Zero Retries 0113

zeroretries.org/p/zero-retries-0113

Steve Stroh N8GNJ, Orv Beach W6BI, Jonathan Naylor

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, with 900+ subscribers.

About Zero Retries

Steve Stroh N8GNJ, Editor

Jack Stroh, Late Night Assistant Editor Emeritus

In this issue:

- **Join the *Fun* on Amateur Radio**
- **Closing The Channel**

Web version of this issue - https://www.zeroretries.org/p/zero-retries-0113

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Editorial by Steve Stroh N8GNJ

New Milestone for Zero Retries - *Two* Guest Authors

In this issue, I'm pleased to feature articles written by Jonathan Naylor G4KLX *and* Orv Beach W6BI. This is the first issue of Zero Retries that has contributions from *two* guest authors.

New Zero Retries Pseudostaffer - Orv Beach W6BI

With his article in this issue, Orv Beach W6BI has crossed the (entirely arbitrary) threshold of contributing substantively enough and frequently enough to Zero Retries to be appointed a Zero Retries Pseudostaffer, joining the original five Pseudostaffers. W6BI's new title, that he adds to his other title as AREDN Ambassador, was named a Zero Retries Pseudostaffer because of his frequent public updates (that are Zero Retries Interesting) about Amateur Radio Emergency Data Network (AREDN) on mailing lists, Facebook, and the AREDN web page. As an active Pseudostaffer, W6BI will be accorded the usual honorarium of my buying him the first beer at future in-person meetings.

"Congratulations" W6BI! We look forward to updates on the rapid evolution of AREDN!

Wither DCC 2023, and the Bigger Picture of Potentially Losing the DCC

One month ago in Zero Retries 0108, I wrote DCC 2023 May Not Happen. ~~Since then, TAPR has been publicly silent on the fate of Digital Communications Conference (DCC) 2023. At this late date, it's a certainty that DCC 2023 won't be held as an in-person event for its traditional timing in September. There's still some hope that an online DCC could be arranged.~~

Update: Statement inTAPR PSR 156 (Summer, 2023) published 2023-08-23:

> The officers and directors of TAPR are weighing the options [for] holding a Digital Communications Conference this year. Most likely it will be an online virtual conference rather than a live in-person conference. An announcement concerning the DCC will be forthcoming soon.

Perhaps 0.1% of us in Amateur Radio know of, *or care*, about the DCC. *But, in my opinion, the DCC is a vital element of Amateur Radio.* In ZR > BEACON later in this issue, I note that the papers for the TAPR DCC 2022 have now been posted. Those eleven papers for DCC 2022 are Amateur Radio "showing our work", formally demonstrating, on the record, *in writing*, in a manner that can be cited in regulatory filings or even legal proceedings as prior art, *about the technological innovation that is occurring in Amateur Radio*.

A perfect illustration of the importance of this is the DCC 2022 paper Preliminary Analysis of an AI-powered Transcription Bot for FM Transmissions by Zhemin Zhang KD2TAI and Brian Robert Callahan AD2BA. That's a great and interesting idea - automatic transcriptions of conversations occurring over two-way radio. Imagine how useful that would be for a post-mortem of an emergency event, having a nearly real time text report of what was said. It seems likely to me that someone will eventually attempt to patent such an idea, but because KD2TAI and AD2BA formally published the idea in the Proceedings of DCC 2022, that idea is now firmly established as prior art.

Why the combination of conference and paper presentation *matters* was brought home to me in a casual sentence in a private correspondence with a friend:

> Lawyers are everything at FCC, engineers do not run the place.

That… was a zinger, to me… but it shouldn't have been. In the 2000s I was writing about the (then) nascent Wireless Internet Service Provider (WISP) industry. I once testified at an FCC panel, and at conferences I was able to talk face to face with FCC staff. At that time, logic, engineering competence, and a sense of the big picture of society were still well-represented at the FCC. But the trend of "lawyer takeover" was evident then. My friend does not do hyperbole, so apparently the trend I was observing at the FCC is now complete.

Some will posit that the idea of a conference like DCC that is held in person, with papers written and presented, is an outmoded concept with the ability to hold virtual conferences via YouTube, Zoom, and recently the QSO Today Academy.

