

Digital Messaging Standard for MIECM

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Digital Messaging Standard for MIECM

Project Overview

At the heart of most local jurisdiction emergency programs on Vancouver Island is a robust, resilient and well-tested communication strategy delivered by the in-house amateur radio based Emergency Communication Teams (ECT). The Industry Canada licenced radio operators who report to the local Emergency Program Coordinator (EPC) are task driven to supply both voice and secure digital messaging services (within the amateur radio spectrum) on an as-required basis. While voice communications are relatively straightforward in terms of the delivery mechanics, digital messaging is slightly more complex and consists of:

- A local network supported by full-time Internet access;
- A VHF or UHF radio based solution utilizing high-level sites for inter-jurisdictional connectivity;
- HF radio equipment; or
- A combination of these to move traffic well beyond the impacted area

Given the recent increase in amateur radio capability on the west coast of Vancouver Island within the emergency programs of Bamfield, Tofino and Ucluelet -- these three communities now serve as the opportunity to develop the MIECM standard for multi-jurisdictional radio interoperability in remote communities and therefore will be the focus throughout this report.

Currently, Bamfield, Tofino and Ucluelet can exchange **unsecured** information via VHF voice repeaters located at Mt. Ozzard (VE7RWC on 147.000 MHz) and at Telegraph Hill (VE7TOF on 146.880 MHz). In the absence of Internet connectivity however, these community EOC's are not capable of exchanging secure digital messaging via VHF radio because they lack the (local) infrastructure and a high-level radio site for interoperability between locations that are not within "line of site".

This report presents an inter-EOC strategy for digital messaging utilizing the west coast example of a single high-level radio site to link Bamfield, Tofino and Ucluelet.

Winlink Express Background

On a worldwide basis, Emergency Operations Centres (EOC) utilize Winlink Express as the preferred amateur radio-based digital messaging client because it supports multiple system features that include secure login to help prevent unauthorized access to the system. The network building blocks of the Winlink system consist of:

- Winlink Express client software used to link to local network nodes
- Local network nodes that are linked to local remote mail servers (RMS)
- Local remote mail servers (RMS) that provide access to five (5) redundant and mirrored common mail server (CMS) located in Halifax, Vienna, Brentwood, San Diego and Perth.

Written by the Winlink Development Team, [Winlink Express](#) features a simplistic feature set and uses the B2F extension radio transfer protocol to support limited size attachments, multiple addresses and tactical addresses. Winlink Express can be operated in a variety of configurable modes such as peer-to-peer (P2P) connecting directly via RF to other Winlink Express or Airmail client or via a Telnet (Internet) connection. It also contains the following capabilities:

- Manual and automated GPS position reporting abilities
- Support for the Winlink catalog of downloadable weather information bulletins such as [Saildocs](#) and [GRIB](#) files
- A propagation prediction feature to help determine which of the participating Winlink RMS gateway HF stations are best to connect to from anywhere on earth.

For emergency communications, the Winlink Express software offers emergency communications specific features that include HTML forms creation, compact formless content transport and a growing library of automatically updated forms that are available to all amateur radio stations.

For inter-EOC communication, in-house amateur radio operators can use Winlink Express to simultaneously send and receive secure digital messages because the software supports a wide selection of transceivers, TNCs and multimode controllers offering a host of connectivity options.

The client equipment to support Winlink software usually includes the following items:

- A commercial grade transceiver (such as the MRIP VX-4600 or a repurposed Motorola radio)
- A [Kantronics KPC 3+ TNC](#) (terminal node controller)
- Related cabling that includes RX audio, TX audio, push-to-talk (PTT), Ground and 12 volts positive
- ICT - 12 volt power supply rated for at least 12 amps (ICT part #: ICT12012 -12A)
- Antenna – base station (Sinclair SD210 – model: SF2P2SNM)
- Computer – either a desktop or laptop running the (free) Winlink Express software and a dedicated Internet connection.

Winlink Software Registration

Even though the Winlink Express software is free, the worldwide group of volunteers who constantly update code and maintain the program encourage users to register the software. The registration fee helps support software development and all Amateur Radio Safety Foundation projects on a global scale.

Registration provides a non-transferable license key that is call sign specific for use on multiple computers, or with multiple instances on the same computer.

The registration fee is US\$24 per call sign for up to 17 call signs. A local authority may want to consider licencing the call sign for each of their ECT members as well as all call signs associated with their EOC operation. For registrations beyond 17 call signs, a bulk-pricing schedule is available from the Winlink development team. Additional information is available from the following sources:

- Contact: k4cix@winlink.org for license details and bulk pricing.
- [Amateur Radio Safety Foundation, Inc.](#)

Winlink Express Network Configurations

A local client (radio operator) can establish Winlink connectivity via the following scenarios:

1. P2P (Peer-to-Peer)
2. P2P through a Network Node
3. WL2K (Winlink address), i.e. ve7uke@winlink.org, ve7eob@winlink.org or va7tof@winlink.org
4. WL2K connecting to a CMS Server (via the Internet)
5. WL2K using Network Nodes

The next section shows each connectivity scenario graphically.

