zoom Webinar to 'live stream to YouTube Live' as we set the webinar live each day.

- 2) We advised each person presenting a talk to pre-record their talk using Zoom Meeting, and save the MP4 file that results. We also asked for a PDF of their slide deck. I did end up creating that PDF from a PowerPoint presentation file for at least one speaker. Good thing, I did that, too.

- 3) We did advise them to use a headset, but many chose the audio from their laptop, webcam, or some other choice. Most of those talks had less than desirable audio due to that.

- 4) We provided a Google Drive folder on the TAPR Google Drive, shared with each presenter (not the world), for the presenter to upload their talk and PDF of their slide deck. The one problem that we had was that the email address we had for many was not what they used to log in to Google, so we had to re-issue the credentials for maybe 10-20% of the speakers. Google did notify us when we needed to do that.

- 5) We had 4 people (me – George Byrkit K9TRV, John Ackermann N8UR, Scotty Cowling WA2DFI, and Dave Larsen KV0S) who all downloaded all the presentations from the google drive and were 'prepared' to stream them if the primary site (me) failed. Fortunately, and likely due to the fact that we took the precaution and did some practice, this was not needed.

- 6) I was the 'show runner'. It was my job to queue up and start each video at the right time. We all had VLC Media Player installed, and it is what we used to play each video.

7) I eventually learned that I needed to have my video (camera) muted, to keep it from overlaying that which Zoom Meeting put in the pre-recorded presentations for those who complied with our request to prepare their presentation this way.

8) We used 'slack' as our backchannel. Those of us involved with putting on the event used it to communicate, separate from Zoom. It wasn't zoom. It was text-based (or html text based), and not audio or video.

9) We had one monitor on the YouTube live stream on the TAPR channel, so that we could see the questions asked, and the quality achieved, via YouTube.

10) Our 'monetized' channel was via Zoom Webinar. If you were a member already, DCC was a free purchase. If you purchased a membership with DCC, then DCC was free.

11) We had the PDF of the 'DCC 2020 Proceedings'. That's the papers that people submitted, many of which were presented at DCC as well. You could order a printed copy, which we publicized on the Blog on the TAPR website. The ARRL also promoted the printed proceedings. Lulu was used to do this. At this point, the printed proceedings are full-price. And the PDF should be available on the TAPR website, along with links to the PDFs for each talk actually given.

### What problems did we have?

Well, on day 1 (Friday), the Zoom webinar suddenly ended, and I had to re-initiate the webinar from my end. I'm not sure what happened. I'm not sure I want to know!

At one point, a presentation stumbled and halted. Its MP4 file was apparently defective. I tried restarting the presentation shortly before the failure, and it failed again. What is the backup? Well, we had the PDF of the presentation, so I started to stream the slide deck from that, and had the presenter available on live audio/video, and brought him on to narrate his own slide deck. The talk was completed roughly within the original timeframe, so I think the recovery was successful.

On Day 2, before the actual start of the webinar, I had to re-start the webinar. What we learned is that one of the back-up show runners (alternate host) was otherwise logged in still on some device to some other Zoom thingie (technical term?) This caused Zoom to broadcast, apparently, an 'end all events' message that affected the DCC because he was an alternate host, and zoom pro license seat holder for TAPR. Maybe something like this is what happened on Friday.

### What will we work on to do better next time?

1) Ensure better audio. Please go get a rebuilt Plantronics C725 Blackwire headset maybe from eBay. They're great. Their audio is high quality. They are quite inconspicuous. The separation they provide between audio talk and audio listen is so much better than any webcam and computer speaker can provide. The quality of audio is much higher, and it doesn't sound like a boxy, echoey room. Please!

2) Work for a better break-time experience. I'm not convinced that using multiple platforms, requiring multiple logins, is a good answer. But it seems to be about all you can do at this time. I expect Zoom Webinar to evolve between now and next year so that this may be resolved within Zoom Webinar.

3) Do a better job at break time. Nathaniel Frissell has a wonderful ability to provide information while almost interviewing the speaker, during the QA session, or its extension into break time. It is a rare skill. (yes, break time is covered in two points. It's that important.)

4) Do a better job 'marketing' TAPR and the DCC. This includes better break-time slides. We've seen what GRC did right after DCC and learned more than a few lessons from that.

