

# Zero Retries 0107 - by Steve Stroh N8GNJ

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 [zeroretries.org/p/zero-retries-0107](http://zeroretries.org/p/zero-retries-0107)

Steve Stroh N8GNJ

*Zero Retries is an independent newsletter promoting technological innovation in Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology. Now in its third year of publication.*

## About Zero Retries

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## Steve Stroh N8GNJ, Editor

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Jack Stroh, Late Night Assistant Editor Emeritus

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Web version of this issue - <https://www.zeroretries.org/p/zero-retries-0107>

## Request To Send

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*Editorial by Steve Stroh N8GNJ*

### ***Two... Years... ?!?!?! of Zero Retries***

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The first issue - [Zero Retries 0000](#), published 2021-07-09, and went out to 44 subscribers who signed up in advance from some notes I posted to various mailing lists, and friends and family. That was the second Friday of July, thus I consider that to be the anniversary date of Zero Retries. Substack tells me that as of Zero Retries 0106 I've published 130 issues of Zero Retries which includes a number of single topic special issues and a few posts only to paid subscribers. As of this issue, there are 800+ subscribers of Zero Retries, and an unknown number that see new issues of Zero Retries via RSS feed.

I still enjoy this quote from [Zero Retries 0000](#):

... Regarding getting started on Zero Retries, however imperfectly, a favorite quote of mine is from the television series Stargate SG-1, "The Serpent's Lair", by Col. Jack O'Neill. The context is that his team is on the cusp of beginning a "big project":

*Well, I suppose now is the time for me to say something profound.*

*[long pause]*

*Nothing comes to mind. Let's do it.*

Thus, Zero Retries begins.

I mentioned another bit of inspiration for Zero Retries in [Zero Retries 0003](#):

Sometime this past June [2021], I casually read an article by [Kevin Kelly](#) called [99 Additional Bits of Unsolicited Advice](#). I'm confident you'll find much wisdom in it, as I did. But as I read through the various bits of unsolicited advice, this one "bit" was *really* profound:

***If your goal does not have a schedule, it is a dream.***

There are moments when you encounter things that sear your soul, and that one seemingly innocuous bit of unsolicited advice seared mine. Just copying and pasting it into this story, it still leaps out at me. The moment I read it, it was instantly clear to me that I hadn't yet launched Zero Retries because ***I didn't have a schedule!*** I had not *committed* to actually *launching* Zero Retries. You're reading Zero Retries now because in that moment, I realized that I *really didn't want Zero Retries to be merely a dream*. With a quick glance at the calendar, I decided to launch Zero Retries, ready or not, on Friday, July 2nd, 2021 at 15:30 Pacific. For some very good reasons that aren't germane here, I just couldn't make that date, and quickly recommitted to launch Issue 0000 exactly one week later on Friday, July 9th, 2021 at 15:30 Pacific. Thank you Kevin Kelly! I *really* needed that one particular bit of unsolicited advice.

*Kelly later revised the post to only mention the first five items in service to selling a book. Fortunately, the Internet Archive's Wayback Machine [cached the original \(excellent\) post with all 99 items](#).*

Overall, I think Zero Retries, as I outlined it in Issue 0000 have held up pretty well. One exception was that I imagined that others, especially various Subject Matter Experts (SMEs), would "jump in" and want to write guest articles for Zero Retries and otherwise participate in showcasing Technological Innovation in Amateur Radio in a "friendly venue". With a few exceptions, that hasn't happened. I've discussed this with some people, and the conclusion we've come to is that writing is now a fading skill - like writing in cursive, especially for "hobbyist" publications like Zero Retries. An odd corollary to that observation is that writing in online forums is extremely popular. People happily write multiple paragraphs in an online forum, but when asked to reformat it lightly for "publication" such as for Zero Retries, universally the reply is some form of "Oh, I'm not a writer..." and decline. I'll sometimes ask if I can excerpt their forum post, and they usually agree (or don't reply at all). In such situations, the formula is pretty simple - quote and highlight the actual quoted text to insure that it's obvious that I didn't write it, provide some context (that the writer doesn't need to explain in a focused forum), and a little bit of big picture.

