

Public Service

Upgrade Your Emergency Data Communications Toolkit with HamWAN

This month's column was written by subject matter expert Steve Aberle, WA7PTM. Steve is a retired Data Network and Security Manager, and was previously a law enforcement first responder and a County Emergency Communications Director. He's also active in ARES and RACES.

Emergency management relies on digital data for situational awareness, visual assessments, exchange of forms, lists of medicines and supplies, resource requests, and more. Even though commercial communications products and services have become more reliable over time, they do become overloaded and fail, albeit less frequently.

Incident commanders, first responders, emergency managers, and the general public are accustomed to high data speeds at work, in the community, and at home. 4G LTE phone networks with 30+ Mbps (megabits per second) download speeds are commonplace, and home internet continues to become faster, with gigabit speeds available in some locations.

When amateur radio volunteers talk to agency officials about potential data communications in an emergency or disaster, they might mention their terminal node controllers (TNC) and sound card modems. However, in the two-symbol system our TNCs use, 0.0012 Mbps and 0.0096 Mbps packet radio, 0.0252 Mbps VARA FM, or even 0.0560 Mbps on 125 and 70 centimeters (which is limited by FCC Rule §97.307(f) (6) to v.92 dial-up

modem speed), is unlikely to impress anyone. These speeds were eclipsed by more modern technologies decades ago.

Achieving Faster Data Speeds

The amateur radio public service community needs a faster way to exchange digital data in our emergency communications toolkit.

One solution to achieve faster data communications via radio is to move into the SHF amateur spectrum. In 2013, a group of amateur radio volunteers with data networking experience in the Puget Sound area of northwest Washington implemented the radio-based data communications system called HamWAN (Ham Wide Area Network). HamWAN has network clients including the state's Emergency Management Division and Department of Transportation, emergency operation centers (EOCs), hospitals, and the Red Cross (see www.hamwan.org for more information). The basic network design has now been cloned in Tennessee, Georgia, New Mexico, British Columbia, and Florida. A similar routed network has been established in Michigan.

HamWAN is a system of commercial-grade microwave radios and dishes on the 5-centimeter amateur radio band (5.650 to 5.925 GHz). Installations consist of dish-style radio antennas creating a point-to-point network backbone, and up to three



This HamWAN dish was installed at the Washington State Department of Transportation (WSDOT) in Vancouver, Washington. It's aimed at Larch Mountain. [Steve Aberle, WA7PTM, photo]

120° sector antennas for client radio connections. Routing is implemented using standard commercial networking protocols. Because HamWAN is a scalable IP-based routed network, not an ad hoc (mesh) network, the overhead of the networking protocols themselves don't become a throughput burden as the network grows.

Speeds monitored on the Puget Sound HamWAN network vary depending on equipment and distance, but one link consistently reaches 300 Mbps and several regularly report 130 or 144 Mbps.

Client speeds in the 5 Mbps to 20 Mbps range are common, so amateur radio data communications can once again be a viable part of the emergency plan in a local jurisdiction. As an added benefit, redundant ties to the internet allow messages to leave and enter HamWAN, but if the internet is down or cut off, HamWAN can still function independently.

Using HamWAN for Emergencies

A temporary emergency or disaster communications network implementation might involve attaching one or more ad hoc networks to HamWAN via client nodes. This could be as simple as a battery-operated portable radio or dish on a hilltop linked to a HamWAN sector antenna and cabled to an access point which would feed a network at an incident command post or evacuation center.

Networks won't do any good in an emergency or disaster if services are unavailable. One should consider how a served agency uses the internet, and then add services to support their needs. The Puget Sound HamWAN has its own Domain Name System (DNS), Network Time Protocol (NTP), and Simple Mail Transfer Protocol (SMTP) servers. Users have other servers on the network, with one example being a Voice over Internet Protocol (VoIP) server. Web, chat, and collaboration servers might be part of a minimal service offering. Cameras with semi-public PTZ (pan tilt zoom) control have been added to many of the HamWAN link sites, and one of those was used to make the first report of a wildfire in September. This is a great use of our microwave frequencies which, if unused, are in danger of being reallocated to commercial service providers.

In February 2019, at the Washington Emergency Communications Coordination Working Group (WECCWG) meeting in Vancouver, Washington, HamWAN was showcased to ESF #2 (Emergency Support Function #2 — Communications) partners from around the state. The services demonstrated over a temporary HamWAN connection were Winlink via Telnet, digital mobile radio (DMR) backbone transport, a VoIP phone conference bridge, and a fast file transfer of ICS 213 messages (where the Seattle EOC shared a Raspberry Pi desktop over HamWAN and a folder with 8 MB of messages was transferred via "drag and drop" in less than 15 seconds).

The cost of client nodes ranges from \$50 to \$350, with very capable configurations being around \$150 (www.hamwan.org/Standards/Component%20Engineering/Client%20Hardware.html). Link sites, a combination of linking and sector antennas, can be less than the price of two PACTOR-4 (0.0105 Mbps) modems.

