

## Chapter 16

# Adaptation of Winlink 2000 Emergency Amateur Radio Email Network to a VHF Packet Radio Infrastructure

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### ABSTRACT

*This chapter presents software and hardware solutions for interconnecting an existing VHF amateur packet radio infrastructure with 'Winlink 2000' radio email network. Having in mind that a number of households, schools, and offices are equipped with Internet connections, and that many radio amateurs at such locations are active on their VHF (or UHF) digital networks on a daily basis, the connectivity between the two systems will increase the chances for citizens who suffer after disasters such as earthquakes, heavy rains and floods, followed by malfunction in commercial communicating services – to remain electronically wired with the rest of world by email. The chapter provides a tutorial on constructing, installing, and testing a simple packet radio repeater station, additionally equipped with computer programs with 'Winlink 2000' compatibility.*

### INTRODUCTION

The global radio email system 'Winlink 2000' has been primarily designed to help people hundreds or thousands miles away from an Internet service provider to send and receive short and urgent emails, by the help of radio amateurs. The actual constraint is circa 120 kilobytes per message including email attachments. Obviously, that size of a correspondence satisfies most emergency needs, such as searching for medical help – doctors or medicines, sending and receiving computer-generated lists of missing or injured people, providing reports from crews on vessels in the middle of an ocean, etcetera. With such requirement in mind, the 'Winlink 2000' designers planned to use HF (high frequencies, short wave) radio communications as their primary media, so they implemented the system for using several more

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efficient HF-related digital modes, such as *Pactor 1*, *Pactor 2*, *Pactor 3*, and *Pactor 4*. Unfortunately, all of them – excluding *Pactor 1* – are proprietary protocols of a commercial modem hardware manufacturer. As a result, many radio amateurs who have been willing to donate their personal capabilities (equipment & time) have been forced into spending a lot of money for purchasing expensive proprietary hardware and related protocol(s). However, recent efforts in researching new digital modes resulted in *Winmor* – a communicating modulation that uses sound capabilities of a PC computer (a ‘SoundBlaster’ card or similar device). Even though *Winmor* was not as efficient as the high-numbered variants of *Pactor*, the new approach proved as more cost-effective solution for many amateur radio enthusiasts worldwide, because they redirected financing into better radio transmitters and antennas.

Nevertheless, both *Pactor 1-4* and *Winmor* are HF-only modulations, which means a potential user has to establish a relatively complex and expensive radio facility, equipped with quality outdoor antennas and radiating strong radio signals on the air. Secondly, the most of HF radio spectrum has been primarily used for international and intercontinental links with very remote correspondents. That means that short-distance and local communications are almost impossible on high frequencies. As a result, the owners of HF systems are mostly available for helping people such as sailors on the oceans, or crew members in remote scientific expeditions, and so on, but the question is how to provide similar service to the local citizens in need. In addition, one should keep in mind a reality that most victims remain after disasters in urban areas with most dense population. In the same time, the majority of radio amateur VHF (or UHF) installations serve urban areas, such as big cities and its surroundings. That is where interconnections in between existing VHF/UHF packet radio relay stations (a.k.a. ‘nodes’) and ‘Winlink 2000’ resources take place.

Everybody knows that one picture is worth more than a thousand words. In this world of modern technologies, recommendations to freely available pictures & slides are always appreciated and welcomed. A so-called ‘webinar’ on Winlink 2000, provided by the South Texas Section of the American Radio Relay League (ARRL), gives the reader a conceptual description of network design, as well as a brief overview to hardware and software solutions for various situations and strategies (ARRL South Texas Section, 2011). However, because of continual changes (i.e. frequent upgrades) in Winlink 2000’s development, some terms and notations given in the webinar are obsolete or deprecated. Secondly, the webinar did not talk about the convergence of Winlink 2000 and existing packet radio infrastructure, what is in the main focus of this book chapter.

## **BACKGROUND**

Following rapid growth in research on wireless communications and networks in recent years, radio amateurs keep their repositioning by implementing new procedures and approaches. Among them is ‘Winlink 2000’ – a well-established emergency amateur radio service that enables people in need to send and receive Internet emails even without direct connectivity to the global network. Instead, the amateur radio stations can provide urgent radio-calls via dedicated gateway servers that forward emails to/from regular Internet users. In addition to the long-haul HF communications that provide alternative connectivity to sailors on the oceans, or to scientists at the expeditions in a jungle or desert, ‘Winlink 2000’ can be easily adapted to existing short-range VHF (or UHF) packet radio installations, in order to allow radio amateurs who reside in urban areas to stay tuned and helpful in public safety emergency situations.

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