A second exception is that in highlighting Technological Innovation in Amateur Radio, and the dearth of coverage of that topic in other Amateur Radio mediums, that at least some Amateur Radio vendors, projects, groups, etc. might want to promote themselves in Zero Retries. To date, there has been no such interest, at least that has approached *me*. But, in fairness, I haven't reached out to potential advertisers and sponsors with a "package"... and I

probably won't. Doing so would, at least in my mind, tip the delicate balancing act that is Zero Retries towards being beholden to advertisers. I tried an experiment for a while of highlighting Pseudosponsors - groups, projects, products, etc. that I thought were Zero Retries Interesting, in the vague form of an advertisement / sponsorship. As far as I could tell from feedback, there was *no* interest in such a thing in Zero Retries - not even from the Pseudosponsors. So, that experiment ended up in the "failed experiment" column.

In the "If I'd known *then* what I know *now* department":

- I would have started Zero Retries *years* earlier; the idea (including the name) had been gestating for at least a decade. The only substantive "gating" factor to starting Zero Retries was that my operating model for Zero Retries required some service that provided "write, hit publish, and we handle the rest", and Substack emerged in 2017 with exactly that capability.
- I would have turned on optional payments from the beginning. It's so much easier to build that in from the beginning than "backfit" it into a newsletter.
- I would have maintained indexes and compilations of Zero Retries as I went along. I'm now in the process of doing that for all issues to date (and it's slow going).
- I would have used graphics more, and learned how to downscale graphics to an more acceptable page size and file size. Substack's editor does some of that, but it's not readily apparent what it's doing behind the scenes.
- Substack's warning banners about the size of a newsletter (too large for email) have some kind of flaw in their algorithm and I gave those warning banners way too much weight until I realized that they were badly flawed.

Overall, I'm satisfied with Substack's capabilities, but it's become apparent that I'm not exactly the target customer for Substack in publishing a newsletter about a niche (Technological Innovation in...) of a niche (Amateur Radio). Substack's tools, ecosystem, and overall "approach" is really intended for newsletters that address "mass market" topics such as politics, sports, "mainstream" technology (such as IT, phones, etc.), literature, "stream of consciousness", etc. If your content isn't that, Substack subtly ignores you.

I've learned a lot these past two years. It's been a delight to dive deep into all these topics, and there's a deep truth in the advice that to understand something, write about it and / or teach it. Writing Zero Retries has become one of the highlights of my life, and thank you Zero Retries readers for making it worth doing.

73,

Steve N8GNJ

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Image courtesy of Stockvault.net

## **The Ten Most Zero Retries Interesting Projects - Summer 2023 - Part 2**

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By Steve Stroh N8GNJ

*Creating a Zero Retries Interesting “Top Ten” list.*

Previous - [The Ten Most Zero Retries Interesting Projects - Summer 2023 - Part 1.](#)

### **Part 2:**

- M17 Project - A Digital Voice Ecosystem for Amateur Radio Using Open Source

- NinoTNC and Dire Wolf Software TNC / TNC4 - Packet Radio is Alive and Well in the 2020s
- ka9q radio - New Approach to Multi-channel VHF / UHF Receivers
- Selected Amateur Radio Space Projects - The Most Interesting Frontier (In Amateur Radio)
- DLARC - Amateur Radio's Library for the 21st Century

## M17 Project

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*A Digital Voice Ecosystem for Amateur Radio Using Open Source.*

While the M17 Project has been a work in progress for years, in my opinion, the past year has seen remarkable progress in M17 realizing its potential as a viable digital voice ecosystem - protocol, infrastructure, and most recently, *hardware*. Most impressive about M17 Project is that all of it is open source, and it's almost entirely software and protocol - any hardware is essentially a "wrapper" around the software and protocols. It's now possible to build an M17 repeater thanks to the versatile open source Multi Mode Digital Voice Modem (MMDVM) which supports M17 as a native mode

### 1

. There are now several portable radios that can be modified to do M17 (minor hardware modifications, mostly new firmware) with no external hardware required. M17 is also being supported in modems such as the Mobilinkd TNC4 and the digirig. The most exciting news lately about M17 is the OpenHT Proof of Concept. I think that we'll soon see M17 on a par with other Digital Voice protocols when Software Defined Transceivers for VHF / UHF, such as the RTX-100, become practical / available and M17 can just be another mode on such a radio.