5) We won't be as inexperienced with the Zoom emails that are sent, and the emails with less-than-useful information will be avoided. We'll know how we have to define the event, and what consequences that has for the information in the Zoom-generated emails. Note that right after the DCC was concluded, I discovered where the editing facilities for these emails are located. Also learned was that we need the Zoom Webinar license, with the DCC (or your webinar) properly set up with proper start times each day, etc., BEFORE we start selling 'tickets' is essential. I personally regret the confusion that these poorly worded auto-generated emails caused. I know what the problems were, because Zoom sent them with my registered email address as the reply-to address. So,

6) I heard about all the problems. Unfortunately, I was pressed with time in the run-up to DCC during the final week. With current Zoom rules, I was the only one who could see, let alone edit, these things.

7) Work hard to get more people involved. We needed more, better speakers to 'spin' the time during the breaks.

## Addendum

Note that now there is a different 3rd party product that has caught my

interest in the zoom-equivalent area. It is called 'vito' from a company called 'tito' that is at [www.ti.to](http://www.ti.to). It integrates a breakout room space with webinar-like features and youtube streaming. At this moment, I don't recall what the event was, but called John A to tell him about it. Now I remember: it was the 'Angular' conference (ng-conf, where 'ng' is pronounced 'angular'). Angular/AngularJS is a TypeScript/JavaScript framework developed by Google.

## Acknowledgements:

I wish to thank my wife for letting me spend two entire days grafted to my computer and dual 4K display rig. Being show-runner is not easy.

I wish to thank John Ackermann who was my sanity checkpoint at numerous times.

I wish to thank Nathaniel Frissell and Kristina Collins for the time they spent at 'attendee moderators', handling QA, break-time, and making their own presentations.

I wish to thank John Ackermann N8UR, Scotty Cowling WA2DFI, and Dave Larsen KV0S, who were all ready to leap in and continue streaming the DCC if I lost my internet connection, my computer melted down, or any catastrophe like that interrupted the outgoing stream. And for doing countless tasks during the event.

I wish to thank the officers and directors of TAPR, without whom this endeavor would not have been possible. They all played important roles, even if you didn't see them on-screen except during the TAPR Annual Membership meeting.

###

# AT Golden Packet Success

By Bob Bruninga, WB4APR

## Maine to Georgia at 9600

On Sat 18 July in brutally hot weather the 15 mountains were manned from Maine to Ga and APRS packets and messages were exchanged end-to-end. Typical Snafu's, I had to turn back 30 mins into my 2 hr trip to go home and get the radio! and another station had to turn back 45 mins in his 5 hour trip to get his coax!

The 4000' hike up Mt Katahdin in Maine was again done by Tim starting at 5 AM and getting back by sunset. Here is report from MDMTN-7 about half way along the mountains:

At 1100 I started receiving packets from the south, including ROAN-3, COMERS-4, AOMTN-5 and HWKSBL-6. As soon as Bob was set up on GDHILL-8 around 1220 (an hour 20m late!) I started receiving from the north, and in about 15 minutes I saw KATHDN-15 flying by.