But I would argue that the DCC, where papers are presented, is more vital than ever now. To even have a hope of "defending itself" at the FCC, Amateur Radio needs to be able to present a solid case for its continued allocation of spectrum. As Dr. Karl Meinzer DJ4ZC says it so well:

> **Ultimately, amateur radio must prove that it is useful for society.**

When you attend a DCC, there's no distraction such as a typical Amateur Radio conference - commercial vendors, flea markets, etc. When you attend a DCC, you're immersed in technological innovation in Amateur Radio. You come away with a sense of "*wow… I'm part of something really cool*".

It's early days, but if the DCC is discontinued under TAPR's stewardship, *I plan to do something about that situation*. If you feel the same, please get in touch.

Paying a Bit More Attention to r/HamRadio

Several Zero Retries readers have periodically directed me to Reddit's r/HamRadio "Subreddit". I've been told that Reddit can be a… "challenging" place, but r/Hamradio seems to be civil. I'm impressed that r/HamRadio reports that there are 57,000 Members.

r/HamRadio is another "drinking from a firehose" experience, and to date I've only periodically visited, but it's growing on me. I don't have anything profound to report from r/HamRadio at the moment, but after spending an hour or so browsing, I came away with the insight that a lot of techies, when considering Amateur Radio, or new Amateur Radio Operators that want some distilled wisdom about some specialized area of Amateur Radio seem to come to r/HamRadio *first* to ask questions. This post is an example:

> I'm 19 trying to get in to hamradio what cool things I can do with [a Baofeng UV-5R] and iPad setup. Also what some tips and good YouTube channels to watch for info.

If a specific Amateur Radio community of interest (examples - TAPR for digital, AMSAT for satellites, Amateur Television, AREDN for microwave networking, Weak Signal (QRP), grantmaking (ARDC), etc. wanted to "evangelize" a bit for their activity / organization, they could do worse than to have a representative (with their affiliation stated with each post) be a regular presence on r/HamRadio.

Overflowing, as Usual

It's getting almost funny to me that Zero Retries was originally *intended* to be a weekly newsletter that would *fit comfortably into an email*. This issue was already overflowing "recommended size for an email" this week, and then late in the week several "must include" items surfaced. I haven't even bothered to check how badly this issue will overflow the maximum size of various email systems, thus here's the link to the web version: https://www.zeroretries.org/p/zero-retries-0113

de N8GNJ

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MMDVM-TNC Project - New 9600 bps Data Mode

By Jonathan Naylor G4KLX

An improved 9600 bps data communications mode for Amateur Radio is being developed for Multi-Mode Digital Voice Modem (MMDVM) units.

In the UK and perhaps other parts of Europe, it's problematic to obtain allocations for channels wider than 12.5 kHz for use by unattended systems such as repeaters and packet radio relay nodes (digipeaters). In Europe, the 440 MHz band is 430 - 440 MHz (and in places, 432-440 MHz). This largely precludes the use of the excellent G3RUH 9600 bps modem modulation for 9600 bps data because it requires a 25 kHz channel.

Several factors have combined to suggest a new 9600 bps modulation using a 12.5 kHz channel is feasible, which would make it easier to deploy 9600 bps unattended data systems in Europe:

- There are two well-proven implementations of 9600 bps data in a 12.5 kHz channel in Amateur Radio - Digital Mobile Radio (DMR) using 4FSK modulation, and System Fusion (SF) using C4FM modulation.
- Both DMR and SF are existing modes in the Multi-Mode Digital Voice Modem (MMDVM) project, thus the development work to implement 4FSK and C4FM is already done.
- IL2P (DCC 2020 paper, reference web page, Wikipedia) is a new link layer protocol with integral Forward Error Correction (FEC). IL2P is available

  1
  as a specification and a proven implementation (NinoTNC) and a reported implementation (in development) in the Dire Wolf software Terminal Node Controller (TNC).

The working name for this project is MMDVM-TNC, as it is replacement firmware for MMDVM units, essentially converting an MMDVM unit into a KISS TNC. Discussion of the MMDVM-TNC project has been warmly received by packet radio users. IL2P's creator, Nino Carrillo KK4HEJ, is following the project and Nino may create a compatible mode in a future version of firmware for the NinoTNC.

Despite using elements of both 4FSK and C4FM modulation (which I call C4FSK), MMDVM-TNC will have no compatibility or interoperability with DMR or SF, nor will it have any compatibility with conventional 9600 bps FSK or G3RUH modulation.

