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IS-IS over IPv6
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Abstract

In this draft, a method to transmit IS-IS PDUs as IPv6 packets is described. While the default encapsulation of IS-IS is specified directly on top of the link-layer, making it necessary for IS-IS to be specified for each link-layer it should be used on, the proposed method allows for IS-IS to run on any link-layers supporting IPv6.

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 January 4, 2016.

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1. Introduction

The original specification of IS-IS [ISO.10589.2002] defines that PDUs are transmitted directly on the link-layer. With this design comes the problem that specification work is required each time a new link-layer should be supported by IS-IS. By transmitting IS-IS PDUs as IPv6 packets, this specification work can be avoided and any link-layer supporting IPv6 can be used. Among other things, this allows to route IPv6 with IS-IS [RFC5308] on any link supporting IPv6.

This specification does not make changes to the general operation of IS-IS and any existing mechanisms should be kept as-is. The only change made by this draft is the format of IS-IS PDUs on the wire.

1.1. Requirements Language

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. Transmitting IS-IS PDUs over IPv6

2.1. Addressing

Link-local IPv6 addresses are used to transmit and receive IS-IS PDUs. Routers SHALL set the source address of transmitted the PDUs to the link-local address of the outgoing interface.

IPv6 link-local multicast is used as destination for the packets. The PDUs that would be sent to ALL-L1-IS when sending them directly on top of the link-layer MUST be sent to the IPv6 multicast group <TBD1> instead. Respectively, PDUs that would be sent to ALL-L2-IS MUST be sent to the multicast group <TBD2>.

2.2. IPv6 header

The packets SHOULD be transmitted with type of service set to Internetwork control.

2.3. Packet format

To transmit IS-IS PDUs over IPv6, they are encapsulated as IPv6 payload without any transport layer protocol. For that purpose, protocol number 124 is used. That number was assigned by IANA for IS-IS over IPv4. [I-D.ietf-isis-wg-over-ip] The PDUs are transmitted as IPv6 payload starting at the NLPI.

3. Considerations for using IS-IS over IPv6

3.1. SNPA

Using the ethernet MAC address as SNPA on LAN links is not practical for this application since the goal of this extension is to become independent from specific link-layer properties.

While the IS-IS over IPv4 draft constructs the SNPA by padding the IPv4 address, we are facing the issue that an IPv6 address will not fit into a standard sized SNPA.

There are multiple options to address this, so this is still TBD.

Option a) Treat the whole 16 byte of the IPv6 address as SNPA. Since the SNPA is only used internally to each router and not put into any IS-IS PDUs, no protocol datastructures need to be modified for this, but implemenations need to deal with this new SNPA length internally.

Option b) Convert the 64-bit interface identifier of the IPv6 link-local address of nodes back to an EUI48 format by using bytes 8 through 10 and bytes 13 through 15 of a nodes IPv6 address and flipping bit 0x02 in the first byte.

This is not an ideal solution since SNPA conflicts may arrise on link layers that use other methods for generation of interface identifiers or for manually configured addresses.

3.2. MTU

All transmitted IPv6 packets SHALL have a maximum size of 1280 bytes. This allows for the protocol to run on any link supporting IPv6. Fragmentation SHALL not be used, therefore the lsp-mtu may have to be adjusted for the LSPs to fit into 1280 byte packets.

Hello PDUs SHOULD be padded so that the total packet size is 1280 bytes.

4. Acknowledgements

There has been previous work to specify operation of IS-IS over IPv4 [I-D.ietf-isis-wg-over-ip] which has been used as a reference for this work.

5. IANA Considerations

For this protocol, IANA should assign two IPv6 multicast group IDs <TBD1> and <TBD2> in the IPv6 Multicast Address Space Registry. [RFC3307]

6. Security Considerations

Routers implementing this encapsulation of IS-IS over IPv6 can be susceptible to receiving and processing IS-IS over IPv6 packets that have not been originated by a router that is on-link. For example, someone with malicious intent could send IS-IS over IPv6 packets to a global unicast address of a router via multiple hops.

For this reason, routers implementing IS-IS over IPv6 SHOULD verify that both source and destination of received packets are link-local.

7. References

7.1. Normative References

[ISO.10589.2002]
International Organization for Standardization, "Intermediate system to intermediate system intra-domain-routing routine information exchange protocol for use in conjunction with the protocol for providing the connectionless-mode Network Service (ISO 8473)", ISO Standard 10589, 2002.

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

[RFC5308] Hopps, C., "Routing IPv6 with IS-IS", RFC 5308, October 2008.

7.2. Informative References

[I-D.ietf-isis-wg-over-ip]
Przygienda, T., Patel, A., and A. Bansal, "IS-IS over IPv4", draft-ietf-isis-wg-over-ip-02 (work in progress), October 1999.

[RFC3307] Haberman, B., "Allocation Guidelines for IPv6 Multicast Addresses", RFC 3307, August 2002.

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