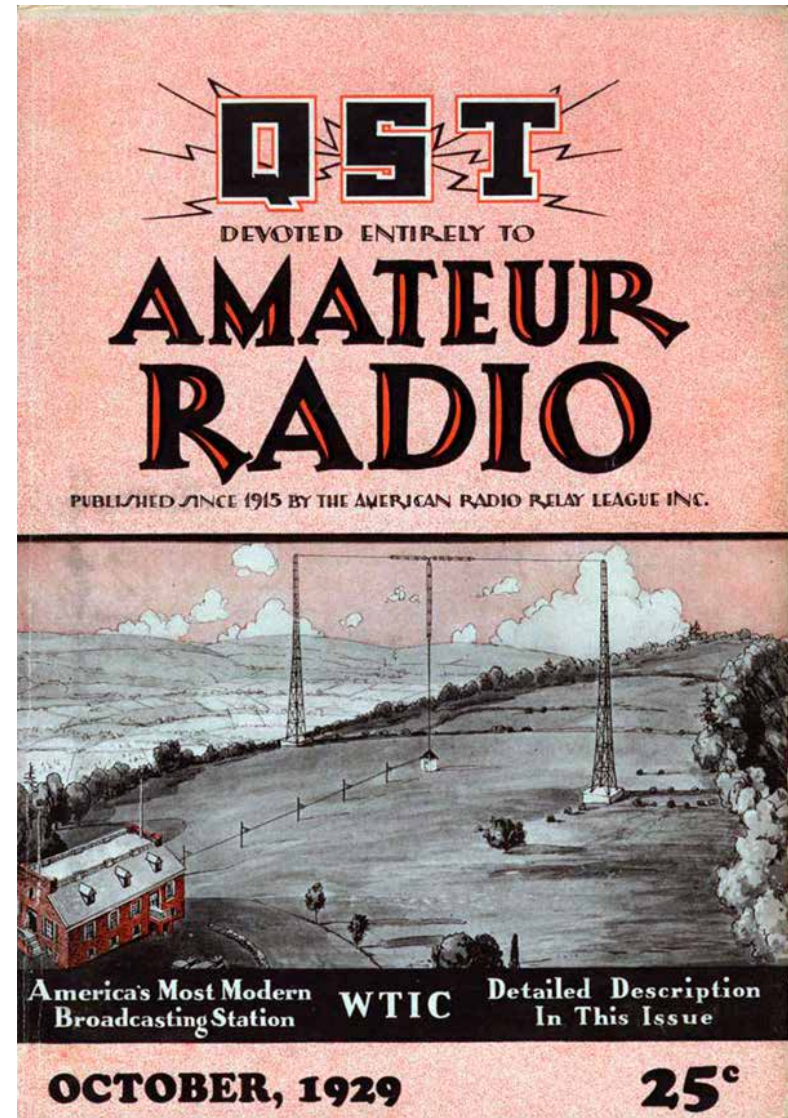
In our 11th year, we now do 9600 and it works fine. And are beginning to invite other mountains within 100 miles of the chain to join us (after the initial end-to-end success). (after 4 hours we usually quit due to exhaustion and heat, success or not!)

The one lesson relearned over and over is that you cannot operate mountain top without some kind of helical or cavity filter. You wont hear anything but QRM. I used the dual band DCI filter so that both the voice channel and data channel were fine on a dual band omni.

The main page will be slowly updated! (none yet, we are all recovering)...

<http://aprs.org/at-golden-packet.html>

###



# Seeking Someone to Improve D-Star Open-AMBE

By Steve Lampereur, KB9NWR

## Overview:

The AMBE speech coder problem started when D-Star was developed and introduced to ham radio in the late 90's early 2000's. It's since been compounded by DMR, Yaesu Fusion, and other digital HT's. The proposed solution has been to replace this with an open source codec. However, none of these digital modes have a means to specify or differentiate the audio codec should they ever want to move away from AMBE. And there still isn't much of a working implementation of Codec2 for VHF/UHF radios. There is a working implementation for [HF.Codec2/FreeDV](#) is a good conception, but it hasn't come to fruition in the advent of the AMBE patents expiring and other digital radios also employing AMBE and flooding the market.

For many hams these days the AMBE concern is not well understood. First you have to take a larger look at the point of amateur radio. To learn about radio, propagation, and the electromagnetic spectrum in general. To understand how it works, and maybe even build or modify your own equipment. In order to learn we must be able to inspect; to tinker, or at the very least have access to a specification we can build from.

So while D-Star was interesting as it was a new thing to play and learn about when it came about, there was this "black box" aspect where you just buy and are a passive consumer. This didn't sit well with many. Why even bother with a hobby of sharing and learning, if there's a big wall saying "this far, no further!", that you are not permitted to create your own radio for. Or permitted to understand.

The "HT of the Future" talk that Bruce Perens also gave some time ago, did also stress the need to have open radio firmware. Let's take a quick look at why this would be good for the hobby.

The Linksys WRT54G WiFi router of the early 2000's was a good example of the good that can come from open firmware/open source. The history here was the original factory firmware was discovered to be based on Linux components, which are covered by the GPL. This required the manufacturers to release the source code. With the code in hand, developers learned exactly how to talk to the hardware inside and how to code any features the hardware could support. It has spawned a handful of open source firmware projects for the WRT54G that extend its capabilities, and reliability, far beyond what is expected from a cheap consumer-grade router. In short, due to open source, one can load a third party firmware on the router and give a \$60 consumer home-grade router all the functionality of a \$600 Cisco professional router.

