Amateur Radio Networking In *this* century… Making it relevant

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I got involved with Packet Radio in 1984 - 1987…

- … and was part of, and missed, various waves of innovation… and decline

1984-1987

- Discovering packet radio in Ohio
- Rise of the TAPR TNC-2
- Basic packet radio
- 2m only @ 1200 bps
- Digipeaters, crude BBS systems
- National linking using 300 bps over HF

1988 - 1993

- Discovering packet radio in Seattle area
- Bit regeneration repeaters (packet that worked!)
- Dual-band VHF / UHF
- 9600 baud
- TCP/IP
- Net/ROM
- Internet gatewaying
- Seattle 9600 baud UHF TCP/IP repeater network
- (missed) 56K, especially the work in Vancouver

1993 - 2007

- Amateur Radio was fun, but fatherhood was better
- Collapse of packet radio networks in the wake of the excitement of public access Internet
- (missed) Rise of APRS
- (missed) Integration of APRS services on Internet, APRS widgets
- (missed) Incredible (and finally interesting) rise of HF data systems - finally interesting; not just RTTY
- decline of Seattle 9600 baud UHF TCP/IP repeater network

1997 - 2007

- Writing / Watching Broadband Wireless Internet Access / Wireless Internet Service Providers evolve
- Inspiration was learning about Spread Spectrum at 1996 ARRL and TAPR Digital Communications Conference here in Seattle
- If you just want the utility of Internet connectivity, everywhere…
  - It's here (enough) now with cellular broadband Internet
  - It's going to get better - a lot better, with Mobile WiMAX
- But, to me, there's still something magical about doing it with Amateur Radio

… Something magical about doing it with Amateur Radio

- Incredible freedom to experiment with radio technology
- If you can find kindred souls that like to "play radio", oh the fun you can have!
- Can combine things in ways you absolutely could not do commercially
  - Even if you could afford it
- Proud to be part of a hobby that has a (constructive) "weird" fringe
  - Moonbounce
  - Dxpeditions
  - QRP

But… there's a real problem with Amateur Radio Networking…

- … and Amateur Radio in general
- Amateur Radio isn't growing… in any relevant measure
- Few younger folks coming in and wanting to play
- I think it's because Amateur Radio isn't perceived as being relevant… cool… interesting
  - Even by this incredible rise of uber-techies that we have now
- Every portrayal of Amateur Radio I've seen is "old white guy, sitting in the basement, tapping out code

In my role as a observer…

- Having sat out much of Amateur Radio as an active participant, I saw that there was some incredible innovation going on
- But it wasn't being very well reported except within its own niches.
  - Satellite folks communicated very well… to other satellite folks
  - HF data folks communicated very well… to other HF data folks
  - QRP…

I've "thought about this" for years

- What it really needs is for me to write a book
- Still does, but I've had a busy last couple of years
- But in the meantime, I've been developing a thesis
- I call it…

A unified vision of Amateur Radio Networking

- Lots of fascinating… but disparate… applications / services…
  - (I'll talk about all the fascinating, disparate "parts" later)
  - But they're all "silo'd", with little crossover or integration
- What would happen if we could integrate all those incredibly interesting… but disparate… applications / services?
- I think… wish… that such an integration would create a whole that is greater than the sum of the parts
- And that "whole" would be relevant to young techies!

Linux as a building block

- As I said, my "formative years" in Packet Radio were in the DOS era
- Lots of potential in what was developed back then, but onerous limitations in the "TNC platform" and the "DOS platform"
- We spent a lot of innovation, energy, time trying to get around those limitations

Linux fixed all of that

- Cheap!
- Could do "wonders" on basic hardware of 386-and-up
- All the cool (command line) utilities - routing; mail, a full-blown scripting language, telnet, FTP, all that cool stuff that we tried to hack into JNOS, etc.
- Best of all - networking built in - from the beginning!
- Phil Karn predicted all of this; his goal for Net and NOS was as a bridge between "Amateur Radio hardware and "real operating systems"

But Linux is tough for hams…

- The "good" Linux is mostly command-line
  - Low resource demands suitable for low-end hardware
- It's tough to install sometimes - getting drivers working
- It's tough to manage / update / configure

OLPC XO as a new paradigm for Amateur Radio

- So, I was excited when I saw the One Laptop Per Child XO laptop
- All the power of Linux...
  - In a standalone "appliance" / laptop
- Linux "baked-in"
  - No complications trying to get Linux installed in whatever oddball / cheap / leftover / may-not-be-working hardware
- Defacto standardization of Linux packages, apps, utilities, etc.
- Server capabilities - web, email, etc.

OLPC XO, cont.

