

LSR Working Group  
Internet-Draft  
Updates: [3563](#) [5305](#) [6232](#) [6233](#) (if  
approved)  
Intended status: Standards Track  
Expires: September 28, 2019

L. Ginsberg  
P. Wells  
Cisco Systems  
T. Li  
Arista Networks  
T. Przygienda  
S. Hegde  
Juniper Networks, Inc.  
March 27, 2019

**Invalid TLV Handling in IS-IS  
draft-ginsberg-lsr-isis-invalid-tlv-02**

Abstract

Key to the extensibility of the Intermediate System to Intermediate System (IS-IS) protocol has been the handling of unsupported and/or invalid Type/Length/Value (TLV) tuples. Although there are explicit statements in existing specifications, deployment experience has shown that there are inconsistencies in the behavior when a TLV which is disallowed in a particular Protocol Data Unit (PDU) is received.

This document discusses such cases and makes the correct behavior explicit in order to insure that interoperability is maximized.

This document when approved updates [RFC3563](#), [RFC5305](#), [RFC6232](#), and [RFC6233](#).

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [BCP 14](#) [[RFC2119](#)] [[RFC8174](#)] when, and only when, they appear in all capitals, as shown here.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <https://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on September 28, 2019.

## Copyright Notice

Copyright (c) 2019 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<https://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

## Table of Contents

<a href="#">1.</a>	Introduction . . . . .	<a href="#">2</a>
<a href="#">2.</a>	TLV Codepoints Registry . . . . .	<a href="#">3</a>
<a href="#">3.</a>	TLV Acceptance in PDUs . . . . .	<a href="#">4</a>
<a href="#">3.1.</a>	Handling of Disallowed TLVs in Received PDUs . . . . .	<a href="#">4</a>
<a href="#">3.2.</a>	Special Handling of Disallowed TLVs in Received Purges . . . . .	<a href="#">4</a>
<a href="#">3.3.</a>	Applicability to sub-TLVs . . . . .	<a href="#">5</a>
<a href="#">3.4.</a>	Correction to POI TLV Registry Entry . . . . .	<a href="#">5</a>
<a href="#">4.</a>	TLV Validation and LSP Acceptance . . . . .	<a href="#">5</a>
<a href="#">5.</a>	IANA Considerations . . . . .	<a href="#">6</a>
<a href="#">6.</a>	Security Considerations . . . . .	<a href="#">6</a>
<a href="#">7.</a>	Acknowledgements . . . . .	<a href="#">6</a>
<a href="#">8.</a>	References . . . . .	<a href="#">6</a>
<a href="#">8.1.</a>	Normative References . . . . .	<a href="#">6</a>
<a href="#">8.2.</a>	Informative References . . . . .	<a href="#">8</a>
	Authors' Addresses . . . . .	<a href="#">8</a>

## [1.](#) Introduction

The Intermediate System to Intermediate System (IS-IS) protocol utilizes Type/Length/Value (TLV) encoding for all content in the body of Protocol Data Units (PDUs). New extensions to the protocol are supported by defining new TLVs. In order to allow protocol extensions to be deployed in a backwards compatible way an implementation is required to ignore TLVs that it does not



understand. This behavior is also applied to sub-TLVs, which are contained within TLVs.

A corollary to ignoring unknown TLVs is having the validation of PDUs be independent from the validation of the TLVs contained in the PDU. PDUs which are valid MUST be accepted even if an individual TLV contained within that PDU is invalid in some way.

These behaviors are specified in existing protocol documents - principally [[ISO10589](#)] and [[RFC5305](#)]. In addition, the set of TLVs (and sub-TLVs) which are allowed in each PDU type is documented in the TLV Codepoints Registry ( <https://www.iana.org/assignments/isis-tlv-codepoints/isis-tlv-codepoints.xhtml> ) established by [[RFC3563](#)] and updated by [[RFC6233](#)] and [[RFC7356](#)].

This document is intended to clarify some aspects of existing specifications and thereby reduce the occurrence of non-conformant behavior seen in real world deployments. Although behaviors specified in existing protocol specifications are not changed, the clarifications contained in this document serve as updates to [RFC 3563](#) (see [Section 2](#)), [RFC 5304](#), and [RFC 6233](#) (see [Section 3](#)).

## **2. TLV Codepoints Registry**

[RFC3563] established the IANA managed IS-IS TLV Codepoints Registry for recording assigned TLV code points [[TLV CODEPOINTS](#)]. The initial contents of this registry were based on [[RFC3359](#)].

