Overview of the Winlink "Hybrid" Network

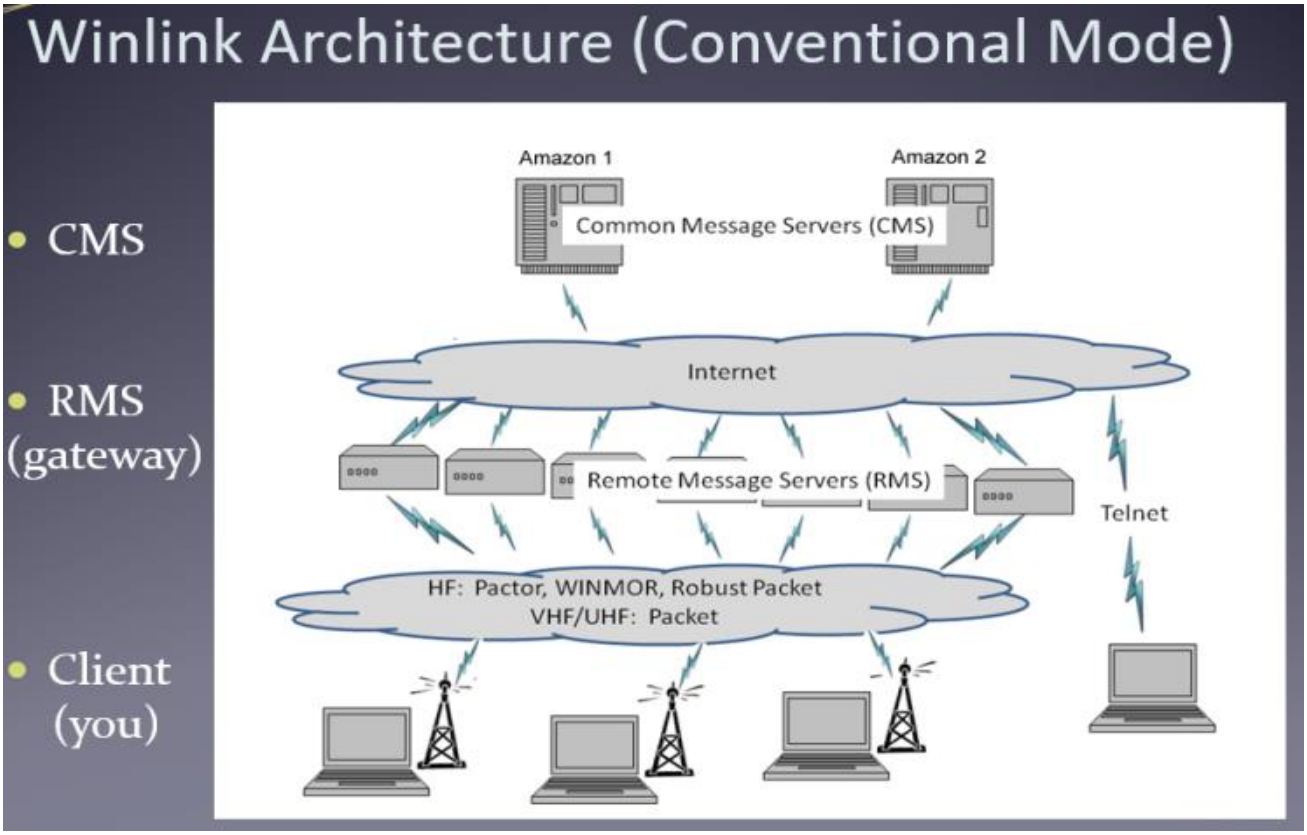
The Winlink radio e-mail network is a versatile system that supports multiple transmission protocols (e.g., Pactor, Winmor, ARDOP, packet, telnet) and several methods for storing and transferring messages – Conventional, Radio-relay, and peer-to-peer. This document will focus on messages sent using HF protocols, primarily Pactor.

Winlink Operating Modes

Winlink provides three modes for transferring messages between stations.

