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LISP Generic Protocol Extension
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Abstract

This document describes extending the Locator/ID Separation Protocol (LISP) Data-Plane, via changes to the LISP header, to support multi-protocol encapsulation.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on October 7, 2018.

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1. Introduction

LISP Data-Plane, as defined in in [I-D.ietf-lisp-rfc6830bis], defines an encapsulation format that carries IPv4 or IPv6 (henceforth referred to as IP) packets in a LISP header and outer UDP/IP transport.

The LISP Data-Plane header does not specify the protocol being encapsulated and therefore is currently limited to encapsulating only IP packet payloads. Other protocols, most notably VXLAN [RFC7348] (which defines a similar header format to LISP), are used to encapsulate L2 protocols such as Ethernet.

This document defines an extension for the LISP header, as defined in [I-D.ietf-lisp-rfc6830bis], to indicate the inner protocol, enabling the encapsulation of Ethernet, IP or any other desired protocol all the while ensuring compatibility with existing LISP deployments.

A flag in the LISP header, called the P-bit, is used to signal the presence of the 8-bit Next Protocol field. The Next Protocol field, when present, uses 8 bits of the field allocated to the echo-noncing and map-versioning features. The two features are still available, albeit with a reduced length of Nonce and Map-Version.

1.1. Conventions

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 RFC 2119 [RFC2119].

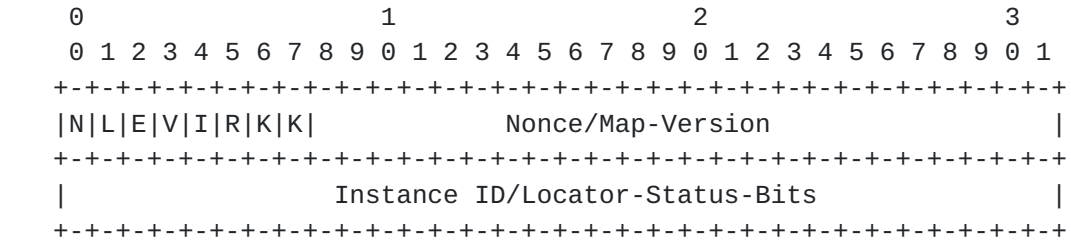
1.2. Definition of Terms

This document uses terms already defined in [I-D.ietf-lisp-rfc6830bis].

2. LISP Header Without Protocol Extensions

As described in the introduction, the LISP header has no protocol identifier that indicates the type of payload being carried. Because of this, LISP is limited to carry IP payloads.

The LISP header [I-D.ietf-lisp-rfc6830bis] contains a series of flags (some defined, some reserved), a Nonce/Map-version field and an instance ID/Locator-status-bit field. The flags provide flexibility to define how the various fields are encoded. Notably, Flag bit 5 is the last reserved bit in the LISP header.



LISP Header

3. Generic Protocol Extension for LISP (LISP-GPE)

This document defines the following changes to the LISP header in order to support multi-protocol encapsulation:

P Bit: Flag bit 5 is defined as the Next Protocol bit. The P bit MUST be set to 1 to indicate the presence of the 8 bit next protocol field.

P = 0 indicates that the payload MUST conform to LISP as defined in [I-D.ietf-lisp-rfc6830bis]. Flag bit 5 was chosen as the P bit because this flag bit is currently unallocated.

Next Protocol: The lower 8 bits of the first 32-bit word are used to carry a Next Protocol. This Next Protocol field contains the protocol of the encapsulated payload packet.

LISP uses the lower 24 bits of the first word for either a nonce, an echo-nonce, or to support map-versioning [RFC6834]. These are all optional capabilities that are indicated in the LISP header by setting the N, E, and the V bit respectively.

When the P-bit and the N-bit are set to 1, the Nonce field is the middle 16 bits.

When the P-bit and the V-bit are set to 1, the Version field is the middle 16 bits.

When the P-bit is set to 1 and the N-bit and the V-bit are both 0, the middle 16-bits are set to 0.

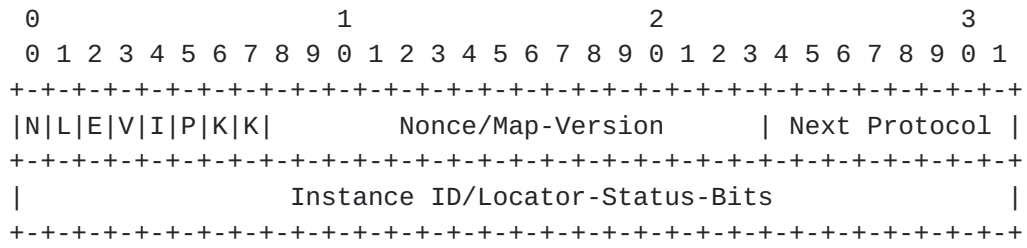
This document defines the following Next Protocol values:

0x1 : IPv4

0x2 : IPv6

0x3 : Ethernet

0x4 : Network Service Header [RFC8300]



LISP-GPE Header

4. Backward Compatibility

LISP-GPE uses the same UDP destination port (4341) allocated to LISP.