While there have been a few radio firmware reverse engineering efforts. The most well known is the MD380 project by Travis, KK4VCZ. The hobby can use a lot more of this and a lot more people like Travis. We haven't yet figured out how to re-write a radio's firmware to create that elusive digital radio that can do more than one digital mode. But that day may still come. Software Defined Radio was likely a foreign concept to many 20 plus years ago when this problem was first brought to our awareness by Bruce Perens. USRP, HackRF, HamShield, RTL-SDR, are known to many now, and having to have a hardware dongle to do the speech coding with those is illogical.

## The Need:

At this point, the AMBE used in D-Star is out of patent. Since there was never a published specification for it like its other variants, hams have thus far not been able to create a software version with similar performance. (Good sounding software AMBE does exist for other modes)

Software AMBE is extremely handy for folks running cloud based conference bridges like DV Switch, that allow hams to cross communicate between digital modes. It also can be used for internet connected apps that connect to the RF gateways without need for hardware (MMDVM hotspots & HT's).

The original reverse engineering thread:

<https://tinyurl.com/ybp7fs3v>

It's been said elsewhere that the suspected key to getting it better output is with the quantization tables:

```
// decode V/UV parameters
// load b1 from ambe_d
//TODO: use correct table (i.e. 0x0000 0x0005 0x0050 0x0055 etc)
```

This likely can't happen at the very least unless the coefficients for encoding the specific D-Star variant of AMBE are exposed in a software implementation somewhere like the one in the MD380 firmware. The good news is it appears our good friend Travis has begun working on that.

In an ideal situation, the D-Star spec would have required publication of this like the APCO specification did. After the fact, I don't foresee any

reason for the patent holder to release such details.

Another ideal scenario is if the FCC rules actually emphasized or required digital transparency, then not only would this enable those who want to learn and code/build, it would likely force working source code for AMBE to be published tomorrow.

It seems sad that various national amateur radio organizations have not stepped up to support open source efforts.

For Developers:

<https://github.com/nostar/dudestar>

<https://github.com/f4exb/dsdcc> - dsd rewrite - C++ library with a single decoder object

<https://github.com/LX3JL/xlxd>

<https://github.com/szechyjs/dsd>

<https://github.com/szechyjs/mbelib>

<https://github.com/LouisErigherve/dsd>

[http://git.osmocom.org/op25/tree/op25/gr-op25\\_repeater/lib](http://git.osmocom.org/op25/tree/op25/gr-op25_repeater/lib) - Op25 has encode and decode support for AMBE (D-Star, DMR and YSF) and IMBE (P25)

<https://tinyurl.com/ycmjye3h> - Pavel's IMBE Encoder/Decoder Fixed-Point implementation

<http://git.osmocom.org/osmo-gmr/tree/src/codecs>

<https://github.com/onlarf/voice-ann>



<https://tinyurl.com/y75sgyvx> - Line 383 - handles the bit interleaving and FEC processing

<https://github.com/travisgoodspeed/md380tools/> - The MD380 Emulator (capable of AMBE encoding and decoding)

<https://github.com/g4klx/AMBETools>

## Donate to TAPR

TAPR is now participating in the AmazonSmile program!

When you shop using the AmazonSmile program, Amazon makes a donation to TAPR equal to 0.5% of the price of your eligible AmazonSmile purchases.

AmazonSmile is the same Amazon you know. Same products, same prices, same service.

Bookmark the TAPR AmazonSmile Program link:

<https://smile.amazon.com/ch/86-0455870>

That link takes you to a special login portal where you enter your normal Amazon credentials and get redirected at the same Amazon home page except there will now be a notice that you are supporting TAPR.

Other ways to donate to TAPR, email [contact@tapr.org](mailto:contact@tapr.org):

###

## DCC Down Under

Hi all

I just want to say thanks to everyone for the work you all put in with the DCC. Alas, timezones are nasty this time of year, meaning that it and most of the meetings were held during sleep hours here. In fact, it lined up almost perfectly that way. The membership meeting was 6:30 am Sunday morning, so I had to get up extra early for it.

###

I did grab some photos of the zoom in the bushland for your viewing pleasure. I think they actually worked fairly well! I didn't get to see any koalas during the meeting, but I did see a Kangaroo.

Hope to get there next year in North Carolina, subject to covid...

73's

Darryl, VK2TDS



###

## Good Reads

### SMOG-P Accomplishes its Mission

The Earth-orbiting mission of the Budapest of Technology and Economics-developed picosatellite has ended: it entered the denser parts of the atmosphere on September 28, 2020 and disintegrated.