Note: all Winlink users have a WL2K address associated with their call and the format is a call sign followed by @winlink.org such as ve7uke@winlink.org

Winlink Express Network Configuration for Bamfield, Tofino and Ucluelet

Within these three west coast communities, the EOC's operate using the following Industry Canada assigned amateur radio call signs:

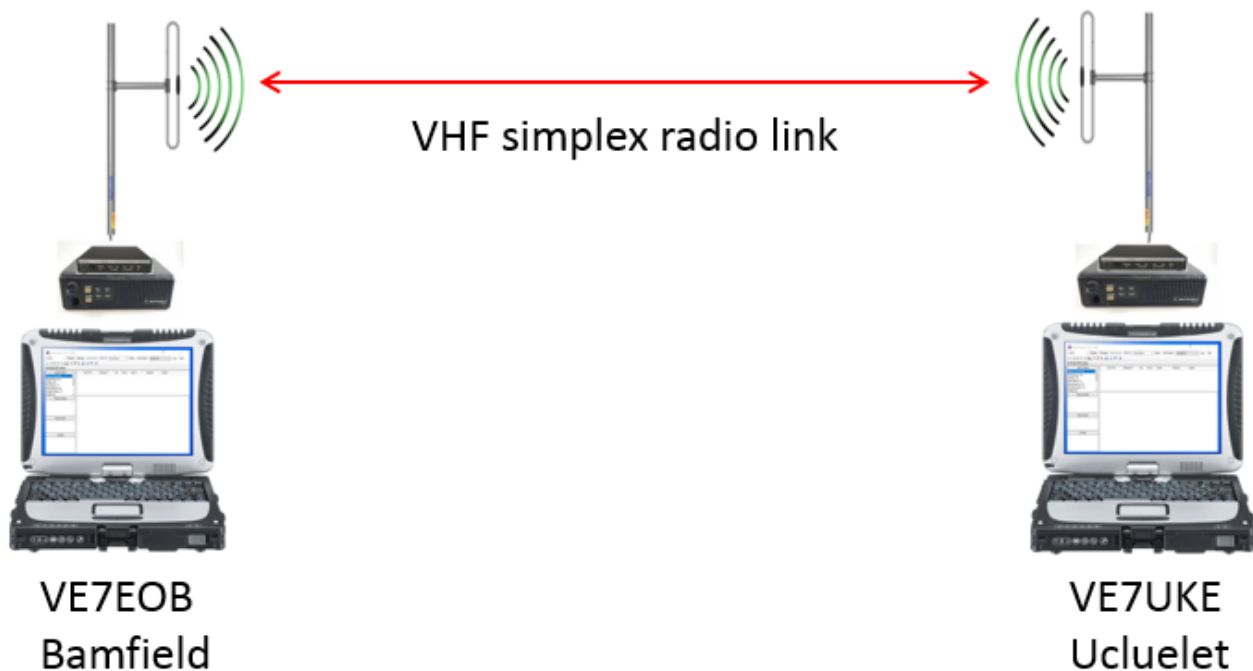
- Bamfield: VE7EOB
- Tofino: VA7TOF
- Ucluelet: VE7UKE

In addition, VE7OZD will be the call sign for a potentially new high-level (-8) network node that will hopefully be established within the Mt. Ozzard radio site complex at some point in the near future.

Using above noted call signs, the following network examples illustrate the various Winlink network configurations for connectivity between the three west coast communities.

