

Overview of the Amateur Radio Digital Open Protocol (ARDOP)

Prepared by Rick Muething, KN6KB

Revision 0.4 Mar 30, 2015

The ARDOP project is a joint amateur development effort seeking to provide a specification and implementation (software or hardware) for a modern versatile open digital protocol.

Project Target Objectives:

1) Open Design: Document and build a modern amateur protocol that can be used on a number of common OS, computers/tablets and DSP devices and is compatible with both HF and VHF transmission. The protocol should be easily extended. Software implementations will be open sourced. A conformance specification and compatibility test insures compatibility between ARDOP implementations.

2) Flexible Implementation: It is anticipated there will be several implementations compatible with a number of software and hardware platforms. These include:

Software implementations (virtual TNC with “sound card”) on Windows, Linux, Apple and Android OS

Hardware implementations using low cost dedicated DSP CPU chips and integrated “sound cards”

3) Bandwidth Options: The initial ARDOP protocol is intended to operate in one of four audio bandwidths, 200 Hz, 500 Hz, 1000 Hz, and 2000 Hz. The bandwidth can be forced by server, forced by client or negotiated by the server and client.

4) Channel Adaptability: The protocol is intended to be able to operate over a wide range of data rate and robustness levels by automatically adapting to propagation and channel conditions seeking the best modulation and bandwidth to maximize *net* error-free throughput.

5) Support both FEC and ARQ operation: ARQ (connected) operation insures error free data delivery between two connected stations. FEC may be used for broadcast (multicast) applications. The bandwidth, modulation mode and repeat level for FEC (multicast) operation is selectable to allow sender tradeoff of robustness and net throughput. Receiver reception requires no setup. Both FEC and ARQ transmission may be monitored by listening parties.

6) Compliance with US FCC Symbol rate rule: The maximum symbol rate on any carrier shall be 300 baud or less for all SSB modes. The protocol shall allow modification extensions to symbol rates > 300 baud if and when the FCC rules are changed.

7) Strong Resistance to Multipath propagation: The protocol shall use modern techniques (low symbol rates, OFDM carrier cyclic prefix, 4FSK modulation, path compensation, strong FEC etc. to optimize performance under poor multipath conditions (path delay variation up to 5 ms).

8) Minimize Interference. The protocol shall minimize the chance of interference with other existing connections on a frequency using modern busy channel detectors and listen before transmit.

9) Flexible Operating Modes and Radios: The protocol may be used on both HF (SSB mode) and VHF/UHF (SSB or FM mode). Timing parameters are adjusted automatically for ARQ modes to accommodate various transmitter keying options, SDR type radios (e.g. Flex) and the use of carrier or sub tone operated VHF/UHF repeaters.

10) Compatible with multi language usage: Although the protocol requires ASCII compliant call signs (7 characters plus optional SSID of -1 through -Z) all data is transferred in pure binary insuring protocol compatibility with multi language character sets like UTF-8.

Available Documents:

- 1) Amateur Radio Digital Open Protocol (ARDOP) Specification (includes detailed specification of all components, bandwidths and operating modes of the protocol)
- 2) Interface Specification for ARDOP TNC (includes commands and data interface details between host program and ARDOP TNC)
- 3) ARDOP Frame Info (.xls) includes details on frame timing, coding and FEC and ARQ throughput.