## NinoTNC / Dire Wolf Software TNC / TNC4

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*Amateur Radio Packet Radio is Alive and Well in the 2020s.*

The evolution of the NinoTNC through multiple revisions and a lot of firmware development has been impressive. The NinoTNC is a KISS data modem for Amateur Radio Packet Radio. The NinoTNC is optimized for building by typical Amateur Radio Operators (some soldering experience required), is low-cost, and very capable. Not only does the NinoTNC offer the most typical Packet Radio mode - AX.25 with 1200 bps Audio Frequency Shift Keying (AFSK), but also higher speeds. Most impressively, NinoTNC's developer created a successor to AX.25 called IL2P - Improved Layer 2 Protocol which integrates (interleaves)

Forward Error Correction (FEC) into Amateur Radio Packet Radio for more reliable communications. One minor downside to the NinoTNC is that technical details of the NinoTNC have not been released as open source.

Dire Wolf Software TNC (humorously broken out as **D**ecoded **I**nformation from **R**adio **E**missions for **W**indows **O**r **L**inux **F**ans)

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is a highly capable software implementation of an Amateur Radio Packet Radio Terminal Node Controller (TNC), requiring only an audio interface and a host computer. It is released as open source, has been ported to a very wide variety of hardware, and is incorporated in a number of Amateur Radio software collections to run on the Raspberry Pi and other Linux implementations. Because IL2P (see previous paragraph) was so well specified, Dire Wolf has implemented IL2P

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, as well as the FX.25 FEC protocol extension to AX.25.

The Mobilinkd TNC4 was released in 2023 after the semiconductor parts shortage of the past four years rendered the predecessor TNC3 impractical to manufacture. The TNC4 has a number of notable features including Bluetooth 4.2 support for Apple devices (which is *challenging*) and a built-in battery. The TNC4 incorporates a Digital Signal Processor (DSP) which makes it flexible enough to support M17 Project (as mentioned above) as well as typical Amateur Radio Packet Radio modes. It's notable that Mobilinkd saw enough potential market to justify the redesign of the TNC3 into the TNC4.

Taken together, these three systems illustrate that Amateur Radio Packet Radio is not merely “hanging in there”, but actually improving, evolving, and growing. In my reading and research for Zero Retries, I often encounter growing interest in re-establishing Amateur Radio Packet Radio *and establishing new networks!* The challenge with such networks is to overcome the inertia of the not-so-great aspects of packet radio such as the poor efficiency of 1200 bps AFSK links, digipeaters not scaling beyond a handful of users before collapsing from Hidden Transmitter Syndrome, and other issues that have plagued Amateur Radio Packet Radio for decades now.

## **ka9q radio**

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### *New Approach to Multi-channel VHF / UHF Receivers*

Phil Karn KA9Q has been a fount of technological innovation in Amateur Radio for decades and in my opinion deserves significant kudos for *continuing* to use his skills to contribute back to Amateur Radio, when the most of his technological peers have “retired” from Amateur Radio.

KA9Q's latest project is ka9q radio. He explains it best on the project's GitHub page:

*ka9q-radio* is a software defined radio for Linux I've been working on for a few years. It is very different from most other amateur SDRs in several respects:

1. Efficient multichannel reception. A single Raspberry Pi 4 can simultaneously demodulate, in real time, every NBFM channel on a VHF/UHF band (i.e., several hundred) with plenty of real time left over.
2. All I/O (both signal and control/status) uses IP multicasting. This makes it easy for more than one module, on the same computer or on a LAN, to operate on the outputs of other modules, or for individual modules to be restarted without restarting everything else.

This is just a completely different paradigm from the “hardware” paradigm of a radio receiver that tunes one frequency at a time, even with software defined receivers displaying a waterfall - when you want to receive a signal, you select that (one) signal to listen to / decode. *ka9q radio* is technological innovation at its best. From my reading and research, *ka9q radio* has not received nearly the level of attention that it truly deserves.

## **Selected Amateur Radio Space Projects**

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### *The Most Interesting Frontier (In Amateur Radio)*

Amateur Radio has been involved in space (communications) since the beginning of the Space Age - Amateur Radio Operators were some of the first to receive Sputnik 1's transmissions in 1957. But Amateur Radio was involved in space communications even earlier than that by using Earth Moon Earth (Moonbounce) communications as early as 1953.