Network Configuration / Connectivity Examples

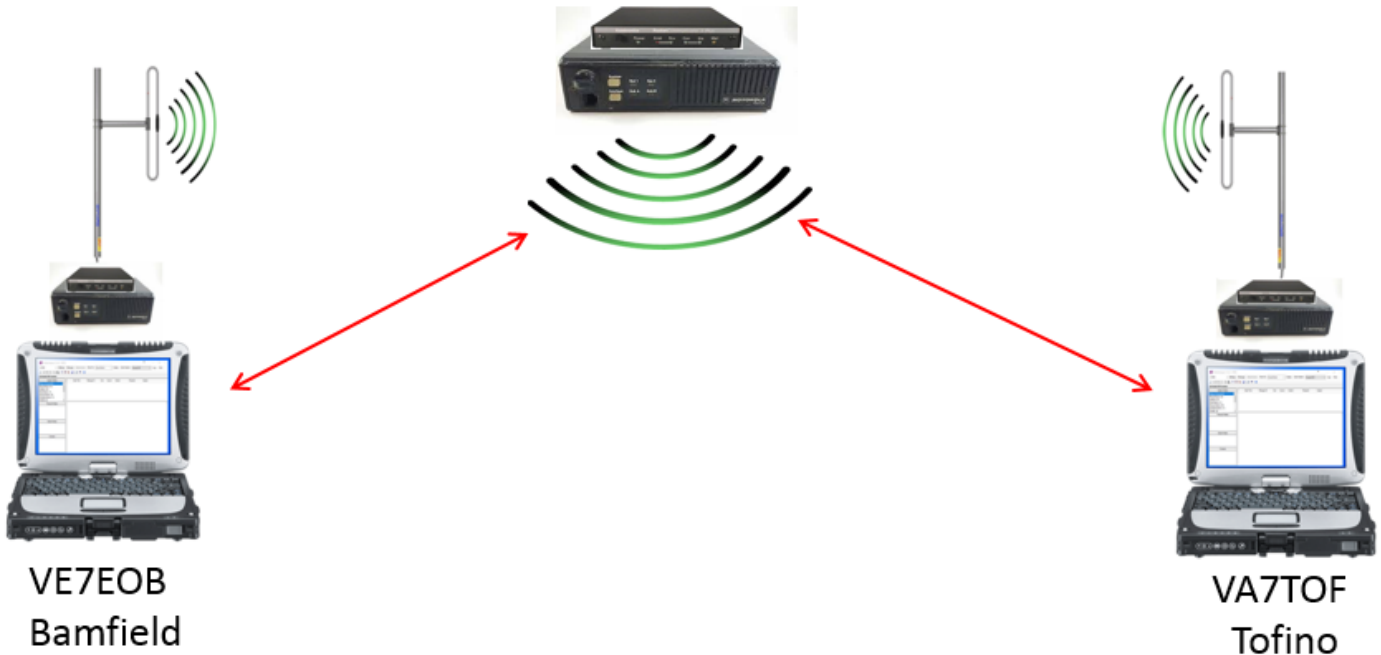
P2P - Peer to Peer (station to station)



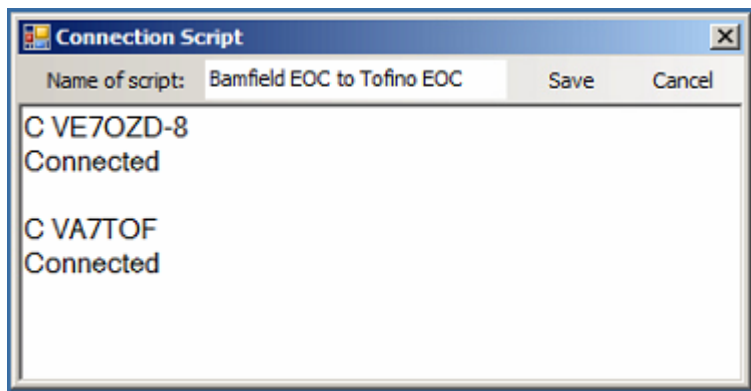
Bamfield EOC (VE7EOB) connects directly to the Ucluelet EOC (VE7UKE) via VHF amateur radio to send a Winlink message.

P2P through a Network Node

High level VE7OZD -8 node at Mt. Ozzard

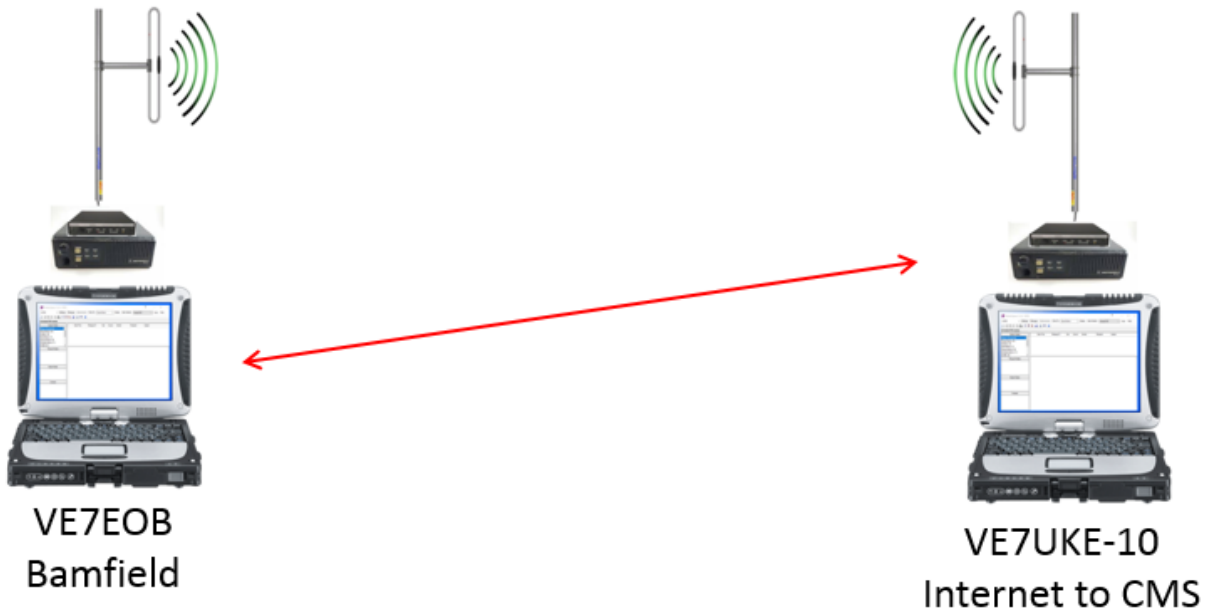


Given the Bamfield EOC (VE7EOB) is not likely to have a reliable simplex (direct) radio path to the Tofino EOC (VA7TOF) via VHF amateur radio, the Mt. Ozzard (VE7OZD-8) high-level intermediate radio site is required in order to send the Winlink message.