After spending the sensationally long time of nearly ten months in space, the world's first functional pocket-sized (5x5x5cm) satellite, 1-PocketQube burned up in the atmosphere. Despite a planned lifecycle of three months, SMOG-P was fully functional even eight months after its launch. The systems and the backup units were properly functioning and the developers did not detect any circuit failures

. You can read all about it here: <https://tinyurl.com/y97omky5>

### Raspberry Pi for Ham Radio Tutorial

A highly-recommended tutorial for beginners interested in Raspberry Pi applications for ham radio has been created by Anthony Le Cren, F4GOH/KF4GOH.

The tutorial can be found here: <https://tinyurl.com/yct4ze92>

### Loop on Ground Antenna

WA1LOU (your PSR editor) continues to experiment with Loop on Ground (LoG) antennas. You can read about her latest experiments here:

<http://www.horzepa.com/2020/11/bigger-log-antenna.html> and here:  
<http://www.horzepa.com/2020/11/bigger-log-antenna-addendum.html>

###

## TAPR Wear Available



Personalized Land's End clothing with the TAPR logo and your name and call sign are now available from the TAPR Store at

<http://business.landsend.com/store/tapr/>

Select from the Men's or Women's catalog. (To make shopping easier, there are "TAPR Recommended Shirts" in the Men's catalog including two styles of polo shirts, each available with or without pockets.)

The logo is available in three colors -- red, blue, and white. The name/call sign monogram thread will match the logo color. (We recommend that you use the white logo with dark colored shirts.)

Prices are very reasonable, for example, after adding the logo and monogram, a mesh pocket shirt is \$39.85 plus shipping and sales tax where applicable. Processing time is 5-7 days.

###

## Write Here!

Your *PSR* editor is working on the next issue of *PSR* and hopes to find a few good writers, particularly ham radio operators working on the digital side of our hobby, who would like to write about their activities and have them published here in *PSR*.



You don't have to be Hiram Percy Maxim to contribute to *PSR* and you don't have to use *Microsoft Word* to compose your thoughts.

Your *PSR* editor can handle just about any text and graphic format, so don't be afraid to submit whatever you have to [wallou@tapr.org](mailto:wallou@tapr.org) --- she can handle it!

The deadline for the next issue of *PSR* is February 1, so write early and write often.



## On the Net

By Mark Thompson, WB9QZB



### Facebook

As you may know, TAPR has a Facebook page, [www.facebook.com/TAPRDigitalHam](http://www.facebook.com/TAPRDigitalHam).

However, I also created a TAPR Facebook Group, [www.facebook.com/groups/TAPRDigital/](http://www.facebook.com/groups/TAPRDigital/).

If you have a Facebook account, "Like" the TAPR Facebook page and join the TAPR Facebook Group.

If you join the group click on the Events link and indicate you're Going to the events.



### On Twitter, Too

Access the TAPR Twitter account at [www.twitter.com/taprdigital](http://www.twitter.com/taprdigital).

###



### Also on YouTube

TAPR now has its own channel on YouTube: the TAPR Digital Videos Channel:

[www.youtube.com/user/TAPRDigitalVideo](http://www.youtube.com/user/TAPRDigitalVideo).

At this time, there are a slew of videos on our channel including many from the TAPR-ARRL Digital Communications Conference (DCC) that you may view at no cost, so have at it!

**PSR**

#147 Autumn 2020, ISSN: 1052-3626

Published by TAPR

Phone +1 972 413 8277

E-mail: [contact@tapr.org](mailto:contact@tapr.org)

URL [www.tapr.org](http://www.tapr.org)

Facebook [www.facebook.com/TAPRDigitalHam](http://www.facebook.com/TAPRDigitalHam)

Twitter [www.twitter.com/taprdigital](http://www.twitter.com/taprdigital)

TAPR Office Hours: Monday to Friday, 9 AM to 5 PM Eastern Time

**Submission Guidelines**

TAPR is always interested in receiving information and articles for publication. If you have an idea for an article you would like to see, or you or someone you know is doing something that would interest TAPR, please contact the editor ([w11lou@tapr.org](mailto:w11lou@tapr.org)) so that your work can be shared with the Amateur Radio community. If you feel uncomfortable or otherwise unable to write an article yourself, please contact the editor for assistance. Preferred format for articles is plain ASCII text (OpenOffice or *Microsoft Word* is acceptable). Preferred graphic formats are PS/EPS/TIFF (diagrams, black and white photographs), or TIFF/JPEG/GIF (color photographs). Please submit graphics at a minimum of 300 DPI.