Like other KISS TNCs, all networking functions will be handled by Packet Radio networking software on a host computer, such as G8BPQ, Linux kernel AX.25, other AX.25, Net/ROM, ROSE, etc.

An MMDVM-TNC will incorporate two new (to KISS TNCs) features:

- The G8BPQ ACKMODE

  2
  extension will be standard, which will improve link performance.
- Input / Output levels will be software selectable using the KISS SET HARDWARE command.

An MMDVM-TNC will also include the option to select (in software) either the new 9600 bps modulation, or standard 1200 bps Audio Frequency Shift Keying (AFSK) for backwards compatibility.

Software development for MMDVM-TNC is on Github:
g4klx/MMDVM-TNC: An AX.25 only version of the MMDVM firmware

The first complete version of MMDVM-TNC code was recently committed to Github, and testing will begin shortly.

Much of the discussion about the potential use of MMDVM-TNC can be found on the The Online Amateur Radio Community (OARC) (Discord) - www.oarc.uk.

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Commentary on the MMDVM-TNC Project

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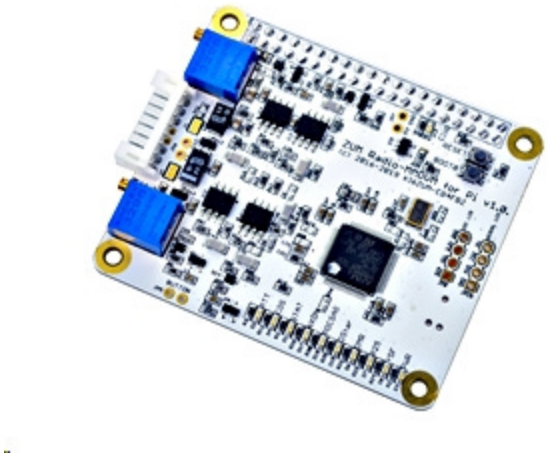
by Steve Stroh N8GNJ

I'm grateful to G4KLX for reaching out to me with news of MMDVM-TNC for publication in Zero Retries. In my opinion, MMDVM-TNC is exciting news!

In his article, G4KLX didn't mention a name for this new *mode* - MMDVM-TNC is the name of the *project*. I suggest that this new mode should be named, simply G4KLX, or perhaps G4KLX9k6, similar to the naming of the 9600 bps mode created by James Miller G3RUH. Or,

if G4KLX prefers to be more modest, perhaps… MMDVM-9600D / MMDVM-9k6d for 9600 bps Data?



Yum Radio MMDVM-Pi - Image courtesy of Zum Radio and Ham Radio Outlet

My perspective is that the MMDVM-TNC project is a very welcome development in Amateur Radio. It will be easy for Amateur Radio Operators to implement as it will be an alternative firmware load for widely available MMDVM units such as the ZUMRadio MMDVM-Pi pictured above. No new *hardware* development is needed; just load the new MMDVM-TNC firmware onto an MMDVM unit and you can quickly begin using a new, powerful, fast, robust data mode that is better than existing 9600 bps systems.

I will speculate that a MMDVM-TNC's combination of using a 12.5 kHz channel, the well-proven modulation techniques, and IL2P's integrated FEC will result in *not just faster* links than 1200 bps AFSK or previous 9600 bps implementations, but also *more robust / more reliable links*.

MMDVM is Active and Well Maintained

A related development to MMDVM-TNC is that Zum Radio received a grant of $150,000 from ARDC to:

> … Hire a full-time software engineer onto the MMDVM project team to complete the aforementioned pending tasks, such as bug mitigation, creating a dashboard that is user-friendly, and improving the core code module (MMDVMHost) relating to both the display interface and digital modes…

My point in mentioning this is that it's evidence that MMDVM is an active and ongoing project and series of products, which MMDVM-TNC can be used on. It's not stated explicitly in the ARDC blurb, but (in my previous experience) ARDC grants used for development (such as this) must be released as open source / publicly accessible.

“MMDVM-REPEATER”?

I’m on record as one of the few who have participated in the community effect of data-only full-duplex repeater systems. My experiences were now nearly three decades ago and while the 9600 bps FSK systems of that era worked acceptably (the bit regeneration

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between the repeater’s receiver and transmitter helped a lot), with current technology we can do better now.

We’re now seeing MMDVM being used as the core of repeaters - typically used for various digital voice modes. Now with the option of MMDVM-TNC running on MMDVM hardware, the same techniques for building digital voice repeaters based on MMDVM units can now be used to construct data-only repeaters. At least it’s *my* hope that MMDVM-TNC will evolve to include repeaters and not be limited for use only for local simplex operations or point-to-point links.