Using the Winlink script editor, the Bamfield EOC radio operator creates a simple script to facilitate the automated connection via Mt. Ozzard (VE7OZD-8) between Bamfield and Tofino

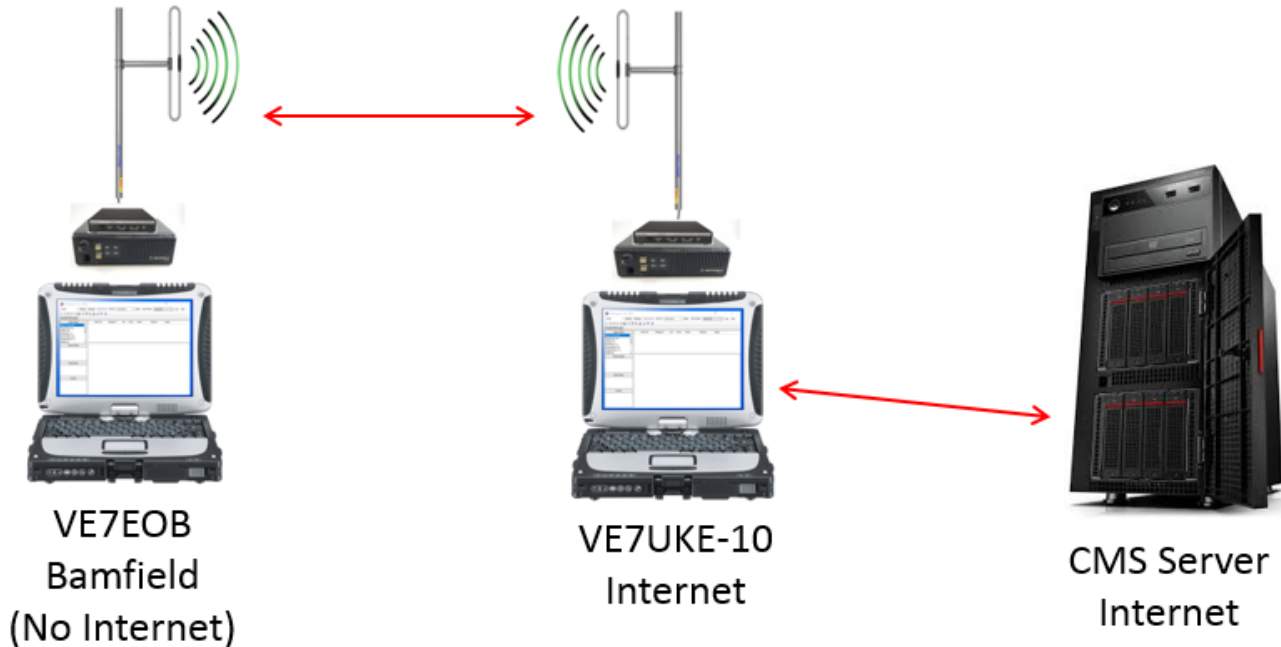
WL2K - Winlink Network



The Bamfield EOC (VE7EOB) does not have a VHF radio path towards Port Alberni to send message traffic, so they utilize the Ucluelet EOC VE7UKE-10 RMS Packet Gateway which is connected to the Internet. The message leaves the local -10 Gateway and is routed to one of the five worldwide mirrored common mail servers (CMS). From the CMS, the message is routed to its destination which could be EMBC or any other location.

