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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.

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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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- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.
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- [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 IANA Considerations Section in RFCs", BCP 26, RFC 5226, May 2008.

### 8.2. Informative References

- [RFC4259] Montpetit, M., Fairhurst, G., Clausen, H., Collini-Nocker, B., and H. Linder, "A Framework for Transmission of IP Datagrams over MPEG-2 Networks", RFC 4259, November 2005.

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