It’s speculation on my part that MMDVM-TNC could, perhaps, be used to create *an integrated digital Amateur Radio repeater* that, with the use of a protocol bit, be used interchangeably by digital voice, short messages such as APRS or keyboard chat, or data.

- **Digital Voice** FreeDV only requires 1.45 kbps (and has the benefit of using an open source / software-only CODEC). The Opus Interactive Audio Codec (Opus) is another open source CODEC with the goal of high quality audio as opposed to FreeDV’s goal of low bitrate to accommodate the narrow channels available on HF).

- **Short Messages** Unused channel time on a repeater is wasted forever. Why not interleave short messages such as APRS, keyboard text chat, even paging alerts such as done with when the repeater is otherwise idle? At 9600 bps, APRS and short keyboard chatting should only occupy a few seconds of repeater time.

- **Data / Files** Similarly, exchange of data via repeater could similarly use otherwise unused channel time. Data exchanges could be scripted to only use the repeater when it has been idle for a period of time, or to adjust its transmissions to be shorter when the repeater is more active, and longer when the repeater is less active.

- **File / Bulletin Distribution** One-to-many bulletins / file transfers such as FLAMP is a capability that has not been widely attempted in Amateur Radio, but with faster data rates and a good implementation for data-only repeaters, perhaps this capability could now be implemented.

A multi-mode repeater such as I’m imagining would multiply the utility of Amateur Radio repeaters. Such a capability that has not been implemented in other services that make use of repeaters. Doing so would break new ground - more technological innovation being pioneered in Amateur Radio, because Amateur Radio literally has a license to experiment with radio technology in ways like this.

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LoRa Implemented in GNU Radio Environment

By Steve Stroh N8GNJ

LoRa is a proprietary, but very widely used implementation of Chirp Spread Spectrum (CSS). An equivalent of LoRa implemented in the GNU Radio environment will make the use of Chirp Spread Spectrum much more widely used - on most (capable) Software Defined Transceivers which GNU Radio has been ported.

From the Github page - tapparelj / gr-lora_sdr:

> This is the fully-functional GNU Radio software-defined radio (SDR) implementation of a LoRa transceiver with all the necessary receiver components to operate correctly even at very low SNRs. The transceiver is available as a module for GNU Radio 3.10. This work has been conducted at the Telecommunication Circuits Laboratory, EPFL.
>
> In the GNU Radio implementation of the LoRa Tx and Rx chains the user can choose all the parameters of the transmission, such as the spreading factor, the coding rate, the bandwidth, the sync word, the presence of an explicit header and CRC.

The authors also published a 2020 academic paper on this project.

Wow. *Wow!* ***WOW!!!*** Apologies, I'm going to gush a bit over this development.

LoRa® is a Registered Trademark of Semtech Corporation. To date, all LoRa systems use Semtech's LoRa products, so it was appropriate to use the name LoRa when discussing such systems.

The development of a system that's interoperable with LoRa, but does not use Semtech's LoRa products changes that situation. Thus perhaps it's appropriate to develop a new name for this project. I propose "GNUra" and will use that invented name in this article. From this point, mentions of "LoRa" specifically refer to Semtech Corp.'s LoRa products.

Exciting Aspects of the Announcement

Working Radio System

GNUra was built as an equivalent to a *working radio system.* If the authors had chosen to develop a *new* system based on Chirp Spread Spectrum, it would not be nearly as useful as

all the practical details that make up a working radio system would also need to be developed.

Tested Interoperability
GNUra has been tested for interoperability with existing LoRa units. This is validation that GNUra *has successfully implemented* all the practical details that make up a working radio system!

Open Source - GNU Radio
GNUra is released under an GPL-3.0 (open source) license. Thus it's experimentable and probably more importantly, *learnable*.

Choice of Hardware
Given capable-enough hardware, if GNU Radio has been ported to a particular Software Defined Radio / Software Defined Transceiver unit, it can (generally) be expected to run any software that's developed using GNU Radio. For development of GNUra, the authors cite the use of "USRP", which is a family of Software Defined Transceivers by Ettus Research (division of National Instruments) called ***U***niversal ***S***oftware ***R***adio ***P***eripheral. While USRP units are high performance Software Defined Transceivers (SDTs), it's reasonable to expect that many other SDTs (assuming they have GNU Radio ported to them) will work equally well with GNUra.