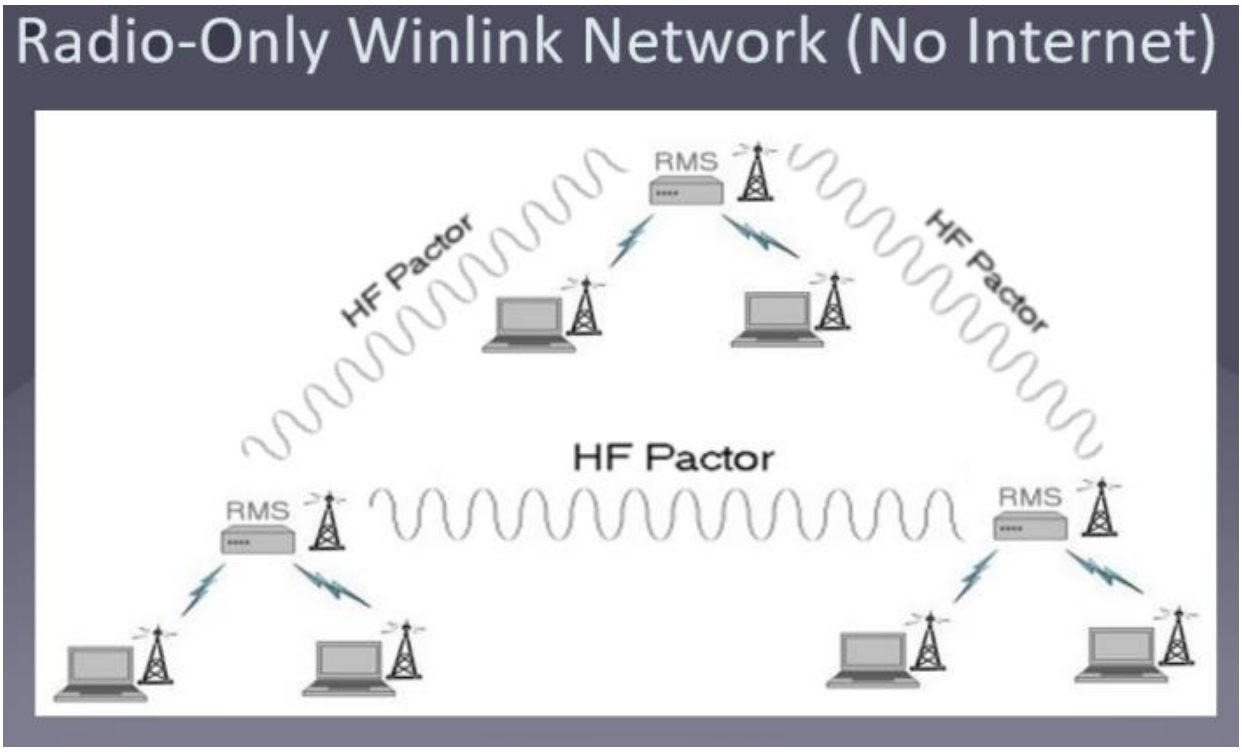
Conventional – This is the standard and preferred mode. A client station consisting of a computer running Winlink Express, a radio, a modem, and an antenna makes an HF radio connection to a Radio Message Server (RMS). The RMS makes an Internet connection to a Common Message Server (CMS) that is the central message repository. Messages sent by the client go by radio to the RMS and then through the Internet where they are stored on a CMS until the recipient connects and downloads messages addressed to them.

The Conventional Mode is efficient and highly reliable. Winlink operates multiple CMS that synchronize with each other frequently to provide completely redundancy. The system can run without interruption with only one CMS in operation. Over the last 15 years, the Winlink central system has been available 99.99% of the time. If an RMS is down and unable to receive a connection, the client can connect to a different RMS. Since all messages are stored in the central CMS database, it doesn't matter which RMS the sender and recipient connect to.



Radio-Forwarding Mode – Conventional mode is reliable and efficient, but it relies on an Internet connection between the RMS and a CMS. If an RMS is running strictly in conventional mode, and it doesn't have an Internet connection, it cannot accept connections from client stations and route them to a CMS. If an Internet outage is confined to the local region of the RMS, a client can simply select a different RMS that has Internet to reach a CMS. However, with the increasing risk of network hacking and cyber-attacks, there is a growing concern with the vulnerability of the Internet itself. By policy, some government sites are prohibited from connecting to the public Internet out of fear of hacking attacks.

