MULTIPROTOCOL ENCAPSULATION IMPLEMENTATION AGREEMENT

FRF.3.1

Frame Relay Forum Technical Committee

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DOCUMENT HISTORY

FRF 3.0

- base document for multiprotocol encapsulation

FRF 3.1

- addition of SNA-High Performance Routing (HPR) - Network Layer Packet (NLP) codepoints
- addition of codepoint for “no layer 2 protocol”
- updated reference

1. INTRODUCTION

1.1. Purpose

This document is a protocol encapsulation over frame relay implementation agreement. The agreements herein were reached in the Frame Relay Forum, and are based on the relevant frame relay standards referred in Section 1.3. They address the optional parts of these standards, and document agreements reached among vendors/suppliers of frame relay network products and services regarding the options to be implemented.

This document may be submitted to different bodies involved in ratification of implementation agreements and conformance testing to facilitate multi-vendor interoperability.

1.2. Definitions

- Must, Shall, or Mandatory - the item is an absolute requirement of this implementation agreement.
- Should - the item is highly desirable.
- May or optional - the item is not compulsory, and may be followed or ignored according to the needs of the implementor.
- Not applicable - the item is outside the scope of this implementation agreement.

1.3. Relevant Standards

The following is a list of standards on which this protocol encapsulation over frame relay implementation agreement is based:

1. ITU-T Recommendation Q.933 - DSS 1 - Signalling specification for Frame mode basic call control, 1993.
2. ANSI T1.617a - Signaling specification for Frame relay bearer service for DSS 1, American National Standards Institute. Inc., 1994.
3. ISO/IEC/TR 9577:1992 - Information processing systems - Telecommunications and information exchange between systems - Protocol identification in the network layer.
4. Enhancements to Recommendation Q.933 - ITU SG 11 Temporary Document PL/11-90 Geneva, 5-23 September, 1994.

2. IMPLEMENTATION AGREEMENTS

2.1. General

Terminal equipment which supports an encapsulation method must know which frame relay virtual connection will carry a given method. Encapsulation procedures must only be used over a Permanent Virtual Connection (PVC) that has been explicitly configured or Switched Virtual Connection (SVC) that are established indicating encapsulation during call setup in the low layer compatibility information element.

This agreement contains procedures for encapsulating protocol traffic within frame relay CCITT Q.922 - 1992 Annex A (ANSI T1.618) frames. The encapsulation procedures are based on ANSI T1.617a -1994 (Supplement to ANSI T1.617 - 1991) Annex F and Annex G.

The implementation agreement describes the procedures for usage of Multiprotocol encapsulation and Single-protocol X.25 encapsulation.

2.2. Multiprotocol encapsulation

Multiprotocol encapsulation provides a flexible method for carrying multiple protocols on a given frame relay connection. These methods are useful when there is a need to multiplex/demultiplex across a single frame relay connection. They are described in ANSI T1.617a -1994 Annex F.

If a protocol can be encapsulated using more than one multiprotocol header format, the first format from the list below, which provides a code point for the protocol, shall be used.

1. Direct Network Layer Protocol Identifiers (NLPID) - protocols for which an NLPID value is defined in ISO TR 9577: e.g., IP, CLNP (ISO 8473),

2. SNAP encapsulation - using SNAP NLPID followed by SNAP: LAN bridging, Connectionless protocols which have a SNAP value (e.g., DECNET, IPX, AppleTalk etc.).

3. NLPID followed by four octets indicating layer 2 and layer 3 identifications: connection oriented protocols (e.g., ISO 8208, SNA, etc.) and other protocols which can't be supported by the other two methods.

2.2.1. Formats and code point log for user defined protocols

This section contains the code point log and frame formats for user defined protocols which are not defined in Annex F of ANSI T1.617a -1994. This will enhance interoperability.

Some protocols that do not have a specific NLPID can use NLPID 0x08 (which indicates ITU-T Q.933). The four octets following the NLPID field identify both the layer 2 and layer 3 protocols being used. The code points for most protocols are currently defined in ITU-T Q.933 low layer compatibility information element (see section 4.5.21 of ITU-T Q.933 octets 6 and 7 codings).

2.2.1.1. Code point log for user specified protocols

Octets 6a and 7a in the low layer compatibility information element are used for identification of user specified protocols that have no code value assigned in octet 6 or 7.

Codepoint log for octet 6a (layer 2)

The following codepoints are for user defined layer 2 protocols; others may be added in the future.

Code point	Description
0x81	No layer 2 protocol

Codepoint log for octet 7a (layer 3)

The following codepoints are for user defined layer 3 protocols; others may be added in the future.