**Production / Distribution**

PSR is exported as Adobe Acrobat and distributed electronically at [www.tapr.org](http://www.tapr.org)

PSR Editor: Stana Horzepa, WA1LOU

E-mail [w11lou@tapr.org](mailto:w11lou@tapr.org)

**TAPR Officers**

President: Steve Bible, N7HPR, [n7hpr@tapr.org](mailto:n7hpr@tapr.org)

Vice President: Scotty Cowling, WA2DFI, [wa2dfi@tapr.org](mailto:wa2dfi@tapr.org)

Secretary: Stana Horzepa, WA1LOU, [w11lou@tapr.org](mailto:w11lou@tapr.org)

Treasurer: Tom Holmes, N8ZM, [n8zm@tapr.org](mailto:n8zm@tapr.org)

**TAPR Board of Directors**

Board Member, Call Sign, Term Expires, e-mail address

John Ackermann, N8UR, 2022, [n8ur@tapr.org](mailto:n8ur@tapr.org)

Steve Bible, N7HPR, 2023, [n7hpr@tapr.org](mailto:n7hpr@tapr.org)

George Byrkit, K9TRV, 2021, [k9trv@tapr.org](mailto:k9trv@tapr.org)

Scotty Cowling, WA2DFI, 2021, [wa2dfi@tapr.org](mailto:wa2dfi@tapr.org)

Stana Horzepa, WA1LOU, 2023, [w11lou@tapr.org](mailto:w11lou@tapr.org)

John Koster, W9DDD, 2021, [w9ddd@tapr.org](mailto:w9ddd@tapr.org)

Dave Larsen, KV0S, 2022, [kv0s.dave@gmail.com](mailto:kv0s.dave@gmail.com)

Bruce Raymond, ND8I, 2022, [bruce@raymondtech.net](mailto:bruce@raymondtech.net)

Darryl Smith, VK2TDS, 2023, [vk2tds@tapr.org](mailto:vk2tds@tapr.org)

TAPR is a not-for-profit scientific research and development corporation [Section 501(c)(3) of the US tax code]. Contributions are deductible to the extent allowed by US tax laws. TAPR is chartered in the State of Arizona for the purpose of designing and developing new systems for digital radio communication in the Amateur Radio Service, and for disseminating information required, during, and obtained from such research.

**PSR Advertising Rates**

Full Page Ad for 1 issue: \$100, 4 issues: \$350

Half Page Ad for 1 issue: \$75, 4 issues: \$250

Quarter Page Ad for 1 issue: \$50, 4 issues: \$175



# Membership Application

TAPR

1 Glen Ave., Wolcott, CT 06716-1442

Phone +1 972 413 8277, Monday–Friday, 9AM–5PM Eastern Time

E-mail [contact@tapr.org](mailto:contact@tapr.org) URL [www.tapr.org](http://www.tapr.org)

Join or renew online at <https://tapr.org/logout/>

## Benefits of a TAPR Membership:

- Subscription to the quarterly PSR
- 10% off most TAPR kits and publications
- Access to the TAPR digital library
- Latest information on TAPR R&D projects
- Co-sponsor of the annual TAPR-ARRL Digital Communications Conference (DCC)

Name \_\_\_\_\_ Call Sign \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State/Province \_\_\_\_\_ Postal Code \_\_\_\_\_

Country \_\_\_\_\_ Daytime Phone No. \_\_\_\_\_

E-mail Address \_\_\_\_\_

New  Renewal  \$30 X \_\_\_\_\_ number of years = \$ \_\_\_\_\_ total

Payment Method: Check  Credit Card  Money Order  Cash  Don't send cash through the mail !

## **STOP!** Provide the following information only if paying by mail with a credit card:

AMEX  Discover  Mastercard  VISA

Credit Card No. \_\_\_\_\_ Expiration Date \_\_\_\_\_ Security Code \_\_\_\_\_

Card Holder's Name \_\_\_\_\_

**TAPR is a community that provides leadership and resources to radio amateurs for the purpose of advancing the radio art.**