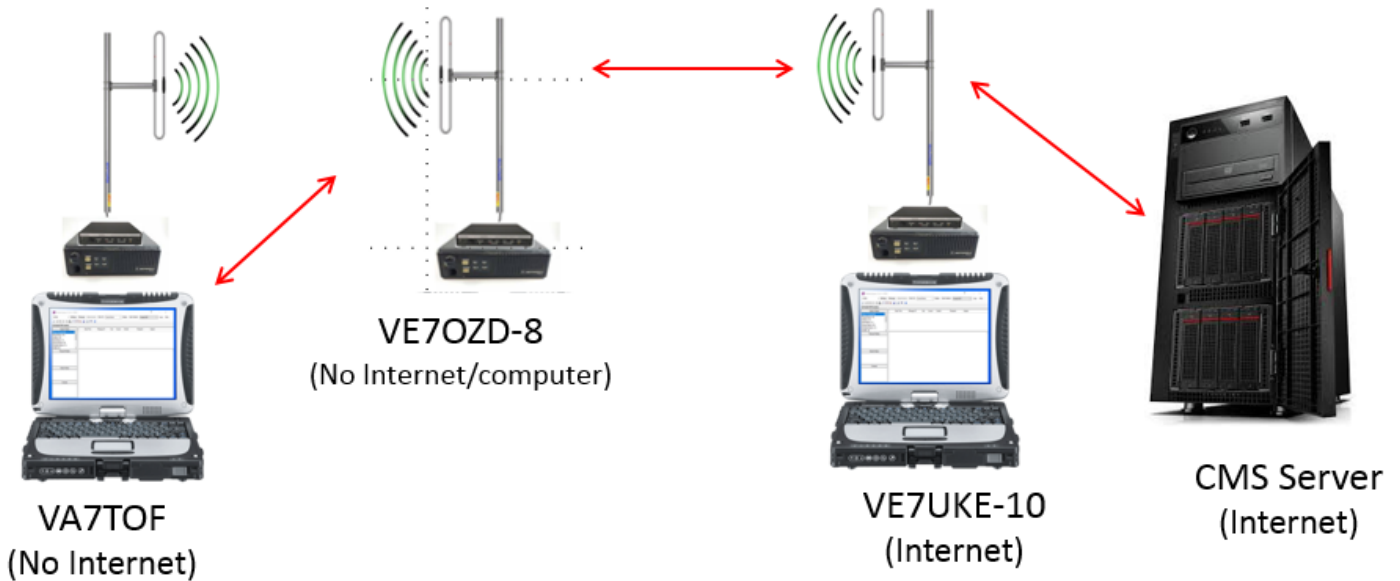
Note: in this example, Bamfield could utilize local Internet connectivity and route their traffic via a Telnet Winlink connection, but using a VHF radio path to Ucluelet simply demonstrates the diversity available within the Winlink network.

WL2K - Winlink Network

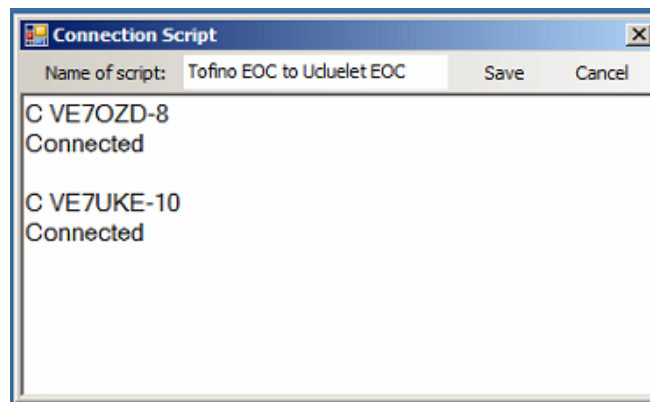


If Bamfield EOC (VE7EOB) wants to send a message to EMBC, but has no Internet connectivity, they utilize the VHF radio path to Ucluelet EOC and the VE7UKE-10 RMS Packet Gateway which is connected to the Internet. The message leaves the local -10 Gateway and is routed to one of the five worldwide mirrored common mail servers (CMS).