Code point	Description
0x81	SNA - Subarea (FID4) (Systems Network Architecture - Network Product Formats LY43 - 0081)
0x82	SNA - Peripheral (FID2) (Systems Network Architecture Formats GA27 - 3136)
0x83	SNA - APPN (FID2) (Systems Network Architecture Formats GA27 - 3136)
0x84	Network Basic Input Output System (NETBIOS) (Local Area Network Technical Reference SC30 - 3383)
0x85	SNA - HPR (Systems Network Architecture Formats GA27 - 3136)

2.2.1.2. Frame formats

This section describes the frame formats for user defined protocols using Q.933 NLPID.

SNA -- Subarea (FID4)

Q.922 (T1.618) Address	
Control 0x03	NLPID 0x08
L2 Protocol ID	
8802 / 2 0x4C	0x80 (Note 1)
L3 Protocol ID	
User Spec. 0x70	0x81
DSAP 0x04 (Note 2)	SSAP 0x04 (Note 2)
Control (Note 3)	
remainder of PDU .	
FCS	

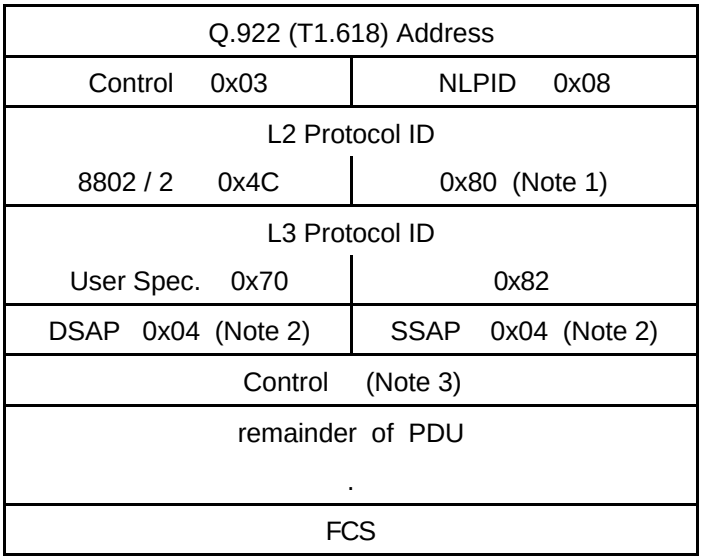
Notes 1 - Included for padding only.

2 - For other values see Token-Ring Network Architecture Reference (IBM SC30-3374).

3 - Control field is two octets for I-format and S-format frames (see ISO 8802/2).

Figure 1 -- Format of frame with 8802.2 (layer 2 and SNA-Subarea - FID4)

SNA -- Peripheral (FID2)



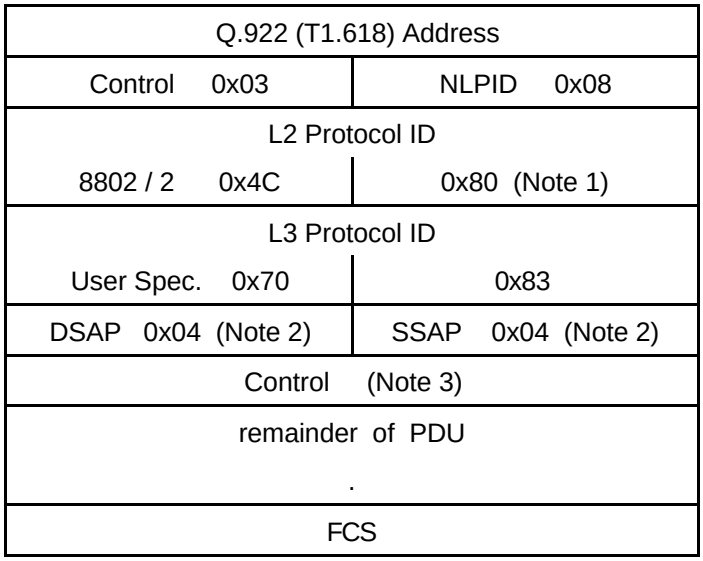
Notes 1 - Included for padding only.

2 - For other values see Token-Ring Network Architecture Reference (IBM SC30-3374).

3 - Control field is two octets for I-format and S-format frames (see ISO 8802/2).

Figure 2 -- Format of frame with 8802.2 (layer 2 and SNA Peripheral - FID2)

SNA -- APPN (FID2)