Conclusion

In June 2016, the Federal Emergency Management Agency (FEMA) held the multi-state Cascadia Subduction Zone (CSZ) Catastrophic Earthquake and Tsunami Functional Exercise. The *Statewide After-Action Report* produced by the State of Oregon said, "Existing auxiliary amateur radio processes are slow and not capable of handling the large volumes of traffic expected during an event of this size, mostly due to radio bandwidth issues." Radio amateurs need to be aware of the perception by governmental entities of the capabilities and limitations of amateur radio and step up to meet that challenge. HamWAN is a way to do that.

Field Organization Reports

September 2020

Public Service Honor Roll

This listing recognizes radio amateurs whose public service performance during the month indicated 70 or more points in six categories. Details on the program can be found at www.arrl.org/public-service-honor-roll.

720 KD8TTE	166 A19F	120 WA4VGZ W4NWT	KE5YTA KB8LKH AC8RV	86 K6JT
595 W7PAT	160 KK3F AC0KQ	K2TV KC9FXE W0LAW	WB8SIQ N1LAH W3CJD	85 NX9K KD8UUB KV8Z WV5Q
560 WA3EZN	W4DNA K0RCJ	KA9QWC KF5QMH KG5NNA	99 KD2LPM	84 KC8YVF
457 WA7PTM	155 W8IM	WK4WC KC8WH K3JL	98 W2CTG	83 WA1LPM
368 KE8BYC	150 N8SY	KY2D WB4ZIQ	97 W9EEU	82 K1STM
355 KE8KOC	145 N1LL	118 KB3YRU	96 KE1ML	80 W9BGJ N8MRS KD8UOT KA2GQQ
320 K8AMH	140 K9LGU K4IWW	115 N8MKY KD8ZCM N1TF	95 K1XFC W4INK	79 WB8R KB0DTI
310 ND8W	138 WD8USA	110 AD4DO W7EES KA9MZJ	92 KN4AAG NC8V K8MDA	78 W5XX
296 WA2CCN	135 W3YVQ AD3J	K3IN N12W WA3QLW	90 KM4WHO AA4XZ	77 N8CJS NV1N
275 N9VC	133 K8RDN N3KRX	WA3AZK WB8YLO K6HTN	89 AB9ZA K3MIY AA3N	76 KA0DBK WB2VUF
262 AD8CM	132 AC8NP	WB8TQZ N1IQI KD2JKV	88 W4EDN W4TTO K8KRA	75 WB8WVKQ WB3FTQ KF5IVJ KC1MSN
260 KW9EMG	130 WC4FSU N2WGF WB9QPM	N3SW N3SW N4CNX KL7RF KW1U	109 K1HEJ	74 W3ZR
210 K15GRH	127 KA8ZGY	108 W4CMH N2DW W54P WF2Y	89 K9GDF W8MAL WB8YYS N6IET	72 K6RAU K0EK
195 KB2RTZ AL0Y	126 AB3WG	105 W2PAX	88 KB1NMO N3JET	70 WX2DX K80V WB0W KC2PQC
192 W9RY	125 KO4OL AG9G	100 WB4RJW KZ8Q KN9P AA3SB		
185 W2PH	120 KF5IOU KY2MMM AF4NC			
180 KB8RCR				
175 K3FAZ				

The following stations qualified for PSHR in August, but were not reported in this column: K3IN 155, KK3F 150, W3YVQ 135, NA7G 130, N12W 102, AA3SB 100, AB3WG 99, WD0BFO 90, KA0DBK 83, N3JET 80, WB3FTQ 75.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AR, CO, CT, DE, EB, EMA, EPA, IL, IN, KS, KY, LA, LAX, MDC, ME, MI, MN, MO, MS, MT, ND, NE, NFL, NLI, NM, NNJ, NTX, OH, OR, SC, SD, SFL, SJV, SNJ, TN, WCF, WI, WMA, WPA, WTX, WV, WY.

Section Emergency Coordinator Reports

The following Section Emergency Coordinators reported: AR, CT, ENY, ID, IL, IN, KY, LA, MDC, ME, MI, MN, MS, ND, NFL, NLI, NM, NNJ, NV, OH, OR, SCV, SFL, SJV, SNJ, STX, SV, TN, UT, VI, VT, WI, WPA, WTX, WV, WWA, WY.

Brass Pounders League

The BPL is open to all amateurs in the US, Canada, and US possessions who report to their SMs a total of 500 or more points or a sum of 100 or more origination and delivery points for any calendar month. Messages must be handled on amateur radio frequencies within 48 hours of receipt in standard ARRL radiogram format. Call signs of qualifiers and their monthly BPL total points follow.

KK3F 1,506, K6HTN 967, NX9K 763, WB9WKO 678, WB8WVKQ 515, KW1U 540, WB8WVKQ 515, KB8RCR 509.

The following station qualified for BPL in August, but was not listed in this column last month: KK3F 980.