There are many, many interesting space communications activities available in Amateur Radio than the (now relatively common) Amateur Radio satellites in Low Earth Orbit (LEO) that can be worked with a portable radio and a small directional antenna. Here are a few of the most Zero Retries Interesting space activities:

The QO-100 Amateur Radio Payload in Geostationary Orbit (Eastern Hemisphere) is a platform for Amateur Radio Operators to experiment with 2.4 GHz uplinks and 10 GHz downlinks. Years after beginning operations, QO-100 is still stimulating technological innovation with interesting projects for its Wideband digital transponder. One example is NPR-VSAT : IP ACCESS OVER QO-100 WB. Another is digital television using the DVB standard.

Amateur Radio on the International Space Station (ARISS) coordinates the Amateur Radio activities and equipment aboard the International Space Station. One primary activity is arranging contacts between schools and ISS astronauts (conducted during their recreational



time). ARISS is now developing several Science Technology Engineering and Math (STEM) packages for classroom use to make it easier for teachers to get kids excited about STEM, space, and radio communications.

Earth Moon Earth (EME) communications has become more feasible for “average” Amateur Radio Operators every year since the creation of JT65 and other “weak signal, high computation” modes (WSJT-X) in 2001. An ideal “getting started” mode, similar to what I’ve been describing for “Neil’s Night” activities

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is MAP65, a receive-only mode for receiving EME transmissions using JT65. To me, and others that I talk to, EME is just... *exciting!*

Colleges and other schools launch many research satellites each year to train students about electronics, space, the physics of space and orbital mechanics, and space communications. (Many include a primary or secondary Amateur Radio communications subsystem.) Receiving the telemetry of those satellites is problematic when the orbit of the satellite isn’t within the range of the school’s satellite station. A growing worldwide network of SatNOGS stations is a solution to that issue. Because SatNOGS stations are receive-only, *anyone* can build one and contribute to the mission of those many research satellites. Some satellites have begun to use the LoRa radio system for research satellite downlinks, and to receive those transmissions, TinyGS was developed as a ground station receiver and network very similar to SatNOGS.

Space... is just cool... and Amateur Radio has many, many ways to participate in space communications and is thus a very exciting Zero Retries Interesting area of interest.

## **Digital Library of Amateur Radio & Communications (DLARC)**

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### *Amateur Radio’s Universal Library for the 21st Century*

Amateur Radio has needed something like DLARC for decades as information that was only originally available only in print has not made the transition to the Internet and web. While a lot of human knowledge has made that transition, for a number of reasons, much of Amateur Radio’s “tribal knowledge” - magazines, books, newsletters, presentations, video and audio recordings, etc. have not made that transition. In particular, Amateur Radio is “built upon the shoulders of giants”. Despite incredible technological innovation occurring, foundational knowledge about basic subjects such as antennas, the physics of radio, reinvention of innovative techniques that were possible, but not practical with earlier technology is vitally important to be accessible instead of “being lost to the recycling bin”.

This loss of knowledge results from a variety of factors - Amateur Radio Operators aging out of being able to retain extensive personal libraries, the decreasing relevance of Amateur Radio in society results in few people wanting to take over personal libraries, and most of all,

no interest from Amateur Radio and other “institutions” in preserving Amateur Radio history.

Into this gaping void, the Internet Archive’s Digital Library of Amateur Radio & Communications (DLARC) project has emerged to conduct in this important mission. DLARC is made possible with a significant grant from ARDC in late 2021. To date, more than 75,000 individual items (magazines, books, files, etc.) have been digitized and made available through DLARC. Hopefully DLARC will continue beyond 2023 with an additional grant from ARDC to continue DLARC’s important work in the coming years.

This concludes the **The Ten Most Zero Retries Interesting Projects - Summer 2023** “series”. I hope you found this article useful and informative.

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## **VARA FM Repeater Considerations**

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In researching the section [VARA FM / VarAC - Fastest Data Communications Using Voice Radios](#) for the article [The Ten Most Zero Retries Interesting Projects - Summer 2023 - Part 1](#) article in [Zero Retries 0106](#), I corresponded with an expert user of VARA FM. The expert user mentioned that they’re building a repeater specifically to be used for VARA FM, and as such had a few special considerations. Some of this information is from the expert user, and some of it is my speculation.