Tweakability (Experimentation / Optimization)

GNUra exposes a number of tweakable parameters, including

- Spreading factors: 5-12
- Coding rates: 0-4
- Implicit and explicit header mode
- Payload length: 1-255 bytes
- Sync word selection (network ID)
- Verification of payload CRC
- Verification of explicit header checksum
- Low datarate optimisation mode
- [Utilization] of soft-decision decoding for improved performances

To reiterate, LoRa is a widely used, widely understood system with good performance as a low-power, low data rate, longer range data communications system. Thus the decision to create an open source equivalent to LoRa using GNU Radio was a great choice.

The authors credit a similar, earlier open source project:

> This work was inspired from https://github.com/rpp0/gr-lora by Pieter Robyns, Peter Quax, Wim Lamotte and William Thenaers. Which architecture and functionalities have been improved to better emulate the physical layer of LoRa.

GNUra Implications for Amateur Radio

Background reading:

- **Zero Retries 0005** - Frequency Hopping Spread Spectrum (FHSS)
- **Zero Retries 0009** - Create a Frequency Hopping Spread Spectrum Radio Using 2021 Technology

My statement in Zero Retries 0005 (see above) in August, 2021 seems a bit prescient:

> I *think* FHSS would be pretty "easy" to implement now that we have inexpensive RF chipsets. The trick is to make the chipset switch frequencies fast enough and some kind of sync mechanism (probably easy now that we have GPS with 1pps outputs).
>
> Thus my advocacy of GNU Radio and GNU Radio Companion (training wheels) to enable those of us who'd like to see such a mode to at least have the means to attempt FHSS without trying to create such a system from scratch.

… at least imagining that current Software Defined Transceivers can implement Spread Spectrum techniques. I remain a fan of FHSS mostly because as I see it, could coexist with existing Amateur Radio operations as an "underlay" that wouldn't bother repeater operation, for example, because the hopping dwell time could be 100 mS and thus unnoticed… especially given that the vast majority of repeaters are unused the vast majority of the day.

I was a (late) participant in TAPR's Special Temporary Authority (STA) granted by the FCC in the 1990s to experiment with Spread Spectrum (SS) technology in portions of spectrum assigned to, and shared with Amateur Radio in the US. The goal was to experiment with SS systems to see if Spread Spectrum operations compatible with other Amateur Radio operations. At the end of the experimentation within the STA, a report to the FCC was to be written with recommendations on changes in the FCC's Amateur Radio regulations to permit modern forms of SS.

It didn't work out very well. TAPR wrote a report with recommendations, but the ARRL, ever fearful of significant change in US Amateur Radio, wrote their report with different conclusions and did not back TAPR's recommendations. In the end, some regulations regarding Spread Spectrum were relaxed, the change wasn't significant enough that Spread Spectrum systems were used, at least not used widely, in Amateur Radio.

Until LoRa emerged in 2009.

LoRa was the first Spread Spectrum system that seemed practical to use in Amateur Radio VHF / UHF spectrum. Semtech made LoRa chips and modules easy to use, easy to integrate, inexpensive, interoperable. LoRa offered a reasonable data rate (up to 50 kbps), and no "hacking" was required to use for Amateur Radio as one frequency option for LoRa modules is 433 MHz

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. LoRa achieves "long range" despite low transmit power in part because it uses spectrum below 1 GHz
5
. LoRa is reasonably reliable, including minimal interference with other LoRa units, because it uses Chirp Spread Spectrum.
Notable uses of LoRa adjacent to Amateur Radio include satellite communication (commercial [1, 2) and non-commercial), micro balloon telemetry, and position reporting networks and units using LoRa instead of Amateur Radio.

But experimentation with LoRa's fundamentals wasn't encouraged. LoRa chips and systems were sold as a "black box" units - experimentation (other than operationally) was discouraged as the primary market for LoRa was commercial Internet of Things devices.

