IS-IS Multi-Flooding Instances
draft-wang-lsr-isis-mfi-00

Abstract

   This document proposes a new IS-IS flooding mechanism which separates
   multiple flooding instances for dissemination of routing information
   and other types of application-specific information to minimizes the
   impact of non-routing information flooding on the routing convergence
   and stability. Due to different flooding information has different
   requirements on the flooding rate, these multi-flooding instances
   should be given various priorities and flooding parameters. An
   encoding format for IS-IS Multi-Flooding Instance Identifier (MFI-ID)
   TLV and Update Process are specified in this document.

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].

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1. Introduction

[ISO10589] specifies the IS-IS protocol, in which each Intermediate
System (IS) (router) advertises one or more IS-IS Link State Protocol
Data Units (LSPs) with routing topology and Traffic Engineering (TE)
information. As the one-octet LSP Number field, there are limited
256 numbers of LSPs that may be assigned. However, with the
increasing amount of Topology information and TE information proposed
to be advertised, for example, advertisement of Virtual Transport
Networks (VTN) Topology, VTN Resource and VTN specific Data Plane
Identifiers [I-D.dong-lsr-sr-enhanced-vpn], there will be huge
consumption of LSPs. In addition, with the increasing use the same
mechanism for advertisement of application-specific information,
therefore, a mechanism should be defined for advertisement of
application-specific information that minimizes the impact on the
operation of the IS-IS protocol.

This document proposes a new IS-IS flooding mechanism which separates
multiple flooding instances for dissemination of routing information
and other types of application-specific information in a single IS-IS
protocol instance. This document therefore defines an encoding
format for IS-IS Multi-Flooding Instances Identifier (MFIs-ID) TLV
and MFIs Update Process.

For dissemination of generic information (GENINFO) not directly
related to the operation of the IS-IS protocol within the domain,
[RFC6823] defines a GENINFO TLV aand specifies that the advertisement
of GENINFO must occur in a non-zero instance of IS-IS protocol as
defined in [RFC8202] for minimizing the impact of advertisement of
GENINFO on the operation of routing. This document also recommends
the use of GENINFO TLV in a specific MFI for advertisement of GENINFO
in the zero IS-IS instance, which can isolate the impact of non-
routing information on the standard IS-IS operation.

Instead of using non-zero IS-IS instances, the advertisement of non-
routing information in MFIs is implemented in the zero IS-IS
instance, which simplifies the deployment. MFIs mechanism has a
lower cost to maintain neighbor because that all the MFIs share the
standard IS-IS instance neighbor. In addition, MFIs can be
configured with customized MFIs-specific flooding parameters
(including the retransmission interval, refresh timer, maximum age,
etc.).

Similarly, OSPF Multi-Flooding Instances will be proposed in the
future work.

2. IS-IS Multi-Flooding Instances

An existing protocol limitation is that a given IS-IS instance in a
single level supports a single update process operating on a single
Link State Database (LSDB). This document defines an extension to
IS-IS to allow one standard instance of the protocol to support
multiple update process operations. This extension is referred to as
"IS-IS Multi-Flooding Instances" (IS-IS MFIs).

Each update process is associated with a unique MFI. The behavior of
the standard update process is not changed in any way by the
extensions defined in this document. MFI-specific prioritization for
processing PDUs and MFI-specific flooding parameters should be
defined so as to allow different MFIs to consume network-wide
resources at different rates. The use of MFIs can enhance the
ability to isolate the resources associated with the standard update
process and other application-specific update process.

2.1. Multi-Flooding Instance Identifier

   A Multi-Flooding Instance Identifier (MFI-ID) is introduced to
   uniquely identify an IS-IS Multi-Flooding Instance and the associated
   update process. The protocol extension includes a new TLV (i.e.
   MFI-ID TLV) in each IS-IS PDU originated by an Intermediate System.
   It is recommended that the MFI-ID TLV be the first TLV in the PDU,
   which allows determination of the association of a PDU with a
   particular MFI more quickly. Each IS-IS PDU is associated with only
   one IS-IS MFI.