First, why dedicate a repeater to VARA FM... or any other data method?

- A repeater dedicated to VARA FM isn’t (mostly) a technical issue, but rather a it’s an operational issue - any FM (voice) repeater *can* be used for VARA FM, but many / most repeater owners “don’t want that data / noise on *my* repeater”.
- Using a repeater for data improves coverage; stations that cannot communicate directly with each other due to distance, having a modest station (compromised antenna or low transmit power) can communicate with each other using a repeater.
- While digipeaters can help with the coverage issue, use of digipeaters impose a significant limitation of “Hidden Transmitter Syndrome”. That is, because a station is unaware that another is transmitting to the digipeater, collisions can result and the stations and the digipeater have to go through inefficient cycles of retries and retransmissions.

- Repeaters enable “broadcast” transmissions; even when communications are occurring between two stations, everyone listening on the channel is aware of the transmissions. Because repeaters simultaneously retransmit a received signal, everyone is aware that the repeater is in use, and “hold off” their transmissions until the repeater is not in use.

### **Technical Features of a Repeater Optimized for VARA FM**

- Conventional repeater features:
  - FM (analog audio), not Digital Voice (DV). DV repeaters / systems are optimized for human voice and as such would distort data encoded in an “data via analog” transmission.
  - Frequency Division Multiplexing - Separate input and output channels in the same band, using a duplexer to only require one antenna (mostly for the economy of installing a single antenna).
  - Continuous Tone-Coded Squelch System (CTCSS; subaudible tone) required to activate the repeater. Not required technically for VARA FM, but “just a fact of life with Amateur Radio FM repeaters”.
  - Automatic identification of the repeater trustee’s callsign every ten minutes when the repeater is in use; likely using 20+ words per minute Morse Code to minimize airtime used for identification.
  - Monitoring of the repeater’s operation by the repeater trustee and the ability to disable the repeater remotely if something goes wrong or it’s being abused.
  - “Coordination” by a regional Amateur Radio repeater coordination group. For coordination purposes, such a repeater is “just a conventional FM voice repeater”.

- VARA FM Specific Adaptations:

- VARA FM Narrow - Stations operating VARA FM through the repeater would use VARA FM *Narrow* because of the audio bandwidth limitations of a typical repeater. Note that even with this “limitation”, VARA FM Narrow can achieve speeds up to 12+ kbps.
- Carrier drop set to 0; when the user’s transmission stops, the repeater’s carrier drops *immediately*. This allows other stations to sense that the repeater is available for use.
- No courtesy tones.
- No other audio indications of status.

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## ZR > BEACON

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By Steve Stroh N8GNJ

*Short mentions of Zero Retries Interesting items.*

### **A TAPR TNC-1 Board For Sale - Only \$350**

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I’ve been watching [this eBay auction](#) with amusement. I have no idea why the owner thinks that a TAPR TNC-1 board is worth this amount, but it’s been for sale for more than one week now.

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### **Interesting Job Opening at ARRL - Digital RF Engineer**

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*Maybe there is some hope for ARRL’s relevance in Zero Retries areas of interest?*

The Digital RF Engineer will serve as the subject matter expert in the areas of digital RF and RF based networking topologies including LAN and WAN based systems. As amateur radio technology migrates from analog to digital and becomes increasingly dependent on software based and FPGA embedded systems, this position will be required to maintain an understanding of leading-edge work in the industry and bring that experience to ARRL in terms of developing technology, technology-based content, and provide support to members in these areas. Short term objectives will include being involved with design, deployment, and management of a high-speed wireless telecommunications network via amateur radio; documenting the process of creating and deploying a portable mesh network; coordinating with the Emergency Management department to incorporate mesh networking into the ARES program; lead development of learning modules in the ARRL Learning Center related to these technology areas.