- Rugged, highly reliable, easy to make mobile
- Wi-Fi - with mesh networking
- Standard interfaces
  - Power - eats 12V direct, low power consumption
  - USB 2.0 (3)
  - Audio in/out (enhanced range for A/D "instrumentation" applications
  - Big (enough) disk - 8 GB on SD card
- Cheap! $200
- "Integrated display" (readable in sunlight)

But then I had this chat with my friend Bill…

- Bill Vodall WA7NWP - "Good" friend
  - Don't go to him when you want your assumptions / biases unchallenged
  - Has stayed active in Amateur Radio Networking
  - He's a skilled Linux geek
- Bill has patiently listend to all of the above "waxing philosophic" about the "unifying wonders" of Linux and patiently tore my arguments apart

Windows as the new Linux (for Amateur Radio purposes)

- Windows isn't expensive any more in resources, cost, or complexity
- It's plenty capable for anything needed, including scripting
  - Bill says it's gotten a lot, lot better, like Perl and Python
- One big issue I had that's moot - overall reliability
- Most importantly, usable by the average ham
- And what won the argument in Bill's favor is that all of the stuff I'm going to talk about "integrating" into a "greater whole" is already out there for Windows.

Disclaimer 1

- Despite the venue, I didn't craft this conclusion to "please" Microsoft, Microsofties, or Microhams
- It was a hard conclusion to arrive at (for me, with historical biases of all the things DOS / Windows couldn't do)
- I'm going to move on from that point because there are Amateur Radio things I want to do…
- And I don't want to wait for… or pine for… those things to be created for Linux.
- So I'm moving on

Disclaimer 2

- As will become rapidly apparent, I haven't actually used very much of what I'm about to describe
- I'm here much more to learn

First I'll describe "pieces"

- Then I'll start talking about "integration effects"

Amateur Radio Email (Over the air! Novel concept!)

- Airmail is the dominant / best email client for Amateur Radio
- Yeah, it is closed source, somewhat unsupported… but it works
- Designed primarily for HF via the WinLink network
- But it also works peer-to-peer over VHF
- Simple, robust, works with existing Amateur hardware - (Kantronics TNCs in host mode)

Amateur Radio Short Messaging / Location

- UI-View on APRS
- I never did get into APRS and so nearly anything APRS is a bit mysterious to me, but from what I've learned, anything I had ever imagined doing with APRS under Linux, UI-View already does, on Windows
- Short messaging is an under-appreciated capability of APRS

Amateur Radio Short Messaging - worldwide

- PSK 31
- So many other digital communications modes I have no idea
- Cheap digital signal processing embedded in sound cards… and radios

Amateur Radio Voice (Relevant to "networking")

- EchoLink
- Creates access to repeaters in other areas via PC / Internet
- Yeah, it is Amateur Radio

Amateur Radio Voice

- Digital Voice on VHF / UHF
- D-Star is one example
- APCO P-25 is another
- Better quality, overall
- Interleaved with some data

Amateur Radio Networking (local)

- D-Star (1.2 GHz version)
- 128 Kbps half/duplex
- Icom did a lot wrong, especially with the networking
- But at least they tried, and created a turnkey, plug-and-play data networking radio usable for Amateur Radio
- One great thing is that it works mobile

Amateur Radio Mesh Networking

- This is something we did well - 20 years ago
- Remember Net/ROM?
  - It had all the key aspects of mesh networking
  - Maintained known good routes / paths
  - Directory of known nodes
  - Made it possible / worked better to have separate backbone
  - Systems could use Net/ROM automatically
  - Limitation was processor power, data storage
    - No longer issues, so we could be doing mesh networking much, much better now

Amateur Packet Radio Infrastructure now

- Lots of digipeaters for APRS
- Lots of audio-only repeaters… that are very, very quiet
- Smattering of Net/ROM, general purpose packet, etc., but also very, very quiet

Integration Potential

- What I want to see ultimately on my Radio Room (Windows) computer is an integrated display
- I want it to display (somehow - I haven't even mocked this up):
  - Ham friends - click on their callsign (or it highlights) and see:
    - Where they (vehicle - APRS) are at the moment
    - If they've been heard recently on a repeater (Echolink)
    - Any emails or messages I've had from them

Integration Potential (cont.)

- Ham friends (cont.)
  - If I want to send a message to them, I want that link to be easy and quick to send them an email message, or quick text message (APRS or HF messaging)
  - If I want to send them a file, etc. I want to be able to send that quickly and easily, without knowing what particular system he happens to be using
  - If I want to look something up on his station, I want to check out the web site / Wiki page that he maintains - fetch the data over the air

Integration Potential - Mobility

- I'll acknowledge up front that this concept was created, as far as I'm aware, by Ken Koster N7IPB
- He called it JeepNet because this pile of radios and a computer stuffed in the back of his Jeep-something
- Tie in all the capabilities listed above, but make them mobile
- Ken had VHF, UHF, HF radios in his Jeep all talking to a vehicle-mounted computer
- What was really cool was that Ken put a Wi-Fi access point into the mix and then ran the whole thing from a Wi-Fi laptop while sitting in a restaurant

Int. Potential - Mobility (cont.)

