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IS-IS Point-to-Multipoint operation
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Abstract

   This document describes a new mode operation for IS-IS. In addition
   to the existing LAN and point-to-point modes of operation, a point-
   to-multipoint mode is defined. This mode is useful for operation
   both on networks with more than two routers where multicast is
   expensive in comparison to unicast, as well on networks where
   creating a LAN pseudonode cannot adequately reflect metrics.

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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   material or to cite them other than as "work in progress."

   This Internet-Draft will expire on October 19, 2016.

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1. Introduction

   The core functionality of the protocol outlined in this document
   consists of an additional Subnetwork dependent function per Section 8
   of ISO/IEC 10589:2002 [IS-IS]. In that regard, the next section can
   be understood as new section "8.5 Point-to-multipoint networks".

   The outlined protocol is remotely similar to the derelict section
   "8.3 ISO 8208 subnetworks" [X.25] in that multiple point-to-point
   adjacencies are established on an interface.

   Point-to-multipoint operation of IS-IS is thus not a new idea; in
   fact section 6.2 already mentions "multipoint links." This document
   re-enables the concept.

2. Point-To-Multipoint Pseudocircuits

In place of ISO 8473 call management [CLNS] establishing sessions, this document establishes pairwise "pseudocircuits" between two IS on a common medium. Multiple such pseudocircuits can normally exist on one P2MP (Point-To-Multipoint) interface.

Each pseudocircuit operates, aside from subnetwork attachment procedures, exactly as a P2P (Point-to-Point) link.

It should be noted that while the Multicast autodiscovery mechanism requires broadcast capability, no other part of the protocol does. The P2MP interface type can be used on non-transitive and/or non-broadcast interfaces.

2.1. Pseudocircuit behaviour

An implementation maintains a set of pseudocircuits per P2MP interface. Each pseudocircuit is uniquely identified by the local interface and peer's SNPA address.

Each participating system MUST use a consistent SNPA address per local interface. A change in SNPA address results in all neighbors treating the interface as distinct from the previous one. A system MAY support multiple SNPA addresses per interface by treating them as distinct interfaces.

Unnumbered media are not supported by this protocol. Each participant on a link MUST have an unique SNPA address on that link.

2.1.1. Representation in LSPs

Pseudocircuits are represented in LSPs as a regular P2P circuit would be. As a result, their treatment in SPF calculations is also identical to P2P circuits.

2.1.2. Forwarding

In scenarios where pseudocircuits do not form a full mesh of all participants on a medium, the best path for a packet may be through the same interface as the one it was received on.

Systems implementing this specification MUST therefore support forwarding packets on the same interface that they were received on. This applies only to interfaces configured for P2MP operation.

2.2. Neighbor IS discovery

The discovery machinery produces as output a "candidate neighbor list," which is a list of possible neighbor's SNPAs and is maintained per P2MP interface. Adding and removing entries to the candidate neighbor list results in pseudocircuit creation and deletion.

A neighbors presence on the candidate list may be supported by multiple sources. These sources are described in the following sections

The IS-IS implementation SHOULD provide user configuration to disable or filter individual sources.

2.2.1. Manual configuration

A list of neighbor IS MAY be configured by the user, providing possible neighbor's SNPAs on an interface.

2.2.2. Lower layer autodiscovery

Lower protocol layers (VPLS, IEEE 802.11) may be able to provide a list of attached neighbors. This list MAY be fed into the candidate neighbor list.

2.2.3. Multicast autodiscovery

For broadcast capable networks, this document defines an autodiscovery mechanism based on multicasting Hello packets. This mechanism MAY be disabled by the user, but MUST be implemented for all lower layer link types with (limited or full) broadcast capability.

A multicast autodiscovery packet is defined as a P2P IIH which is multicast over the LAN media as defined in [RFC5309]. Additionally it must include a Three-Way Adjacency TLV as defined in [RFC5303] indicating the circuit is in the DOWN state (i.e., 1 octet of value indicating the DOWN state). Receiving such a Hello places the sending IS on the candidate list for as long as the PDU's holdtime indicates.

A system MAY implement a receive-only passive multicast autodiscovery mode where it adds candidates (forms pseudocircuits) on receiving autodiscovery PDU, but does not send such PDUs itself.

If either passive or full multicast autodiscovery is enabled, receiving a unicast autodiscovery PDU also adds the neighbor to the candidate list.

2.3. Adjacency formation

Since there may be no underlying protocol layer partitioning the link
into actual P2P circuits in this case, additional handling is
required on bringing up the individual pseudocircuit adjacencies.

To prevent different pseudocircuits from "bleeding" into each other,
implementations of this protocol MUST enable [RFC5303] on all P2MP
pseudocircuits, with changes as follows:

o Received IIH PDUs on P2MP pseudocircuits without the Point-to-
   Point Three-Way Adjacency option MUST be discarded.

2.4. Pseudocircuit teardown

Pseudocircuits are destroyed when their P2P state machine has
transitioned into "Down" state and they are no longer supported as a
candidate by any discovery mechanism.

As long as a pseudocircuit is present, its P2P state machine will, as
expected for P2P circuits, trigger transmission of further Hello
PDUs, even when it is in Down state.

3. Configuration model

TODO: YANG model

4. Security Considerations

TODO.

5. Privacy Considerations

TODO.

6. Acknowledgements

Acknowledge Les Ginsberg for pointing out that P2P Hellos rather than
LAN hellos could and should be used.

7. Change Log

April 2016 [-02]: (no changes/keepalive)

October 2015 [-01]: Moved from new P2MP Hello PDU to using existing
   P2P PDU.

July 2015 [-00]: Initial Version

8. References

8.1. Normative References

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

[RFC5303]   Katz, D., Saluja, R., and D. Eastlake, "Three-Way
            Handshake for IS-IS Point-to-Point Adjacencies", RFC 5303,
            October 2008.

[RFC5309]   Shen, N., Ed. and A. Zinin, Ed., "Point-to-Point Operation
            over LAN in Link State Routing Protocols", RFC 5309, DOI
            10.17487/RFC5309, October 2008,
            <http://www.rfc-editor.org/info/rfc5309>.

8.2. Informative References

[CLNS]   ISO/IEC, "Protocol for providing the connectionless-mode
            network service: Protocol specification", ISO/IEC
            8473-1:1998, 1998.

[RFC7176]   Eastlake, D., Senevirathne, T., Ghanwani, A., Dutt, D.,
            and A. Banerjee, "Transparent Interconnection of Lots of
            Links (TRILL) Use of IS-IS", RFC 7176, May 2014.

[RFC7356]   Ginsberg, L., Previdi, S., and Y. Yang, "IS-IS Flooding
            Scope Link State PDUs (LSPs)", RFC 7356, September 2014.

[X.25]   ISO/IEC, "X.25 Packet Layer Protocol for Data Terminal
            Equipment", ISO/IEC 8208:2000, 2000.

Appendix A. Misconfiguration With P2P over LAN

TODO.

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