To provide resiliency to an Internet outage, Winlink offers a Pactor **radio-forwarding** mode that transfers messages from an RMS that doesn't have Internet to another RMS that has Internet and/or to an RMS where the recipient can pick them up. This mode of operation can operate with local and total Internet outages.



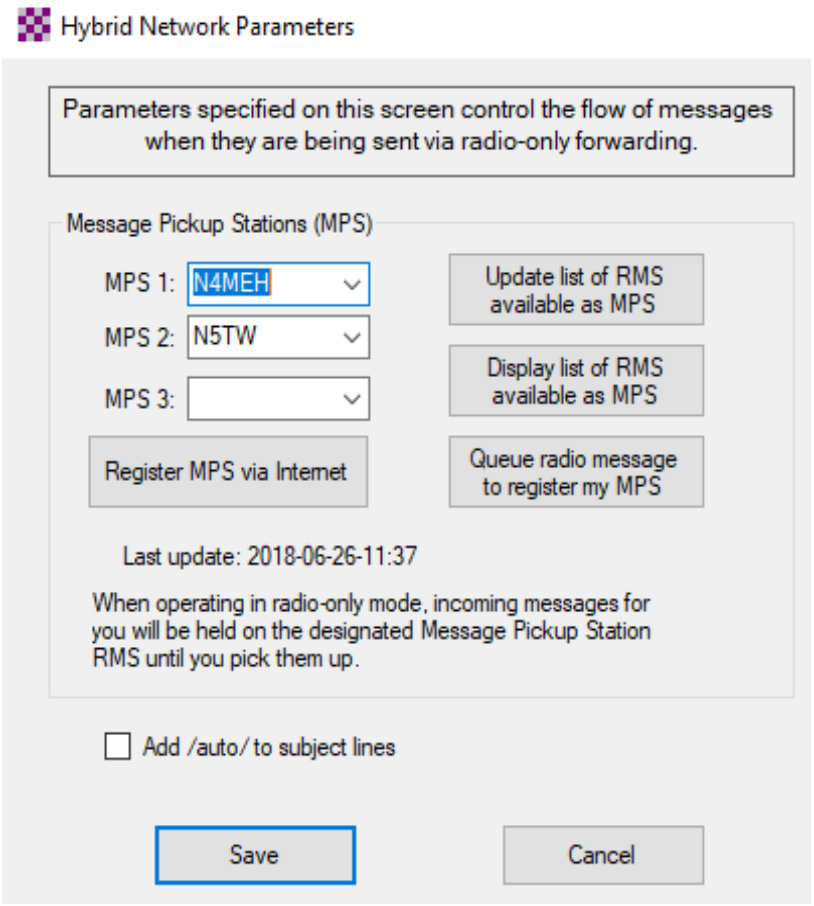
In order for an RMS to participate in the radio-forwarding Winlink network, it must run both the RMS Trimode and the RMS Relay programs, and RMS Relay must be configured to operate in "Hybrid Mode". RMS are encouraged to do this, but it is not required.

The term "**Hybrid Mode**" refers to an RMS configured to operate in Conventional Mode when it has Internet access and to switch automatically to Radio-Forwarding Mode if it loses the Internet connection.

For testing and exercises, messages can be composed and sent into a Hybrid RMS as "**Radio-Only Messages**." Because of the way these messages are tagged and the type of connection made to the RMS, these messages are forced to be handled using radio-forwarding mode even if the Internet is available. Radio-only messages must be addressed to the call sign of the recipient. SMTP e-mail addresses cannot be used with radio-only messages.

Message Pickup Stations (MPS)

Messages transferred by radio-forwarding are not stored on a CMS. Instead, they are forwarded to an RMS and stored in its local database for the recipient to download. Since it would be impractical to send a copy of every radio-forwarding message to every RMS, the recipient must designate which RMS he wants to use as his **Message Pickup Stations (MPS)**. This designation must be done at least 24 hours before radio-forwarding will be available for them. The MPS selection is done in Winlink Express by clicking Setting/Hybrid Network Parameters.