WL2K using Network Nodes

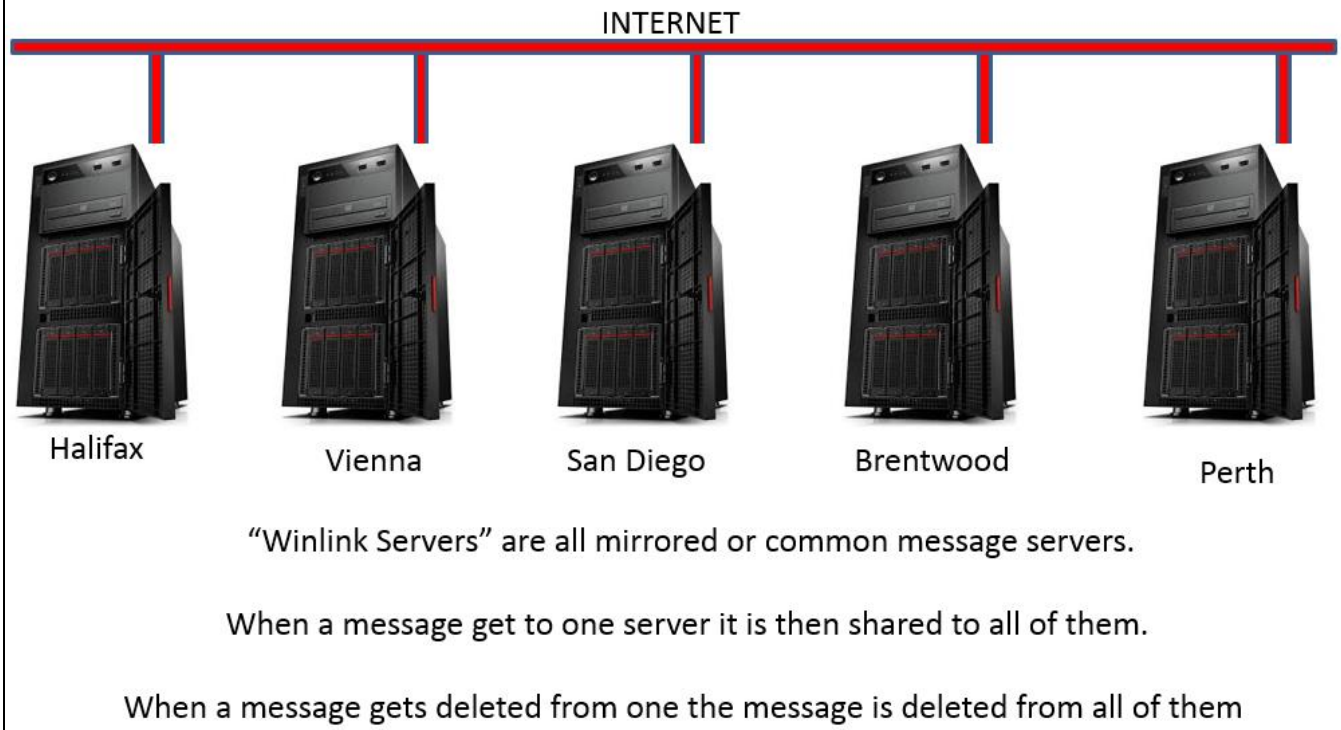


If the Tofino EOC (VA7TOF) has no Internet connectivity, but wants to send a message to EMBC, they utilize the VHF radio path to Mt. Ozzard (VE7OZD-8) and then link to the Ucluelet EOC (VE7UKE-10) RMS Packet Gateway which is in turn connected to the Internet. The message leaves the local -10 Gateway and is routed to one of the five worldwide mirrored common mail servers (CMS).



Using the Winlink script editor, the EOC radio operator creates a simple script to facilitate the automated connection between Tofino and Ucluelet

Winlink Network



Winlink node at Mt. Ozzard (VE7OZD-8)

Central to inter-EOC connectivity for secure digital messaging between the three west coast communities, is the establishment of a single high-level Winlink node (VE7OZD-8) at the Mt. Ozzard radio site. This high-level site is a critical local network element that is required to support inter-EOC secure digital messaging for the emergency programs in Bamfield, Tofino and Ucluelet. Without the Mt. Ozzard site — and in the absence of Internet connectivity, there is no other mechanism to facilitate inter-EOC secure digital messaging for the local emergency programs. Admittedly, the use of HF Pactor is an alternative, but given the relatively close proximity of one community to another and vagaries of HF radio propagation — not to mention the complexity of the equipment, it simply is not a reliable enough alternative for all three communities. Creation of the VE7OZD-8 Winlink node guarantees inter-EOC secure digital messaging for all three communities in an emergency.

While a site intermodulation study would likely be required at Mt. Ozzard, the VE7OZD-8 node could operate on any of the following frequencies: 144.350, 144.930, 144.950, 144.970, 144.990, 145.010, 145.050, 145.070, 145.090, 145.630 or 145.690. All frequencies are available for use in this project as they are within the Amateur Radio portion of the Industry Canada spectrum — so no additional radio licencing is required to implement the Node.

The VE7OZD-8 node project is an initiative of the Mid Island Emergency Program Coordinators and Managers (MIECM) group, which consists of EPC’s from each local emergency program jurisdiction on Vancouver Island, Powell River and the Sunshine Coast. Greater Victoria EPC’s are part of a separate Local Government Emergency Program Advisory Committee (LGEPAC), which is similar to the MIECM.

Establishing an RMS Packet Gateway in Ucluelet

Given there is little in the way of Winlink Express infrastructure on the west coast, the VE7OZD-8 node at Mt. Ozzard and a corresponding RMS Packet Gateway in Ucluelet need to be created to build operational capacity that will support local emergency programs in all three communities.

Centrally located between Bamfield and Tofino, the Ucluelet emergency program radio room is the ideal location to establish an RMS Packet Gateway using call sign VE7UKE-10.

The Gateway and the its corresponding RMS Relay software will be operational 24 x 7 x 365 and other than periodic computer housekeeping which includes updating the software, there is no requirement for local intervention as the Gateway simply runs unattended. If required, a member of the Mid Island Emergency Radio Coordinators Team (MIERCT) could connect remotely to the Gateway using TeamViewer software and perform software updates or operational maintenance. From an IT perspective, the Gateway is a very benign application.

The RMS Packet Gateway will operate on the same frequency as the Mt. Ozzard VE7OZD-8 node.

