                      IANA Guidance for Managing
   the Unidirectional Lightweight Encapsulation (ULE) Next-Header Registry

Abstract

   This document updates RFC 4326 to clarify and update the allocation
   rules for the Unidirectional Lightweight Encapsulation (ULE) Next-
   Header registry. This registry is used by ULE and Generic Stream
   Encapsulation (GSE) to record the code points of Extension Headers
   and protocols supported by these encapsulation protocols.

Status of This Memo

   This is an Internet Standards Track document.

   This document is a product of the Internet Engineering Task Force
   (IETF). It represents the consensus of the IETF community. It has
   received public review and has been approved for publication by the
   Internet Engineering Steering Group (IESG). Further information on
   Internet Standards is available in Section 2 of RFC 5741.

   Information about the current status of this document, any errata,
   and how to provide feedback on it may be obtained at
   http://www.rfc-editor.org/info/rfc7280.

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1. Introduction

   The Unidirectional Lightweight Encapsulation (ULE) [RFC4326]
   specifies an encapsulation for links that employ the MPEG-2 Transport
   Stream, with support over a wide variety of physical-layer bearers
   [RFC4259]. The encapsulation header includes a Type field that
   identifies payload types and Extension Headers (e.g., [RFC5163]).
   The ULE specification requested IANA to maintain the ULE Next-Header
   registry to record the allocation of the values used to derive this
   Type field.

   The Digital Video Broadcast (DVB) Project has published an
   encapsulation for second-generation DVB physical layers. This
   specifies the Generic Stream Encapsulation [GSE]. This encapsulation
   shares many of the network properties of ULE and uses a common format
   for the Type field [RFC5163]. The ULE Next-Header registry is
   therefore also applicable to this encapsulation.

   This document updates the IANA rules and guidance defined in
   Section 11.1 of [RFC4326] in the following way:

   o The document clarifies use of the ULE Next-Header registry by GSE
      as well as by ULE.

   o Section 3 specifies that new allocations in the ULE Next-Header
      registry are to be assigned by IANA using the "Specification
      Required" policy and provides guidance to the expert reviewer.

   o Section 3.3 reserves a range of allocated values.

   o Section 4 adds an explanatory note to clarify the encoding used in
      the ULE Next-Header registry.

2. Terminology

   This document assumes familiarity with the ULE terminology used in
   [RFC4326] and [RFC5163].

   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].

2.1. The ULE Next-Header Registry

   The Mandatory Extension Headers are allocated in the ULE Next-Header
   registry with integer values in the decimal range 0-255. The
   registered value corresponds to a 16-bit Type value (converted by
   setting the most significant 8 bits of the 16-bit value to zero).
   This Type value may identify a Mandatory Extension Header or a
   specific protocol.

   The Optional Extension Headers are allocated in the ULE Next-Header
   registry with integer values in the decimal range 256-511. The
   registered value corresponds to the 16-bit Type value that would be
   used for an Optional Extension Header with a length (H-LEN) of 1.

2.2. Informative Example of Using a Value from the Optional Range

   This section provides an informative example of how a registry entry
   is constructed to identify an Optional ULE Extension Header.

   Values registered by IANA in the Optional ULE Extension Header range
   correspond to a 16-bit Type value with the H-LEN field (in bits 5 to
   7) set to a decimal value of 1. This registration format is used
   irrespective of the H-LEN value to be used. Bits 8 to 15 of the
   value in the registry are combined with the actual required H-LEN
   value (bits 5 to 7) to form the 16-bit Type field.

   For example, the decimal value 256 has been allocated to denote the
   padding Extension Header.

   o Type value 256: When a 2-byte padding Extension Header is used,
      the H-LEN is 1, resulting in a Type value with a decimal value of
      256 (as allocated), corresponding to a hexadecimal value of 0x100.

   o Type value 768: When a 6-byte padding Extension Header is used,
      the H-LEN is 3, resulting in a Type value with a decimal value of
      768, corresponding to a hexadecimal value of 0x300.

3. Updated IANA Guidance on Allocation in the ULE Next-Header Registry

   The rules for allocation were defined in Section 11 of [RFC4326].
   This document updates these rules by replacing them with the rules in
   this section:

   Allocations in the ULE Next-Header registry are to be assigned by
   IANA using the "Specification Required" policy defined in [RFC5226].
   Applications must include a reference to a specification of the Next-
   Header extension in a "permanent and readily available public
   specification" [RFC5226]. An IETF Standards Track RFC can provide
   such a reference. Other specifications are also permitted. The
   Designated Expert shall advise IANA on whether a particular
   specification constitutes a "permanent and readily available public
   specification".