The next Section describes a method to determine the Data-Plane capabilities of a LISP ETR, based on the use of the "Multiple Data-

Planes" LCAF type defined in [RFC8060]. Other mechanisms can be used, including static xTR configuration, but are out of the scope of this document.

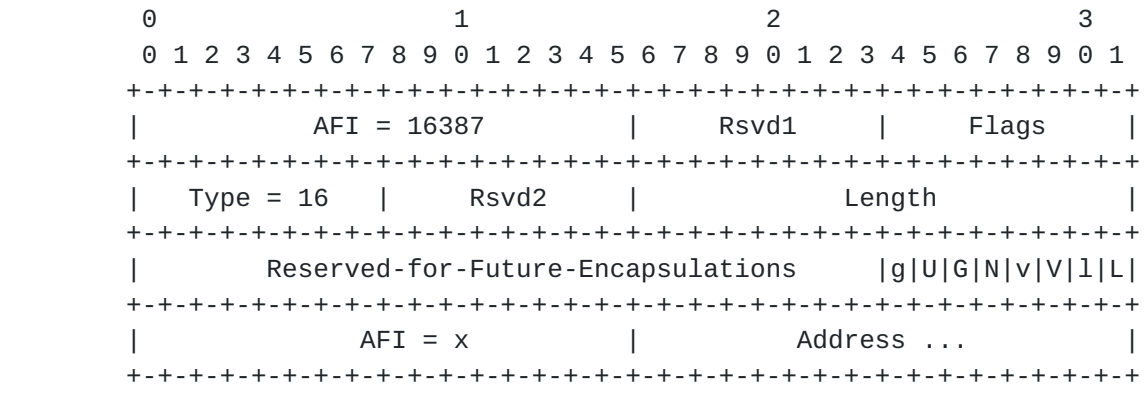
When encapsulating IP packets to a non LISP-GPE capable router the P bit MUST be set to 0.

A LISP-GPE router MUST not encapsulate non-IP packets to a non LISP-GPE capable router.

4.1. Use of "Multiple Data-Planes" LCAF to Determine ETR Capabilities

The LISP Canonical Address Format (LCAF) [RFC8060] defines the "Multiple Data-Planes" LCAF type, that can be included by an ETR in a Map-Reply to encode the encapsularion formats supported by a given RLOC. In this way an ITR can be made aware of the capability to support LISP-GPE on a given RLOC of that ETR.

The "Multiple Data-Planes" LCAF type, as defined in [RFC8060], has a Reserved-for-Future-Encapsulations 25-bit field. This document defines the least significant bit of that field as g bit (bit 24 in the third 32-bit word of the LCAF).



Multiple Data-Planes LCAF Type

g Bit: The RLOCs listed in the AFI-encoded addresses in the next longword can accept LISP-GPE (Generic Protocol Extension) encapsulation using destination UDP port 4341

All other fields: As defined in [RFC8060]

4.2. Type of Service

When a LISP-GPE router performs Ethernet encapsulation, the inner 802.1Q [IEEE8021Q] priority code point (PCP) field MAY be mapped from the encapsulated frame to the Type of Service field in the outer IPv4 header, or in the case of IPv6 the 'Traffic Class' field

4.3. VLAN Identifier (VID)

When a LISP-GPE router performs Ethernet encapsulation, the inner header 802.1Q [IEEE8021Q] VLAN Identifier (VID) MAY be mapped to, or used to determine the LISP Instance ID field.

5. IANA Considerations

IANA is requested to set up a registry of LISP-GPE "Next Protocol". These are 8-bit values. Next Protocol values in the table below are defined in this document. New values are assigned via Standards Action [RFC5226]. The protocols that are being assigned values do not themselves need to be IETF standards track protocols.

Next Protocol	Description	Reference
0	Reserved	This Document
1	IPv4	This Document
2	IPv6	This Document
3	Ethernet	This Document
4	NSH	This Document
5..255	Unassigned	

6. Security Considerations

LISP-GPE security considerations are similar to the LISP security considerations and mitigation techniques documented in [RFC7835].

With LISP-GPE, issues such as data-plane spoofing, flooding, and traffic redirection may depend on the particular protocol payload encapsulated.

7. Acknowledgements and Contributors

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8.1. Normative References

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