- What's missing when Ken did this was a way to do peer-to-peer in Amateur Radio
- We should be able to show up and have our "JeepNet" systems all find out about each other and start communicating
- We should use Wi-Fi (there's plenty of ways to make it work better without "Amateur Radio" hacking it
- We should add Net/ROM capability to the mix
- How about sharing / caching / replicating disks between JeepNets?

Integration Potential - Fixed and Mobile

- Take it one step further - have the JeepNets talk to home stations
- If your JeepNet is within range of (any) home station, it connects / communicates / synchs
- JeetNet "communications protocol" autodiscoves local resources - repeaters, digipeaters, local ham hangouts, etc.

The power of all the things we can do…

- Is in being able to do all those things
- Any one of those things is a pale imitation to commercial / Internet implementations
- But combining them all, showing off all that Amateur Radio can do, in a unified way…
- That's powerful… impressive…
- Relevant!
- And doing it with Amateur Radio

Some Parting Thoughts

- Considering that Amater Radio as an overall hobby is supposed to be about communicating… we do a surprisingly lousy job of it.
- One of the best parts of Amateur Radio was the Elmering… and we seem to have lost that.
- We need to develop a way (we have dozens right now…) to find each other and find kindred souls that are into some of the same things we are
- And most of of all, if we want to see Amateur Radio survive us, we need to develop a way for newbies to find us easily for what they want to know

Where's Myspace / LinkedIn / Facebook for hams?

- I should be able to browse hams in my area to find out what they're into
- I should be able to browse interests, like satellite, to find out who's into those things
- I should be able to easily find Amateur Radio clubs
- We don't have uniform, consistent ways to do those things, and we should
- Amateur Radio Wikipedia?

Amateur Radio Magazines

- Sad fact that a lot of our "knowledge base" is locked up in magazines that aren't publicly accessible
- Antennas haven't changed that much - imagine how much "tribal knowledge" on Amateur Radio antennas is locked up in magazines
- Just my opinion, but the ARRL keeps way too much information restricted as "members only" - to the detriment of Amateur Radio

R&D Funding in Amateur Radio

- We need some patient, generous R&D funding for pushing Amateur Radio forward
- Example of TAPR FHSS Radio - developed on Amateur Time Units (years) and parts were obsoleted twice before the project was abandoned
- Amateur Radio's Catch-22 is that potential sales don't justify large R&D investments
- So it's not economical for companies to develop truly new technology - they'll never get a payback
- Imagine what could have happened if we had cheap 2.4 GHz to 1.2 GHz transverters / power amplifiers?

R&D Funding (cont.)

- Dewayne Hendricks WA8DZP pointed out that the cheapest, most capable "wireless data communications device" in the world is the humble DOCSIS cable modem
- What would happen if we could get transverters for those to operate them at 440 or 915 or 1.2 GHz?
- The funding is needed for bootstrapping the Non-Recurring Engineering expenses - paying for professional engineering, prototypes, certification, etc.
- Once a product is real and buildable, there's usually takers that will build it for the Amateur Radio market as long as they don't have the overhead of the NRE

R&D Funding (cont.)

- One example of what patient, generous R&D funding could do in Amateur Radio is to buy Metricom (Ricochet).
- Yes, it's still alive… just barely.
- In Denver, but on it's… fifth?… owner, and likely to be killed completely any month now
- 902-928 MHz, 2.4 GHz (and 2.3 GHz) mesh backhaul
- Needs some infrastructure services development that would be easily done with Linux / Windows now
- Warehouse full of equipment from years ago.

Interesting stuff that I'll be looking at and playing with

- Besides the stuff mentioned above
- Asterisk - all the capability of a #5 ESS - voice switching / transcoding / "anything imaginable"
- Inevitably I'll eventually do D-Star (1.2 GHz / 128 Kbps)
- Putting as many of my TNC collection on the air as I can, likely all with little "serial to Ethernet helper modules"
- Virtualization - there's a lot of interesting DOS and old Windows stuff for Amateur Radio out there
- Writing it down - book, wiki, blog

References

- Steve Stroh N8GNJ - www.n8gnj.org
- OLPC XO - www.laptop.org
- AirMail - www.airmail2000.com
- UI-View - www.ui-view.org


MicroHAMS
Where do you want to QSO today?