To create the VE7UKE-10 RMS Packet Gateway, the following components are required:

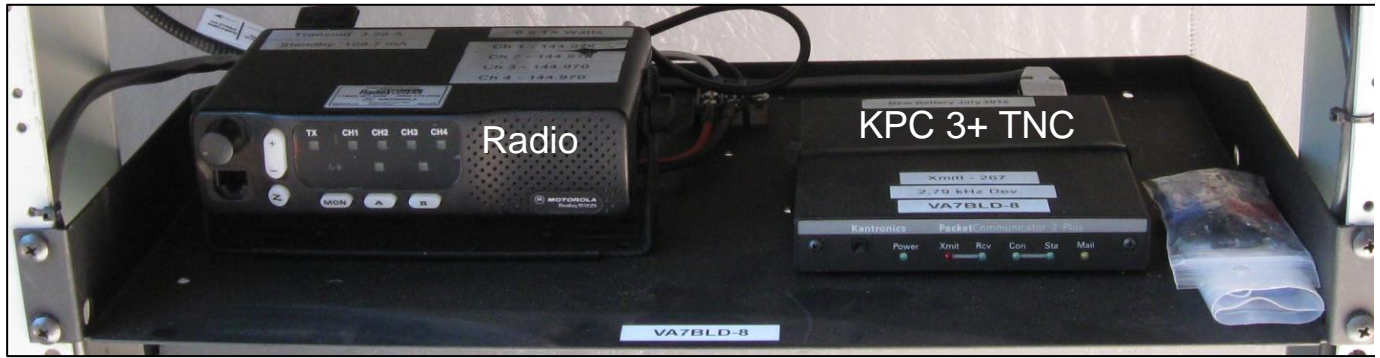
- RMS Packet software complete with RMS Relay software – both are free programs
- Commercial grade VHF radio and a [Kantronics KPC 3+ TNC](#)
- Commercial grade external VHF antenna that is high and in the clear (free from other objects)
- Desktop computer that can be dedicated to the application 24 x 7 x 365 (no other use)
- Full-time Internet access
- TeamViewer v12 software for remote maintenance of the installation

Note: the Cowichan Valley Regional District – Public Safety Division operates RMS Packet Gateways in Duncan (VE7SKR-10), Ladysmith (VE7LSO-10) and Lake Cowichan (VA7LKC-10). In addition, they operate Winlink Nodes at Mt. Wood (VE7WOD-8) and Bald Mtn (VA7BLD-8). While these facilities directly support the CVRD Emergency Program, they also provide secure messaging capacity to our mutual aid partners to the north and the south – including EMBC who utilize the site at Mt. Wood.

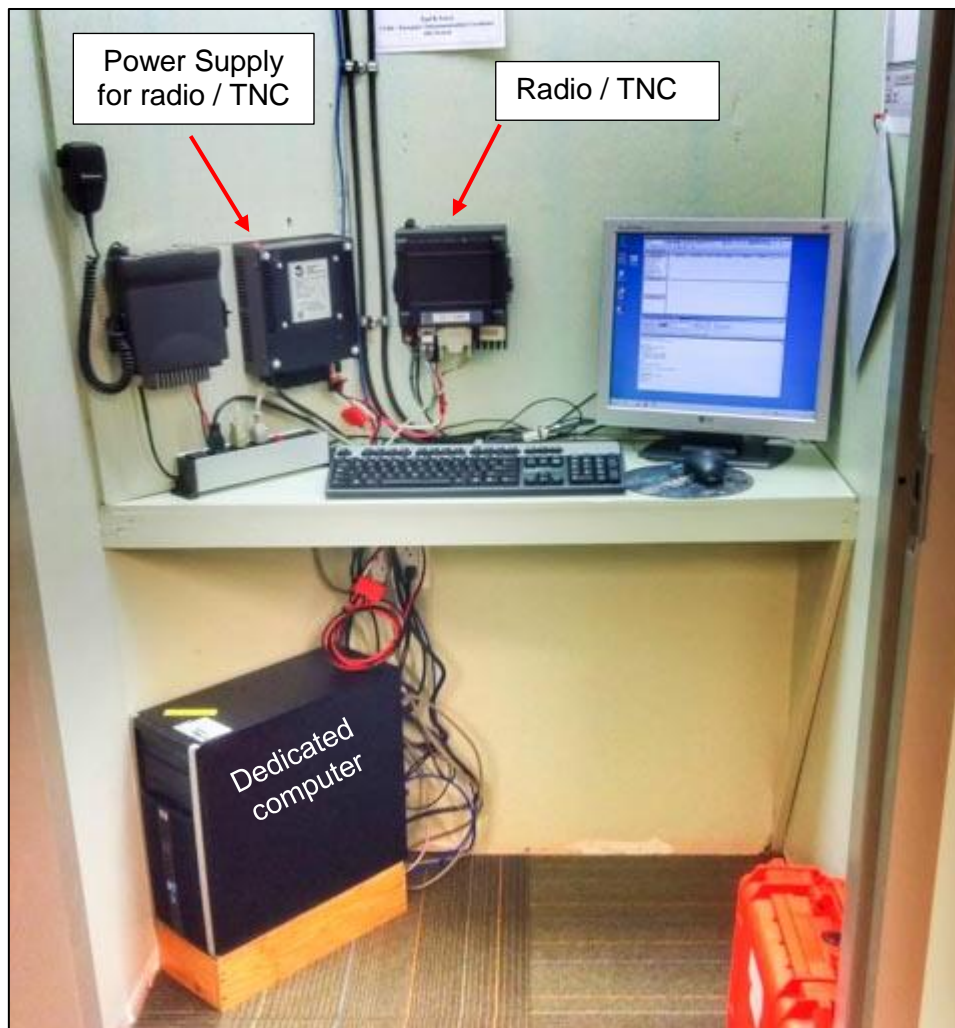
If the Ucluelet Emergency Program were to install an RMS Packet Gateway, it would provide similar support to both Bamfield and Tofino – and it would be available to travelling amateur radio operators as well as local mariners who wish to send / receive Winlink messages.