Thus the development of GNUra as "tweakable" and "experimentable" *software*, within the very capable and well-supported GNU Radio framework, Amateur Radio Operator's ability to explicitly experiment in Amateur Radio spectrum, opens up an entirely new realm of spread spectrum experimentation in Amateur Radio. GNUra operations in Amateur Radio don't have to preserve backwards compatibility with LoRa, such as:

- LoRa units for 433 MHz use a 125 kHz channel

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  ; larger or smaller chanels could be experimented with. If GNUra can use a 100 kHz channel, it could be used on 219-220 MHz, 222-225 MHz, and 420-450 MHz, where 100 kHz channels are within current FCC regulations.
- Operate GNUra on 222-225 MHz instead of 433 MHz - easy because of the flexibility of Software Defined Transceivers and all US Amateur Radio Operators can operate on 222-225 MHz.

- Experiment with dynamic parameters; depending on the use case, optimize for high data rate, longer range, more robust links, etc.
- From the GNUra code, learn the fundamentals of how this team implemented Chirp Spread Spectrum in GNU Radio, and perhaps create a similar system that implements Frequency Hopping Spread Spectrum (FHSS).

To summarize, I believe that “GNUra” will be a fertile area of experimentation and development within Amateur Radio in the near future.

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Experimental “Supernode” Online on the AREDN Network

By Orv Beach W6BI

I was alerted to this development by a posting on the socal-hamnet-users mailing list and reached out to W6BI and he sent me this article. AREDN feels like an Amateur Radio superpower. - Editor

There are supernodes now on the AREDN network. They're running custom code developed by Tim [Wilkinson] KN6PLV. They're all linked to the other supernodes. Here's how it works, from Tim:

> Essentially it's building a mesh of meshes. Each mesh maintains its complete independence. The only difference is that when you attach a supernode to the mesh, this adds a default route (10.0.0.0/8) so if any node on the mesh has traffic for an IP not on that mesh, the traffic is sent to the supernode. The supernodes see all management traffic on all meshes, so they know how to reach all the other nodes, and can forward traffic where it needs to go.
>
> The practical upshot is that mesh nodes can access any node on any mesh, but won't get flooded with thousands of routes and names from all those meshes.

You can see the total linked network at https://arednmap.xojs.org/

As of this writing the supernodes know about more than 1,000 nodes on the network.

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WINTNC - Windows TNC Driver Version 2.00

By Steve Stroh N8GNJ

I don't think this is quite a record in software history for versions to be separated by multiple decades… but it might be for Amateur Radio Packet Radio.