3.1. ULE Next-Header Registry

   The ULE Next-Header registry allocates 0-511 decimal (0x0000-0x01FF
   hexadecimal). IANA must not allocate values greater than 511
   (decimal). For each allocated value, it also specifies the set of
   allowed H-LEN values (see [RFC4326], Section 5). The combination of
   the IANA-registered value and the H-LEN are used by ULE and GSE to
   derive a set of allowed 16-bit integer values in the range 0-1535
   (decimal). This forms the first part of the ULE Type space (see
   [RFC4326], Section 4.4.1).

   The registry is divided into two ranges:

   1. 0-255 (decimal) IANA-assigned values, indicating Mandatory
       Extension Headers (or link-dependent Type fields). [RFC4326]
       made initial assignments to this range of values in the registry,
       updated by later requests.

   2. 256-511 (decimal) IANA-assigned values, indicating Optional
       Extension Headers. The entry MUST define the need for the
       Optional Extension and the intended use. [RFC4326] made initial
       assignments to this range of values in the registry, updated by
       later requests.

3.2. Expert Review Guidelines

   The Specification Required policy also implies use of a Designated
   Expert [RFC5226]. The Designated Expert shall review a proposed
   registration for the following REQUIRED information:

   For requests in the range 0-255 (decimal) - Mandatory Extension
   Headers:

   o The value and the name associated with the Extension Header;

   o The procedure for processing the Extension Header;

   o A definition of the Extension Header and the intended use; and

   o The size of the Extension Header (by default, the entire remaining
      payload).

   For requests in the range 256-511 (decimal) - Optional Extension
   Headers:

   o The value and the name associated with the Optional Extension
      Header;

   o The procedure for processing the Extension Header;

   o A definition of the Extension Header and the intended use
      (including any extension ordering requirements); and

   o The range of allowable H-LEN values that are permitted (in the
      range 1-5).

   If the registration information does not have any of the above
   required information, the Designated Expert shall not approve the
   registration to IANA.

3.3. Reservation of Next-Header Values for Private Use

   This document reserves the range 144-159 decimal (0x80-0x8F
   hexadecimal) for Private Use [RFC5226].

   These values are not available for allocation by IANA. Appropriate
   use includes development of experimental options for which either no
   general-purpose solution was planned, insufficient operational
   experience was available to understand if a general solution is
   needed, or a more general solution is not yet mature. This use is
   not coordinated between users of these values, so the uniqueness of a
   particular value can not be guaranteed.

   Authors of specifications MUST contact IANA to request a new value to
   be allocated in the ULE Next-Header registry. An IANA-allocated
   value uniquely identifies the method. Such an allocation is REQUIRED
   for any method that is to be standardised.

4. Update to Registry Information

   IANA has recorded an additional explanatory note in the ULE Next-
   Header registry:

      The Mandatory Extension Header range in the ULE Next-Header
      registry is used to allocate integer values in the range 0-255
      (decimal). These values are used to identify Mandatory Extension
      Headers. The registered value corresponds to the 16-bit Type
      value for the Mandatory Extension Header or the specified
      protocol.

      The Optional Extension Header range in the ULE Next-Header
      registry is used to allocate integer values in the range 256-511
      (decimal). These values are used to identify Optional Extension
      Headers. The registered value corresponds to the 16-bit Type
      value that would be used for an Optional Extension Header with a
      header length (H-LEN) of 1.

   This additional note has been placed before the existing note.

5. Security Considerations

   This document does not present new security considerations.

6. IANA Considerations

   Section 3 specifies updated IANA allocation rules.

   Per Section 3.3, IANA has reserved the range 144-159 decimal
   (0x80-0x8F hexadecimal) marked it as Reserved for Private Use.

   Per Section 4, IANA has updated the ULE Next-Header registry
   information.

7. Acknowledgments

   The author acknowledges feedback from IANA, Thomas Narten, Margaret
   Wasserman, Wes Eddy, and the IETF Gen-ART team. Helpful reviews and
   comments on usage of this registry were also received from Alexander
   Adolf and Hans-Peter Lexow.

8. References

8.1. Normative References

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   [RFC4326]   Fairhurst, G. and B. Collini-Nocker, "Unidirectional
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               December 2005.

   [RFC5163]   Fairhurst, G. and B. Collini-Nocker, "Extension Formats
               for Unidirectional Lightweight Encapsulation (ULE) and the
               Generic Stream Encapsulation (GSE)", RFC 5163, April 2008.

   [RFC5226]   Narten, T. and H. Alvestrand, "Guidelines for Writing an
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8.2. Informative References

   [RFC4259]   Montpetit, M., Fairhurst, G., Clausen, H., Collini-Nocker,
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