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Internet Protocol Encapsulation of AX.25 Frames
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Abstract

This document describes a method for the encapsulation of AX.25 Link Access Protocol for Amateur Packet Radio frames within IP version 4 and version 6 packets. Obsoletes RFC1226.

Note

Comments are solicited and should be addressed to the author(s).

The sources for this draft are at:

https://github.com/irl/draft-rfc1226-bis

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1. Introduction

This document describes a method for the encapsulation of AX.25 Link Access Protocol for Amateur Packet Radio [AX.25]) frames within IPv4 and IPv6 packets. It obsoletes [RFC1226].

AX.25 is a data link layer protocol originally derived from layer 2 of the X.25 protocol suite and designed for use by amateur radio operators. It is used extensively by amateur packet radio networks worldwide.

In addition to specifying how packets should be encapsulated, it gives recommendations for DiffServ codepoint marking of the encapsulating headers based on the AX.25 frame content and provides security considerations for the use of this encapsulation method.

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

3. Internet Protocol Encapsulation

Each AX.25 frame is encapsulated in one IP version 4 or version 6 datagram using protocol number 93 as assigned in the Assigned Internet Protocol Numbers registry [protocol-numbers]. For AX.25 version 2.0, the maximum frame size expected is 330 bytes and implementations MUST be prepared to handle frames of this size. Higher frame sizes can be negotiated by AX.25 version 2.2 and so this is a minimum requirement and not a limit.

HDLC framing elements (flags and zero-stuffing) are omitted, as the IP datagram adequately delimits the beginning and end of each AX.25 frame. The CRC-16-CCITT frame check sequence (normally generated by the HDLC transmission hardware) is included trailing the information field. In all other respects, AX.25 frames are encapsulated unaltered.

3.1. Priority Frames

In normal operation, the DiffServ codepoint field [RFC2474] in the encapsulating IP header SHOULD be set to best effort (BE). The exception to this is "priority frames" as specified for AX.25 version 2.2, including acknowledgement and digipeat frames, which SHOULD have the DiffServ codepoint set to AF21 [RFC2597]. A slot is reserved on the radio channel for the transmission of these frames and the use of this codepoint will permit the frames to arrive promptly at the station for transmission.

For the avoidance of doubt: on decapsulation the AX.25 frame MUST NOT be modified regardless of the DiffServ codepoint on the received encapsulating IP header.

3.2. Automatic Packet Reporting System

Automatic Packet Reporting System [APRS] is an amateur radio-based system for real time digital communications for local situational awareness. APRS uses AX.25 frames for addressing, and additionally assigns special meaning to some of the reserved bits of an AX.25 frame header.

As a special case, when used with the Automatic Packet Reporting System [APRS], priority frames will not occur. If a tunnel is configured as carrying APRS data, the DiffServ codepoint SHOULD by default be set to AF11 [RFC2597]. Where the "Precedence Bit" [RR-bits] is set (i.e. it is zero) in an APRS packet, the DiffServ codepoint should be set to BE. Where the "Operator Present Bit" [RR-bits] is set (i.e. it is zero), the DiffServ codepoint MAY be set to AF21 [RFC2597].

Again, for the avoidance of doubt: on decapsulation the AX.25 frame MUST NOT be modified regardless of the DiffServ codepoint on the received encapsulating IP header.

4. IANA Considerations

Protocol number 93 is assigned in [protocol-numbers] and should be updated to point to this document.

5. Security Considerations

XXX Left the hard part for last, but the basics of it:

You should use something to guarantee integrity

My advice is to use IPsec

Use ESP on the Internet, use AH on amateur radio links

Use AH if possibility that packet will go via amateur radio

Tunnels will be configured statically (can't think of other use cases) so certificates are good

Routing via IPsec is not required, transport mode suffices, tunnel mode for cases where there is NAT

6. Acknowledgements

The author would like to acknowledge the work of Brian Kantor who authored the original specification [RFC1226] that this document updates.

7. References

7.1. Normative References

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7.2. Informative References

[APRS] Wade, I., Ed., "APRS Protocol Reference", August 2000, <http://www.aprs.org/doc/APRS101.PDF>.

[RFC1226] Kantor, B., "Internet protocol encapsulation of AX.25 frames", RFC 1226, DOI 10.17487/RFC1226, May 1991, <https://www.rfc-editor.org/info/rfc1226>.

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