   The MFI-ID TLV is carried in Link State PDUs (LSPs) and Sequence
   Number PDUs (SNPs). MFI-IDs MUST be unique within the same routing
   domain. The following format is used for the MFI-ID TLV:

```
                                     No. of octets
      +---------------+---------------+
      |     Type      |    Length     |      2
      +---------------+---------------+
      |           MFI-ID              |      2
      +-------------------------------+
```

   MFI-ID#0 is reserved for the routing flooding instance supported by
   legacy systems. IS-IS LSPs and SNPs do not carry the MFI-ID TLV,
   which indicates these PDUs are associated with the routing flooding
   instance in the zero IS-IS instance.

2.2. Update Process Operation

   In this document, MFIs can be created in a single IS-IS instance.
   Different application information can be advertised to all the other
   Intermediate systems in the corresponding MFI.

   The Update Process in an Intermediate system shall generate one or
   more new Link State PDUs. Each Level 1/Level 2 Link State PDU
   associated with a specific MFI carries application information
   belonging to the specific MFI. And Level 1/Level 2 PSNP and Level 1/
   Level 2 CSNP containing information about LSPs that transmitted in a
   specific MFI are generated to synchronize the LSDB corresponding to
   the specific MFI.

   In each MFI, update parameters can be customized differently. As
   specified in [ISO10589], parameters include the LSP MaxAge, LSP
   Refresh time, LSP retransmission interval, Maximum LSP Generation
   interval, Minimum LSP Generation interval, Minimum LSP transmission
   interval, PSNP sending interval, and CSNP sending interval. Note
   that besides of different update parameters, any other elements in
   these MFI-specific Update Process are same as the standard IS-IS

   Update Process including Input and Output, Event driven LSP
   Generation, action on receipt of a link state PDU, etc.

2.3. Interoperability Considerations

   In the scenario where some routers that do not support MFI are
   deployed in the same routing domain, it is recommended that all MFIs
   in an IS-IS protocol instance share one LSP Number space. The total
   number of LSPs in all MFIs cannot exceed 256. This implementation
   mode of MFI can coexist with routers that do not support MFI. If
   routers that do not support MFI receive the LSPs and SNPs encoding
   MFI-ID TLV, then routers SHOULD ignore the MFI-ID TLV and continues
   processing other TLVs.

   In the scenario where all routers in the entire routing domain
   support MFI, it is recommended that each MFI can has its separate LSP
   Number space. Each MFI can have a maximum of 256 LSPs. Both LSP ID
   and MFI are used to uniquely identify an LSP.

   Note that the MFI mechanism does not affect neighbor relationship
   establishment, shortest-path-first (SPF) algorithm and TE routing
   calculation, but only affects IS-IS LSDB synchronization.

3. IS-IS Non-routing MFIs Omission of Routing Calculation

   IS-IS standard routing related TLVs and TE related extended TLVs, for
   example, IS Neighbors TLV and IP Reachability, are not included in
   Non-routing Multi-flooding Instances.

4. Applicability of IS-IS Multi-Flooding Instances

   In addition to IS-IS route flooding, more and more application
   information and node capabilities that are not directly related to
   IS-IS operations need to be advertised in the entire routing domain
   through the IS-IS flooding mechanism. For example, the advertisement
   of supported In-situ Flow Information Telemetry (IFIT) capabilities
   at node and/or link granularity [I-D.wang-lsr-igp-extensions-ifit].

5. IANA Considerations

   IANA is requested to allocate values for the following new TLV.

```
                 +------+-------------+
                 | Type | Description |
                 +------+-------------+
                 | TBA  | MFI-ID TLV  |
                 +------+-------------+
```

6. Security Considerations

   It does not introduce any new security risks to IS-IS.

7. Acknowledgements

   TBD

8. References

8.1. Normative References

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8.2. Informative References

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   [RFC8202]   "IS-IS Multi-Instance",
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