The registry includes a set of columns indicating in which PDU types a given TLV is allowed:

IIH - TLV is allowed in Intermediate System to Intermediate System Hello (IIH) PDUs (Point-to-point and LAN)

LSP - TLV is allowed in Link State PDUs (LSP)

SNP - TLV is allowed in Sequence Number PDUs (SNP) (Partial Sequence Number PDUs (PSNP) and Complete Sequence Number PDUS (CSNP))

Purge - TLV is allowed in LSP Purges [[RFC6233](#)]

If "Y" is entered in a column it means the TLV is allowed in the corresponding PDU type.

If "N" is entered in a column it means the TLV is NOT allowed in the corresponding PDU type.



### **3. TLV Acceptance in PDUs**

This section describes the correct behavior when a PDU is received which contains a TLV which is specified as disallowed in the TLV Codepoints Registry.

#### **3.1. Handling of Disallowed TLVs in Received PDUs**

[ISO10589] defines the behavior required when a PDU is received containing a TLV which is "not recognised". It states (see Sections 9.3 - 9.13):

"Any codes in a received PDU that are not recognised shall be ignored."

This is the model to be followed when a TLV is received which is disallowed. Therefore TLVs in a PDU which are disallowed MUST be ignored and MUST NOT cause the PDU itself to be rejected by the receiving IS.

#### **3.2. Special Handling of Disallowed TLVs in Received Purges**

When purging LSPs [ISO10589] recommends (but does not require) the body of the LSP (i.e., all TLVs) be removed before generating the purge. LSP purges which have TLVs in the body are accepted though any TLVs which are present "MUST" be ignored.

When cryptographic authentication [RFC5304] was introduced, this looseness when processing received purges had to be addressed in order to prevent attackers from being able to initiate a purge without having access to the authentication key. [RFC5304] therefore imposed strict requirements on what TLVs were allowed in a purge (authentication only) and specified that:

"ISes MUST NOT accept purges that contain TLVs other than the authentication TLV".

This behavior was extended by [RFC6232] which introduced the Purge Originator Identification (POI) TLV and [RFC6233] which added the "Purge" column to the TLV Codepoints registry to identify all the TLVs which are allowed in purges.

The behavior specified in [RFC5304] is not backwards compatible with the behavior defined by [ISO10589] and therefore can only be safely enabled when all nodes support cryptographic authentication. Similarly, the extensions defined by [RFC6233] are not compatible with the behavior defined in [RFC5304], therefore can only be safely enabled when all nodes support the extensions.



It is recommended that implementations provide controls for the enablement of behaviors that are not backward compatible.

### **3.3. Applicability to sub-TLVs**

[RFC5305] introduced sub-TLVs, which are TLV tuples advertised within the body of a parent TLV. Registries associated with sub-TLVs are associated with the TLV Codepoints Registry and specify in which TLVs a given sub-TLV is allowed. As with TLVs, it is required that sub-TLVs which are disallowed MUST be ignored on receipt.

### **3.4. Correction to POI TLV Registry Entry**

An error was introduced by [RFC6232] when specifying in which PDUs the POI TLV is allowed. [Section 3 of \[RFC6232\]](#) stated:

"The POI TLV SHOULD be found in all purges and MUST NOT be found in LSPs with a non-zero Remaining Lifetime."

However, the IANA section of the same document stated:

"The additional values for this TLV should be IIH:n, LSP:y, SNP:n, and Purge:y. "

The correct setting for "LSP" is "n". This document corrects that error.

## **4. TLV Validation and LSP Acceptance**

The correct format of a TLV and its associated sub-TLVs if applicable are defined in the document(s) which introduce each codepoint. The definition SHOULD include what action to take when the format/content of the TLV does not conform to the specification (e.g., "MUST be ignored on receipt"). When making use of the information encoded in a given TLV (or sub-TLV) receiving nodes MUST verify that the TLV conforms to the standard definition. This includes cases where the length of a TLV/sub-TLV is incorrect and/or cases where the value field does not conform to the defined restrictions.

However, the unit of flooding for the IS-IS Update process is an LSP. The presence of a TLV (or sub-TLV) with content which does not conform to the relevant specification MUST NOT cause the LSP itself to be rejected. Failure to follow this requirement will result in inconsistent LSP Databases on different nodes in the network which will compromise the correct operation of the protocol.





LSP Acceptance rules are specified in [[IS010589](#)] . Acceptance rules for LSP purges are extended by [[RFC5304](#)] [[RFC5310](#)] and further extended by [[RFC6233](#)].

[IS010589] also specifies the behavior when an LSP is not accepted. This behavior is NOT altered by extensions to the LSP Acceptance rules i.e., regardless of the reason for the rejection of an LSP the Update process on the receiving router takes the same action.