Actually... *I'm shocked* that this appears to be a full-time paid staff position at ARRL

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- *As amateur radio technology migrates from analog to digital...*
- *... in terms of developing technology, technology-based content, and provide support to members in these areas.*
- *... design, deployment, and management of a high-speed wireless telecommunications network via amateur radio;*

Not to be snarky (really!) but this is the first time (since the packet radio era) that I've heard ARRL acknowledge that *there is a transition underway from analog to digital.*

While this is an encouraging development... this is the *same organization that:*

- "Hounded" Ria Jairam N2RJ, one of the most technically knowledgeable ARRL Directors, to the point that she resigned as an ARRL Director,
- Doesn't feature any regular digital content in its primary magazine,
- Doesn't make any of its legacy publications relating to digital communications (such as the excellent Gateway newsletter) available for public access,
- Has long ceased supporting

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the primary Amateur Radio conference for digital communications (which is why I now call it the TAPR Digital Communications Conference), and

- Ignores the technological retardation resulting from the inane limitation of 56,000 symbols per second on VHF / UHF bands, but engages with a member of the US Congress to update a similar limitation on the HF bands merely so it can make legal use of their Pactor-4 modems on HF.

I'm equal parts hopeful for such a position to be filled and that person potentially influence the ARRL's sad dereliction of the potential of digital technology within Amateur Radio... and feel sorry for the person that gets the job and likely discovers it's "same old, same old" at ARRL regarding digital communications in Amateur Radio.

If the role does get filled... the new *Digital RF Engineer* has a standing invitation to talk 😊

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## Building an M17 Repeater

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Regarding the M17 Project's progress (see above), Rob Robinette K9OJ provides an interesting and detailed construction article on how he built a repeater dedicated to M17 - [Building an M17 Repeater](#).

My repeater is made up of these components:

- **Repeater Controller:** Repeater Builder STM32\_DVM\_PiHat mounted on a raspberry pi 3+. I upgraded the STM32\_DVM firmware to 1.6.0 for M17 support.
- **Repeater Controller Software:** W0CHP WPSD dashboard based on pi-star. It supports M17 without modification. Chip's dashboard is far superior to the standard pi-star dashboard.

Plus, of course, the usual transmitter radio, receiver radio, duplexer, power supply, cabling, etc.

In fact, K9OJ's [entire site](#) is an interesting read, but he offers a lot of good Zero Retries Interesting info in the [Ham Digital Modes](#) section.

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## Growing Interest in Amateur Radio Regarding "Shortwave Modernization Coalition" Petition In Progress at the FCC

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- [ARRL is "reviewing the petition"](#).
- Ria Jairam N2RJ - [Stock trading on HF bands - is it time to panic yet?](#) (YouTube).
- Jim Heath W6LG - [Will This Petition Before The FCC Bring An End To Amateur Radio As We Know It Or Am I Wrong](#) (YouTube).

- Hacker News - [Commercial interests petition FCC for high power allocation on shortwave](#).

Commendably - Benn Kobb AK4AV has been [reporting on this issue for months](#).

In my opinion, this petition being adopted in some form is probably inevitable because this portion of spectrum being allocated to Broadcasting is mostly a failed business model. Thus there is little demand for this portion of spectrum because advertising revenue for radio programming has been severely reduced by advertising on Internet. As in, “who listens to *shortwave* broadcasting in *this* era”? Shortwave broadcasting is expensive - multi-kilowatt transmitters require a lot of expensive electrical power, real estate for antennas is expensive, and the specialized equipment is now mostly custom-built. Thus there are few remaining commercial shortwave broadcasters. No one besides the “Shortwave Modernization Coalition” has a better idea for what to do with this spectrum, and with a (proposed, at the moment) new business model, there’s no chance of reverting that spectrum for use by Amateur Radio.

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## Join the *Fun* on Amateur Radio

If you’re not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, check out [Join the Fun on Amateur Radio](#) for some pointers.

[Zero Retries Frequently Asked Questions \(FAQs\)](#) — In development 2023-02.

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## Closing the Channel

In its mission to highlight technological innovation in Amateur Radio, promote Amateur Radio to techies as a literal license to experiment with radio technology, and make Amateur Radio more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to everyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex, which hides Amateur Radio content behind paywalls.

My ongoing *Thanks* to:

- Tina Stroh KD7WSF for, well, *everything!*

- **Founding Members who generously support Zero Retries financially:**  
 Founding Member 0000 - Steven Davidson K3FZT  
 Founding Member 0001 - Chris Osburn KD7DVD  
 Founding Member 0002 - Don Rotolo N2IRZ
- Numerous Annual and Monthly subscribers who also generously support Zero Retries financially!