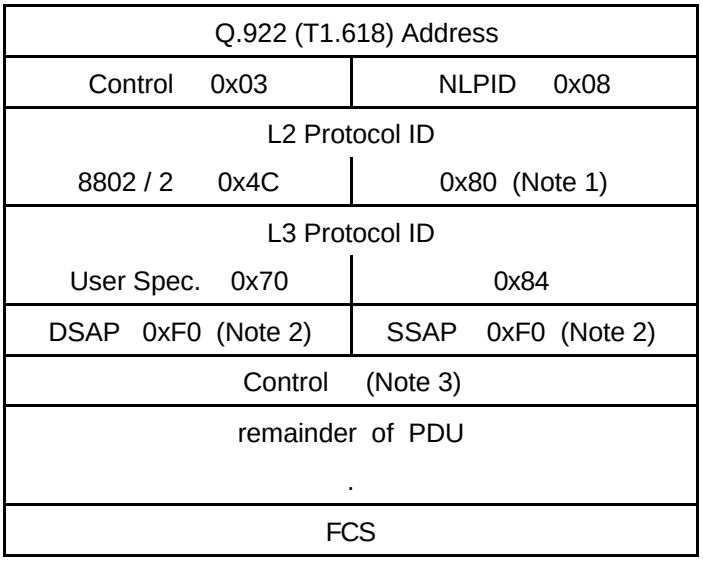
Notes 1 - Included for padding only.

2 - For other values see Token-Ring Network Architecture Reference (IBM SC30-3374).

3 - Control field is two octets for I-format and S-format frames (see ISO 8802/2).

Figure 3 -- Format of frame with 8802.2 (layer 2 and SNA - APPN - (FID2))

NETBIOS



Notes 1 - Included for padding only.

2 - For other values see Token-Ring Network Architecture Reference (IBM SC30-3374).

3 - Control field is two octets for I-format and S-format frames (see ISO 8802/2).

Figure 4 -- Format of frame with 8802.2 (layer 2 and NETBIOS)

High Performance Routing (HPR) Network Layer Packet (HPR) without Layer 2

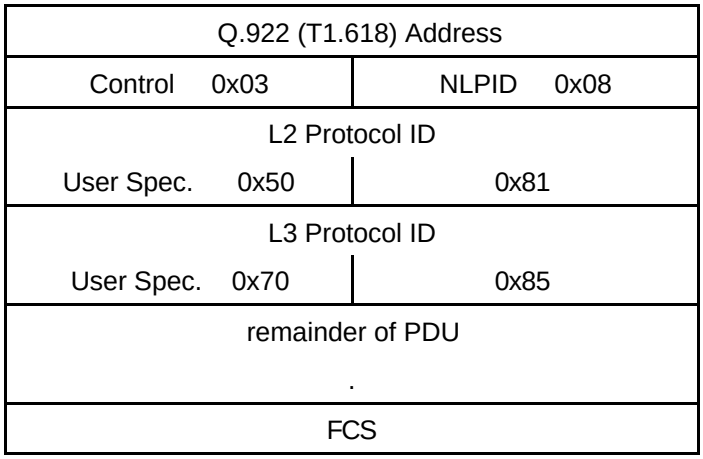
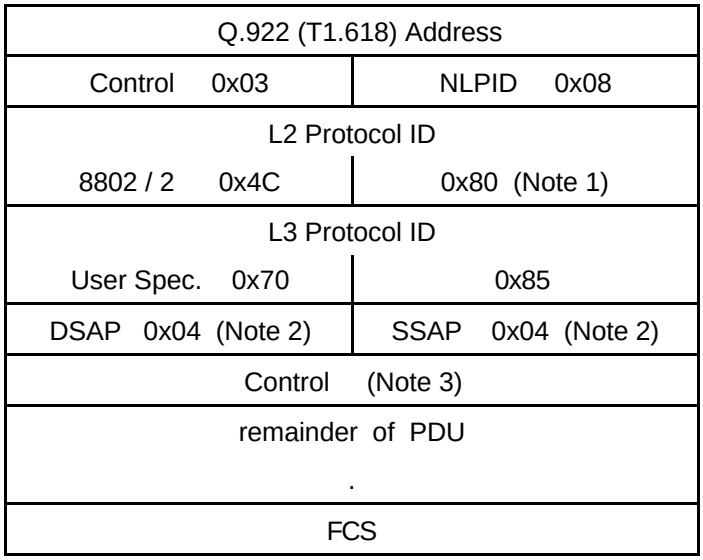


Figure 5 -- Format of frame with no layer 2 and HPR NLP

High Performance Routing (HPR) Network Layer Packet (HPR)



Notes 1 - Included for padding only.

2 - For other values see Token-Ring Network Architecture Reference (IBM SC30-3374).

3 - Control field is two octets for I-format and S-format frames (see ISO 8802/2).

Figure 6 -- Format of frame with 8802.2 (layer 2) and HPR NLP

2.3. Single-protocol X.25 Encapsulation

Single-protocol X.25 encapsulation provides a simple method to allow interconnection of X.25 devices via a frame relay connection. This method is useful for devices that do not need or wish to support multiprotocol encapsulation procedures, or wishes to use LAPB procedures end to end. The encapsulation procedure is described in ANSI T1.617a-1994 Annex G.

Note - Only X.25 single protocol usage is defined. Usage of other single protocol frame relay encapsulation is outside the scope of this implementation agreement.