Each user should select two MPS. It's possible to select three, but for efficiency reasons, three is recommended only for emergency management agencies.

The sending station does not need to be aware of the MPS selected by the recipient. The message can be sent into any RMS operating in Hybrid Mode, and that RMS will forward a copy of the message via Pactor to the designated MPS. If the recipient has designated two MPS, a copy of the message is sent to each one. Once Winlink Express has downloaded a message from one MPS, it will not download the same message again from another MPS.

Using “PING” Messages to Test Radio-Only Forwarding

The Winlink hybrid network supports "PING" messages to check the radio-only connectivity between two RMS. Ping messages are different than normal Winlink messages in two ways:

- The message is addressed to the call sign of an RMS rather than the call sign of an end user.
- The message must be sent as a radio-only message and not through the CMS system.

To send a Ping message, put the call sign of the RMS you want to test as the "To" address of the message. Put **/PING/** as the subject of the message. (Ping is not case-sensitive, but it must be enclosed by '/' characters).

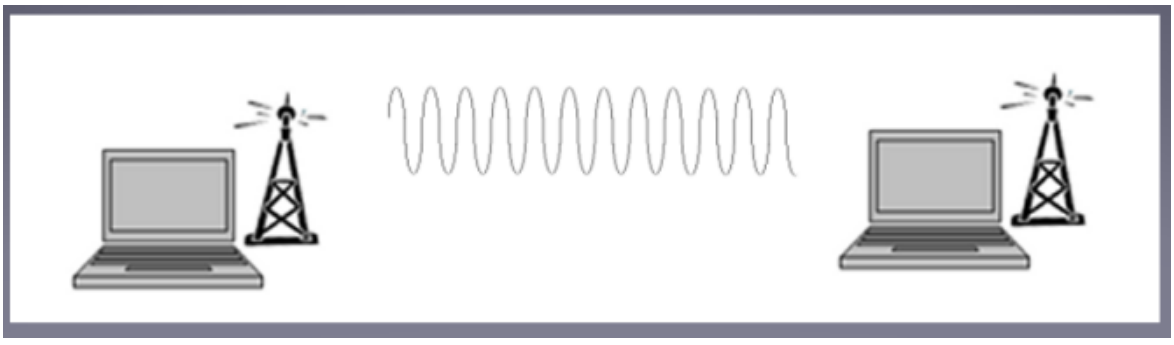
Send the Ping message into a hybrid RMS as a radio-only message. The message will be forwarded to the destination RMS using radio-only relaying. When the message is received by RMS Relay running on the destination RMS, RMS Relay will generate an automatic reply providing information about the RMS and showing the message path that was taken to reach it. This reply will be sent back via radio-only forwarding to the MPS registered for the sender of the message.

Radio-only message mode has several disadvantages compared to conventional mode:

- Conventional mode messages uploaded to a CMS are available to download within a minute. Radio-only messages may take minutes or hours to reach the MPS.
- Conventional messages can be downloaded through any RMS. Radio-only messages can be downloaded only by radio-only connections to one of the MPS.
- You cannot send Internet e-mails (Gmail, Yahoo, etc.) via radio-only.
- The recipients must have designated MPS.

Peer-To-Peer Mode – This mode of operation transfers messages directly from one client station to another client station without going through an RMS or a CMS; the Internet is not used. There are several disadvantages to peer-to-peer mode:

- Both stations must be on the air at the same time
- Stations must coordinate the frequency, and it must be clear
- Both stations must use the same transmission protocol, for example, Pactor.
- Messages cannot be sent to Internet e-mail accounts such as Gmail and Yahoo.



Composing and Sending Conventional, Radio-Only, and Peer-to-Peer Messages

The mode of message handling is specified both when a message is composed and when it is transmitted.

Composing a Message

A choice must be made for the mode on the screen where a message is composed.