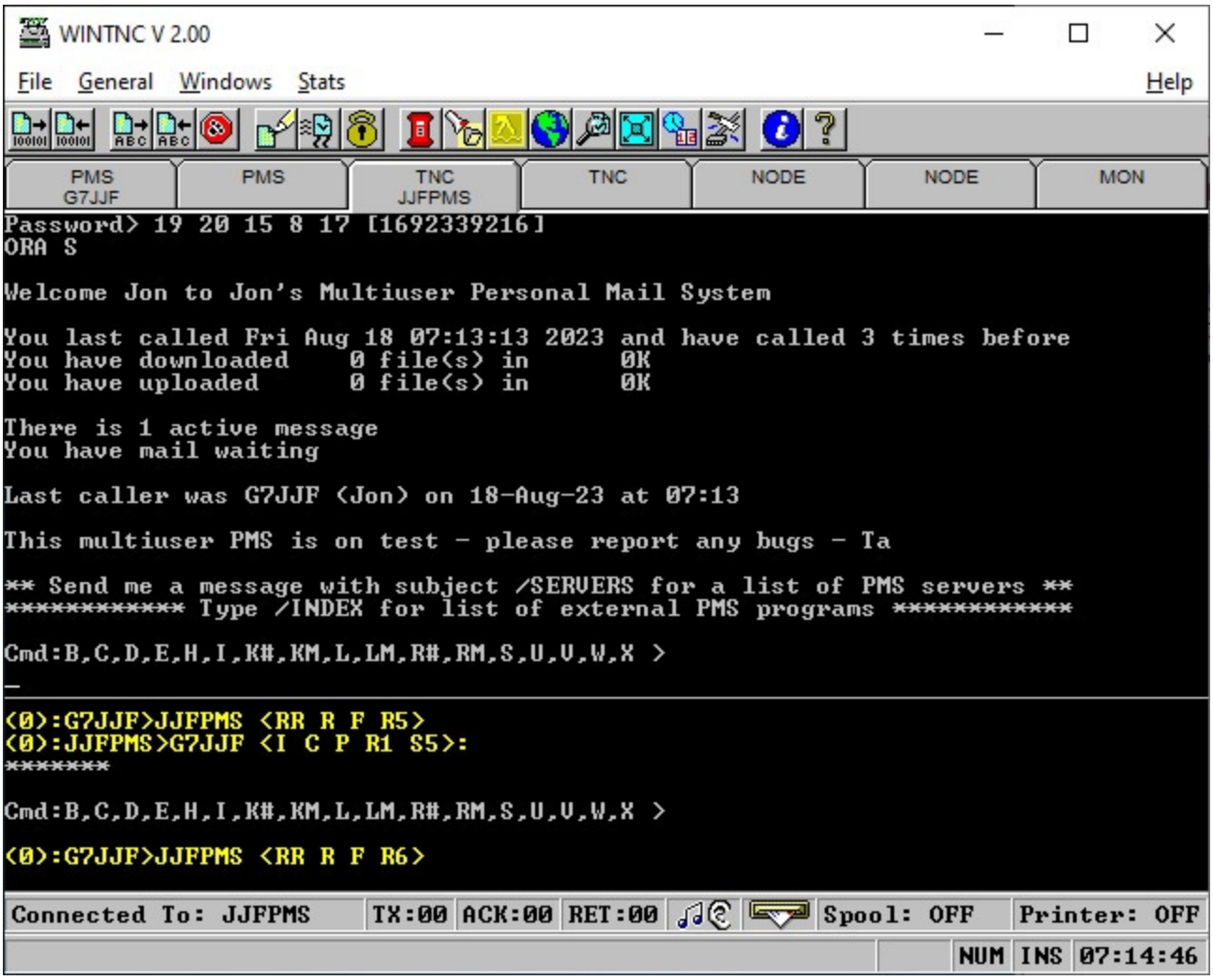

Image courtesy of Jon Welch G7JJF

From Facebook group **Packet radio systems and information** - Jon Welch G7JJF:

> Back in the 90's, I wrote several packet driver programs including WINTNC. This was a 16 bit program and only ran on Windows up to version XP. Packet seemed to die down in the early 00's so I never got around to converting the program to run on the more modern 32/64 bit OS's, such as Windows 7, 10 and 11. I was recently contacted by a member of another Facebook packet group to enquire about a 32 bit version of the program so I thought it was about time I updated the program which I have now done. So I have a 32 bit version of WINTNC available if anyone would like to try it out. I no longer have any radio gear or TNC's to test it with so I would like to know if anyone manages to get it working. It should, but I can't check myself. The program also supports the AGWPE interface so works with the UZ7HO SoundModem. You can download a copy from https://www.g7jjf.com/wintnc2.htm. Please let me know if you would like a free registration key to the program as well. As this is the first release after conversion, I am sure there may be a few things that have missed my testing and don't work so please let me know if you spot anything that doesn't seem right. Thanks.

Download WINTNC V2.0 - http://www.g7jjf.com/wintnc2.htm

A few features that stood out to me about WINTNC were:

- Integrated Personal Mail System with FBB compatible compressed forwarding
- conference server accessible from node
- YAPP and ASCII file transfer facilities
- UUencode and UUdecode of files
- 7PLUS encoding and decoding of files
- FBB header broadcast support

Those technologies such as YAPP (if memory serves, **Y**et **A**nother **P**acket **P**rotocol) used for transferring binary files over Packet Radio, are nearly forgotten now, but are fully functional within Packet Radio. It’s cool that WINTNC is now available to make them more usable for Windows users.

I found it wonderfully generous that G7JJF undertook this (and ongoing) work on WINTNC considering…

> I no longer have any radio gear or TNC's to test it with so I would like to know if anyone manages to get it working. It should, but I can't check myself.

I suggest dropping G7JJF a note of thanks and request a free key - WINTNC sounds like it might be fun to use.

If you're really feeling nostalgic, G7JJF also offers some DOS packet radio software.

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ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of Zero Retries Interesting items.

TAPR DCC 2022 Papers Now Online

From TAPR:

> The paper presentations of the 2022 ARRL and TAPR Digital Communications Conference (DCC at Charlotte, NC) are now online.

This was the 41st annual DCC. Two papers that were notable to me were both hardware projects

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that use the now-ubiquitous ESP32:

- ESP32 Packet/APRS: Creating a Low Cost Tracker
- ezDV: Low Cost Digital Voice on the ESP32

Nooelec Ham It Down 3GHz Downconverter

From AMSAT-SM:

> Nooelec, manufacturer of LNAs and SDR equipment, releases a new downconverter. It is designed to convert signals from the 1.55 GHz to 3.1 GHz range into the frequency range of software-defined radio devices like RTL-SDRs.