## **5. IANA Considerations**

IANA is requested to update the TLV Codepoints Registry to reference this document.

IANA is also requested to modify the entry for the POI TLV in the TLV Codepoints Registry to be:

IIH:n, LSP:n, SNP:n, and Purge:y.

## **6. Security Considerations**

As this document makes no changes to the protocol there are no new security issues introduced.

The clarifications discussed in this document are intended to make it less likely that implementations will incorrectly process received LSPs, thereby also making it less likely that a bad actor could exploit a faulty implementaion.

Security concerns for IS-IS are discussed in [[IS010589](#)], [[RFC5304](#)], and [[RFC5310](#)].

## **7. Acknowledgements**

The authors would like to thank Alvaro Retana.

## **8. References**

### **[8.1.](#) Normative References**

- [IS010589]  
International Organization for Standardization,  
"Intermediate system to Intermediate system intra-domain  
routeing information exchange protocol for use in  
conjunction with the protocol for providing the  
connectionless-mode Network Service (ISO 8473)", ISO/  
IEC 10589:2002, Second Edition, Nov 2002.



- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.
- [RFC3563] Zinin, A., "Cooperative Agreement Between the ISOC/IETF and ISO/IEC Joint Technical Committee 1/Sub Committee 6 (JTC1/SC6) on IS-IS Routing Protocol Development", [RFC 3563](#), DOI 10.17487/RFC3563, July 2003, <<https://www.rfc-editor.org/info/rfc3563>>.
- [RFC5304] Li, T. and R. Atkinson, "IS-IS Cryptographic Authentication", [RFC 5304](#), DOI 10.17487/RFC5304, October 2008, <<https://www.rfc-editor.org/info/rfc5304>>.
- [RFC5305] Li, T. and H. Smit, "IS-IS Extensions for Traffic Engineering", [RFC 5305](#), DOI 10.17487/RFC5305, October 2008, <<https://www.rfc-editor.org/info/rfc5305>>.
- [RFC5310] Bhatia, M., Manral, V., Li, T., Atkinson, R., White, R., and M. Fanto, "IS-IS Generic Cryptographic Authentication", [RFC 5310](#), DOI 10.17487/RFC5310, February 2009, <<https://www.rfc-editor.org/info/rfc5310>>.
- [RFC6232] Wei, F., Qin, Y., Li, Z., Li, T., and J. Dong, "Purge Originator Identification TLV for IS-IS", [RFC 6232](#), DOI 10.17487/RFC6232, May 2011, <<https://www.rfc-editor.org/info/rfc6232>>.
- [RFC6233] Li, T. and L. Ginsberg, "IS-IS Registry Extension for Purges", [RFC 6233](#), DOI 10.17487/RFC6233, May 2011, <<https://www.rfc-editor.org/info/rfc6233>>.
- [RFC7356] Ginsberg, L., Previdi, S., and Y. Yang, "IS-IS Flooding Scope Link State PDUs (LSPs)", [RFC 7356](#), DOI 10.17487/RFC7356, September 2014, <<https://www.rfc-editor.org/info/rfc7356>>.
- [RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in [RFC 2119](#) Key Words", [BCP 14](#), [RFC 8174](#), DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.
- [TLV\_CODEPOINTS] IANA, "IS-IS TLV Codepoints web page (<https://www.iana.org/assignments/isis-tlv-codepoints/isis-tlv-codepoints.xhtml>)".



## **8.2.   Informative References**

[RFC3359] Przygienda, T., "Reserved Type, Length and Value (TLV) Codepoints in Intermediate System to Intermediate System", [RFC 3359](#), DOI 10.17487/RFC3359, August 2002, <<https://www.rfc-editor.org/info/rfc3359>>.

### Authors' Addresses

Les Ginsberg  
Cisco Systems

Email: [ginsberg@cisco.com](mailto:ginsberg@cisco.com)

Paul Wells  
Cisco Systems

Email: [pauwells@cisco.com](mailto:pauwells@cisco.com)

Tony Li  
Arista Networks  
5453 Great America Parkway  
Santa Clara, California 95054  
USA

Email: [tony.li@tony.li](mailto:tony.li@tony.li)

Tony Przygienda  
Juniper Networks, Inc.  
1194 N. Matilda Ave  
Sunnyvale, California 94089  
USA

Email: [prz@juniper.net](mailto:prz@juniper.net)

Shraddha Hegde  
Juniper Networks, Inc.  
Embassy Business Park  
Bangalore, KA 560093  
India

Email: [shraddha@juniper.net](mailto:shraddha@juniper.net)