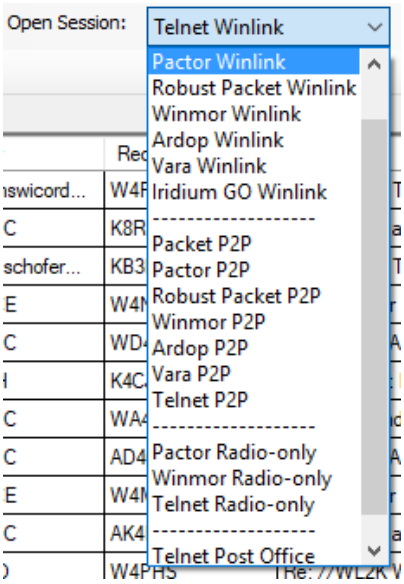
"**Winlink Message**" – This specifies the message should be sent as a conventional message to a CMS. The message will be held in the Outbox until a conventional connection is made to an RMS. It will not be sent through a radio-only or peer-to-peer connection.

"**Radio-Only Message**" – This specifies the message is forced to be transferred by radio-forwarding. It is not sent to a CMS. The recipient must download the message from one of his/her designated Message Pickup Stations (MPS). The message will be held in the Outbox until a radio-only connection is made to an RMS. It will not be sent through a conventional RMS connection or a peer-to-peer connection.

"**Peer-to-Peer Message**" – This specifies the message is to be held until a peer-to peer connection is made to the client station having the call sign matching the "To" address of the message. The message will not be sent during a conventional connection to an RMS or during a radio-only connection.

Connection Modes

When you open a session, you must select whether you want the session to make a conventional, radio-only, or peer-to-peer mode connection. This is done using the session drop-down list in Winlink Express.



A “Winlink” session makes a conventional connection to an RMS. When a message is created and tagged as Conventional, Radio-only, or Peer-to-Peer, it will be held until the matching type of session is active.

When a conventional (“Winlink”) connection is made to an RMS, data is relayed between the client station and a CMS. RMS Relay on the RMS simply passes packets back and forth.

When a radio-only connection is made to an RMS, RMS Relay running on the RMS processes the connection itself and stores any messages sent in its local database. No information is passed up to a CMS. Winlink Express appends “-T” to the call sign of the RMS to notify the RMS that a radio-only connection needs to be handled locally.

Handling of Conventional and Radio-Only Messages

Conventional Messages

RMS has an Internet connection – The connection is routed through the RMS and the Internet to a CMS. Messages being sent go to the CMS and are stored in its database. Messages for the connecting person held by the CMS are downloaded to the client.

RMS does not have an Internet connection – If the sysop of the RMS had enabled an option to accept only radio-only messages for no-Internet operation, a message will be sent back notifying the client, and the connection will be dropped. If the RMS is configured to accept conventional connections without Internet, Winlink Express displays a warning message notifying the operator that outgoing messages may be delayed.

If the client station operator elects to continue the connection, then outgoing messages are accepted by RMS Relay on the RMS and stored in its local database. Depending on how the RMS operator configures his RMS, the messages may be held until the Internet connection is restored and then uploaded to a CMS, or the RMS may make a Pactor connection to another RMS that has Internet and forward the messages through it to reach a CMS.

If the posted messages are addressed to call signs that have registered MPS, a copy of the message will be sent to each MPS for the recipient. In this case, the messages will be available on a CMS and also on the MPS. They will have the same message ID, so Winlink Express will download only one copy.

Radio-Only Messages

If a message is created as a radio-only message, and a radio-only connection is made to a hybrid RMS, then the RMS will always use RMS Relay to process the connection. Messages sent will be stored by RMS Relay in its local database. No copy of the message will be uploaded to a CMS. A copy of the message will be made for each MPS registered for the recipient, and the messages will be routed to the MPS where they will be stored in its local database.

Downloading Messages

Conventional messages are stored on a CMS. Radio-only messages are stored in the local database for the RMS designated as MPS. To retrieve a conventional message, you must make a conventional connection that reaches a CMS. The only exception is when the original RMS they were posted through didn't have an Internet connection, so copies were sent both to a CMS and the MPS.

Since radio-only messages are stored in the local database of the RMS designated as MPS, radio-only connections to one of the MPS RMS must be made to download these messages.