### **Want to Support Zero Retries?**

- The *most* effective way to support Zero Retries is to simply mention Zero Retries to your co-conspirators that are also interested in knowing more about technological innovation that is occurring in Amateur Radio and encourage them to become a fellow subscriber.
- One particularly effective method of promoting Zero Retries is to add a mention of Zero Retries to your QRZ page (or other web presence) and include a link:

### **Zero Retries**

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An independent newsletter about technological innovation in Amateur Radio, promoting Amateur Radio as (literally) a license to experiment with and learn about radio technology.

By Steve Stroh N8GNJ

If you'd like to financially support Zero Retries, becoming a paid subscriber is *greatly* appreciated and helps offset expenses incurred in publishing Zero Retries. Paid subscriptions for Zero Retries are *entirely optional*, as explained in this special issue of ZR:

[Zero Retries Administrivia - Activating Payment Options.](#)

### **These blogs and newsletters regularly feature Zero Retries Interesting content:**

- [Dan Romanchik KB6NU](#) mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- [Jeff Davis KE9V](#) also mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- [Amateur Radio Weekly](#) by Cale Mooth K4HCK is a weekly anthology of links to interesting Amateur Radio stories.



- [Experimental Radio News](#) by Bennet Z. Kobb AK4AV discusses (in detail) Experimental (Part 5) licenses issued by the US FCC.
- [TAPR Packet Status Register](#) has been published continuously since 1982.
- [Other Substack Amateur Radio newsletters](#) recommended by Zero Retries.

**These YouTube channels** regularly feature Zero Retries Interesting content:

- [HB9BLA Wireless](#) by Andreas Spiess HB9BLA
- [KM6LYW Radio](#) by Craig Lamparter KM6LYW (home of the [DigiPi project](#))
- [Modern Ham](#) by Billy Penley KN4MKB
- [Tech Minds](#) by Matthew Miller M0DQW

The [Substack email publishing platform](#) makes Zero Retries possible. I recommend it for publishing newsletters.

If you're reading this issue on the web and you'd like to see Zero Retries in your email Inbox every Friday afternoon, just click below to join 400 200 300 400 500 600 700 800+ other readers:

***Please tell your co-conspirators about Zero Retries — just click:***

[Share Zero Retries](#)

Offering **feedback or comments** for Zero Retries is equally easy — just click:

[Leave a comment](#)

If you're a fellow smart person that uses **RSS**, there *is* an **[RSS feed for Zero Retries](#)**.

**Zero Retries (N8GNJ) is on Mastodon** — [n8gnj@mastodon.radio](mailto:n8gnj@mastodon.radio) — just click:

[Zero Retries / N8GNJ on Mastodon](#)

Email issues of Zero Retries are “instrumented” by [Substack](#) to gather basic statistics about opens, clicking links, etc.

More bits from Steve Stroh N8GNJ:

- [SuperPacket blog](#) — *Discussing new generations of Amateur Radio Data Communications — beyond Packet Radio (a precursor to Zero Retries)*

- [N8GNJ blog](#) — *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs — Bellingham, Washington, USA*

Thanks for reading!

Steve Stroh N8GNJ / WRPS598 (He / Him / His)

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1

... along with D-Star, DMR, System Fusion, P25, NXDN, POCSAG, AX.25, and FM.

2

It has also been ported to Macs.

3

There's some confusion about whether IL2P is actually in the Dire Wolf codebase. The linked article shows that it was, but the [\(development\) version 1.7](#) does not mention IL2P.

4

See [Zero Retries 0097](#) (Part 1), [Zero Retries 0098](#) (Part 2), and [Zero Retries 0099](#) (Part 3). In all that research and writing, I have *no idea how I missed noting the availability of MAP65* in my articles on Neil's Night. It seems to have been there all along on the main WSJT-X page. Sigh...

5

My memory is that such specific technical roles have been voluntary, part time, and solely advisory.

6

Other than allowing its name in the title of the conference, which is a legacy that TAPR has been loath to abandon - despite ARRL's lack of involvement in the DCC for at least the past decade.