Assuming a repurposed computer, commercial VHF radio and Sinclair antenna were available to the Ucluelet RMS Packet Gateway project; the additional costs would be less than \$600. This would include a new Kantronics KPC 3+ TNC (CAD\$300) and LMR-400 coax cabling plus connectors and Polyphaser lightning protection module. A low cost - high rate of return project from any perspective.

Equipment associated with both a -8 and -10 configuration



VA7BLD-8 Node at the CVRD Bald Mtn radio site



VA7LKC-10 RMS Packet Gateway located in the radio closet at the CVRD Lake Cowichan Sports Arena



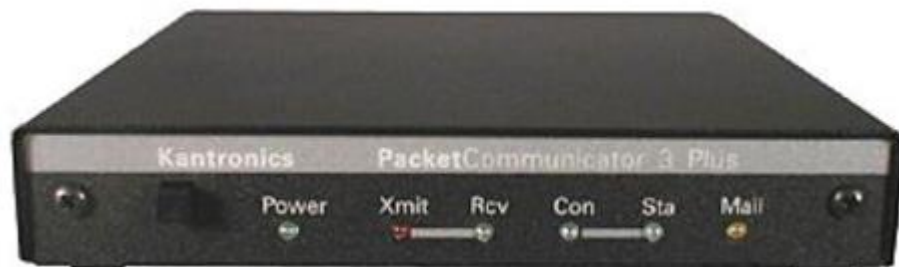
- Sinclair SD210 (SD210-SF2P2SNM)
1 dipole, bi-directional pattern, 138-174 MHz
- Covers 138-174 MHz Band
 - 2.0 dBd gain with bi-directional pattern
 - Can be top or side mount (Universal mount)



This commercial grade antenna is the minimum requirement for either a -8 or a -10 application

Kantronics


KPC-3+ Packet Communicator



Next Steps

In order to move this project through its development cycle, the MIECM and especially the three west coast communities should consider:

1. Review the project at the June 23, 2017 MIECM meeting in Tofino to gain approval in principle from all members
2. Review total project cost and determine related funding sources
3. Discuss with local (in-house) IT departments to ensure they are onboard with the implementation of the Winlink software within their networks
4. Review the project with Canadian Coast Guard (CCG) -- focusing on the tremendous value to all three community emergency programs in establishing the Mt. Ozzard VE7OZD-8 node
5. Source parts for the Ucluelet VE7UKE-10 RMS Packet Gateway and implement the facility
6. Establish additional RMS Packet Gateways at both the Tofino and Bamfield EOC's
7. Exercise the new local network

Summary Comments

These three west coast communities have an operational vulnerability that needs to be addressed by the MIECM.

Building infrastructure to support secure digital messaging is a critical component that should be added to all three local jurisdiction emergency program EOC's in the immediate future. While each community is making incremental local improvements to their in-house radio communication program, all three need to work collectively to implement this initiative which has the potential to provide significant value in an emergency.

Admittedly amateur radio voice communication can now be used by all three EOC's, but the volume of message traffic in an emergency will quickly outstrip the ability of a small number of local radio operators to successfully pass all traffic in a timely manner. With the implementation of digital messaging, all three EOC's can move a tremendous volume of message traffic in a fraction of the time required to send the equivalent traffic via voice. The focus of this report is primarily inter-EOC communications for the west coast communities and the timely delivery of secure digital message traffic to the Alberni-Clayoquot Regional District EOC, EMBC and beyond.

The wider scope of this project however is to develop and refine the process for securing digital radio/TNC interoperability that can be replicated in small remote communities wherever they may be located.

The operational efficiency gained by an EOC that utilizes the Winlink software is a game-changer allowing fast, secure and logged message transmission/receipt that enhances any local authority emergency program!

Please direct all questions related to any aspect of this project to:

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CVRD – Emergency Telecommunications Coordinator
Phone: 250-715-6618
Email: radio@cvr.bc.ca

Ed Gorse, VE7ED created the base drawing content used within the "Network Configuration and Connectivity Examples" section and offered it to the MIECM for use within this project.