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Extensions to IS-IS for Layer-2 Systems

Abstract

This document specifies the Intermediate System to Intermediate System (IS-IS) extensions necessary to support link state routing for any protocols running directly over Layer-2. While supporting this concept involves several pieces, this document only describes extensions to IS-IS. Furthermore, the Type, Length, Value pairs (TLVs) described in this document are generic Layer-2 additions, and specific ones as needed are defined in the IS-IS technology-specific extensions. We leave it to the systems using these IS-IS extensions to explain how the information carried in IS-IS is used.

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/rfc6165.

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1. Overview

There are a number of systems (for example, [RBRIDGES], [802.1aq], and [OTV]) that use Layer-2 addresses carried in a link state routing protocol, specifically Intermediate System to Intermediate System [IS-IS] [RFC1195], to provide true Layer-2 routing. In almost all the technologies mentioned above, classical Layer-2 packets are encapsulated with an outer header. The outer header format varies across all these technologies. This outer header is used to route the encapsulated packets to their destination.

Each Intermediate System (IS) advertises one or more IS-IS Link State Protocol Data Units (PDUs) with routing information. Each Link State PDU (LSP) is composed of a fixed header and a number of tuples, each consisting of a Type, a Length, and a Value. Such tuples are

commonly known as TLVs. In this document, we specify a set of TLVs to be added to [IS-IS] PDUs, to support these proposed systems. The TLVs are generic Layer-2 additions, and specific ones, as needed, are defined in the IS-IS technology-specific extensions. This document does not propose any new forwarding mechanisms using this additional information carried within IS-IS.

1.1. Terminology

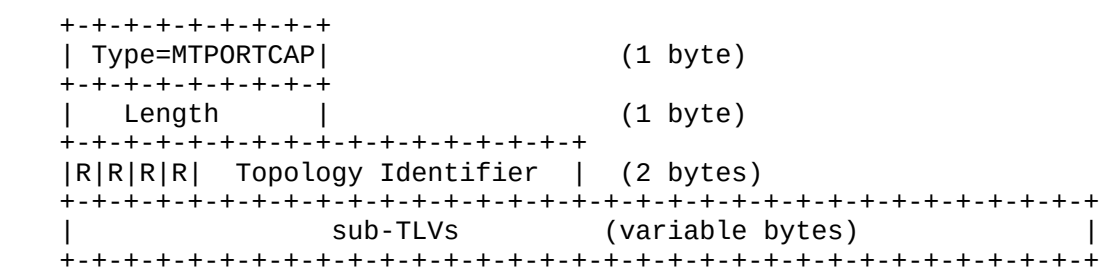
The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

2. TLV Enhancements to IS-IS

This section specifies the enhancements for the TLVs that are needed in common by Layer-2 technologies.

2.1. Multi-Topology-Aware Port Capability TLV

The Multi-Topology-aware Port Capability (MT-PORT-CAP) is IS-IS TLV type 143 and has the following format:

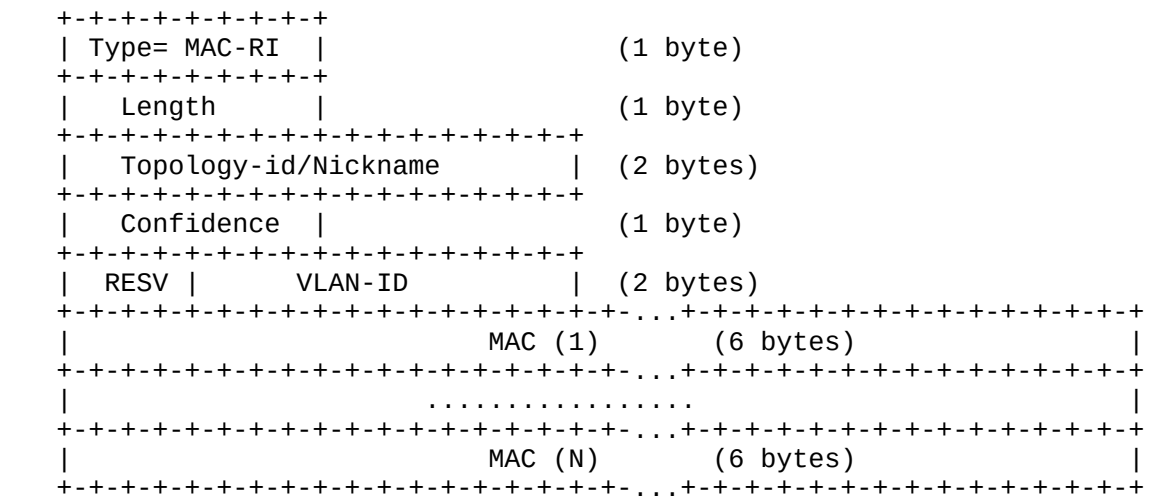


- Type: TLV Type, set to MT-PORT-CAP TLV 143.
- Length: Total number of bytes contained in the value field, including the length of the sub-TLVs carried in this TLV.
- R: Reserved 4 bits, MUST be sent as zero and ignored on receipt.
- Topology Identifier: MT ID is a 12-bit field containing the MT ID of the topology being announced. This field when set to zero implies that it is being used to carry base topology information.
- Sub-TLVs: The MT-PORT-CAP TLV value contains sub-TLVs formatted as described in [RFC5305]. They are defined in the technology-specific documents.

The MT-PORT-CAP TLV may occur multiple times and is carried within an IS-IS Hello (IIH) PDU.

2.2. The MAC-Reachability TLV

The MAC-Reachability (MAC-RI) TLV is IS-IS TLV type 147 and has the following format:



- Type: TLV Type, set to 147 (MAC-RI).

- Length: Total number of bytes contained in the value field given by 5 + 6*n bytes.

- Topology-id/Nickname : Depending on the technology in which it is used, this carries the topology-id or nickname. When this field is set to zero, this implies that the Media Access Control (MAC) addresses are reachable across all topologies or across all nicknames of the originating IS.

- Confidence: This carries an 8-bit quantity indicating the confidence level in the MAC addresses being transported. Whether this field is used, and its semantics if used, are further defined by the specific protocol using Layer-2 IS-IS. If not used, it MUST be set to zero on transmission and be ignored on receipt.

- RESV: (4 bits) MUST be sent as zero and ignored on receipt.

- VLAN-ID: This carries a 12-bit VLAN identifier that is valid for all subsequent MAC addresses in this TLV, or the value zero if no VLAN is specified.

- MAC(i): This is the 48-bit MAC address reachable from the IS that is announcing this TLV.

The MAC-RI TLV is carried in a standard Link State PDU (LSP). This TLV can be carried multiple times in an LSP and in multiple LSPs. It MUST contain only unicast addresses. The manner in which these TLVs are generated by the various Layer-2 routing technologies and the manner in which they are consumed are detailed in the technology-specific documents.

In most of the technologies, these MAC-RI TLVs will translate to populating the hardware with these entries and with appropriate next-hop information as derived from the advertising IS.

3. Acknowledgements

The authors would like to thank Peter Ashwood-Smith, Donald E. Eastlake 3rd, Dino Farinacci, Don Fedyk, Les Ginsberg, Radia Perlman, Mike Shand, and Russ White for their useful comments.

4. Security Considerations

This document adds no additional security risks to IS-IS, nor does it provide any additional security for IS-IS.

5. IANA Considerations

This document specifies the definition of a set of new IS-IS TLVs -- the Port-Capability TLV (type 143) and the MAC-Reachability TLV (type 147). They are listed in the IS-IS TLV codepoint registry.

	IIH	LSP	SNP
MT-Port-Cap-TLV (143)	X	-	-
MAC-RI TLV (147)	-	X	-

6. References

6.1. Normative References

[IS-IS] ISO/IEC 10589:2002, Second Edition, "Intermediate System to Intermediate System Intra-Domain Routing Information Exchange Protocol for use in Conjunction with the Protocol for Providing the Connectionless-mode Network Service (ISO 8473)", 2002.

[RFC1195] Callon, R., "Use of OSI IS-IS for routing in TCP/IP and dual environments", RFC 1195, December 1990.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC5305] Li, T. and H. Smit, "IS-IS Extensions for Traffic Engineering", RFC 5305, October 2008.

6.2. Informative References

[802.1aq] "Standard for Local and Metropolitan Area Networks / Virtual Bridged Local Area Networks / Amendment 8: Shortest Path Bridging, Draft IEEE P802.1aq/D1.5", 2008.

[OTV] Grover, H., Rao, D., and D. Farinacci, "Overlay Transport Virtualization", Work in Progress, October 2010.

[RBRIDGES] Perlman, R., Eastlake 3rd, D., Dutt, D., Gai, S., and A. Ghanwani, "RBridges: Base Protocol Specification", Work in Progress, March 2010.

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