This was an interesting post by Lars Thunberg SM0TGU. The "Ham It Down" seems to offer an interesting, reasonably-priced improvement in capability for microwave operations. The more usual case for such a converter is to "up-mix" frequencies below 30 MHz into the native operating range (VHF / UHF) of inexpensive software defined receivers.

Quansheng Multiband Radio's Firmware can be Flashed and Customized from a Web Browser

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From CNX Software – Embedded Systems News:

> But flashing the firmware requires downloading the manufacturer's Windows-only programming software and customizations are provided through multiple firmware files. But it has now become much easier to flash the firmware for Quansheng devices thanks to the work of whosmatt who developed the UVMOD web interface using WebSerial to flash the firmware and even customize it from Windows or Linux.

For better, or worse, it doesn't get much easier than *this* to hack a radio to be able to transmit… let's just say… "over a wide range of spectrum".

TAPR PSR 156 (Summer 2023)

TAPR's Packet Status Register (PSR) Newsletter is *always* a favorite of mine (see the last line of every issue of Zero Retries). A few highlights:

- Nominations for TAPR Board of Directors are now open.
- My Amateur Radio Moonshots article from Zero Retries 0103 was reprinted - *Thanks Editor Stana!* I'm honored to have those ideas presented to the TAPR membership and audience in PSR. (Original article).
- News briefs from the JNOS 2.0 World by Maiko Langelaar VE4KLM. JNOS 2.0 is alive and well, and now "speaks native" IPv6, includes IP-IP tunneling (TUN), works with VARA HF (and hopefully VARA FM), and "Full blast TCP/IP" using JNOS over VARA has been demonstrated.

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Zero Retries 0113 Poll

POLL

What was Your Favorite Article in Zero Retries 0113?

MMDVM-TNC Project

32%

Commentary on MMDVM-TNC Project

8%

LoRa Implemented in GNU Radio

48%

Experimental AREDN “Supernode”

4%

WINTNC Version 2.00

8%

25 VOTES · POLL CLOSED

This poll will be open through Thursday 2023-08-31.

Feedback Loop

Nice range of comments to Zero Retries 0112! Thank you Dale N0KQX, Rich Casey N5CSU, Bill Dornbush AA6BD, and [Cale K4HCK]!

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.

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
  Founding Member 0003 - William Arcand W1WRA
- 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:

  https://www.zeroretries.org

  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. It's a *must-read-now* for me!
- RTL-SDR Blog - *Excellent* coverage of Software Defined Radio units.
- 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 ~~100~~ ~~200~~ ~~300~~ ~~400~~ *500* ~~600~~ ~~700800~~ *900*+ 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 — 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)
These bits were handcrafted (by a mere human, not an Artificial Intelligence bot) in beautiful Bellingham (The City of Subdued Excitement), Washington, USA.

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Blanket permission granted for TAPR to use any Steve Stroh content for the TAPR Packet Status Register (PSR) newsletter (I *owe* them from *way* back).

1
Not stated as open source, but the author's statement at https://tarpn.net/t/il2p/il2p.html is *You are encouraged to consider implementing the spec*.

2
Per G8BPQ:
ACKMODE enables the transmission of 'ACK required' frames. These cause the TNC to send a reply when the frame has been transmitted. This will improve link performance by avoiding the possibility of a retry being sent before the original frame has even left the TNC. This mode should always be used if the TNC support it.

3
The bit regeneration at these repeaters was done with an add-on board to a TAPR 9600 bps modem (which was an add-on board to a TAPR TNC-2 (or clone). It's astonishing, and evidence of how much we're losing, that there's no readily available online reference to the TAPR bit regen board and circuit.

4
In Europe, 433 MHz is allocated for low-power, license-exempt systems. In the US, it's often *used* that way, but no one makes a fuss about such usage.

5
LoRa implementations for various license-exempt VHF / UHF bands include 169 MHz, 433 MHz, 868 MHz, and 915 MHz. The status of whether these bands are license-exempt or not varies around the world.

6
This took some digging; I finally found the channel size listed in this document - https://lora-alliance.org/wp-content/uploads/2020/11/RP_2-1.0.2.pdf

7
In this era it's always technically inaccurate to say "hardware project" because there's now *always* a software component.