              OSPF Link-Local Signaling (LLS) Extensions for
                     Local Interface ID Advertisement

Abstract

   Every OSPF interface is assigned an Interface ID that uniquely
   identifies the interface on the router. In some cases, it is useful
   to know the assigned Interface ID on the remote side of the adjacency
   (Remote Interface ID).

   This document describes the extensions to OSPF link-local signaling
   (LLS) to advertise the Local Interface ID.

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1. Introduction

   Every OSPF interface is assigned an Interface ID that uniquely
   identifies the interface on the router. [RFC2328] uses this
   Interface ID in the Router Link State Advertisement (Router-LSA) Link
   Data for unnumbered links and uses the value of the MIB-II ifIndex
   [RFC2863]. [RFC4203] refers to these Interface IDs as the Link
   Local/Remote Identifiers and defines a way to advertise and use them
   for GMPLS purposes. [RFC8379] defines a way to advertise Local/
   Remote Interface IDs in the OSPFv2 Extended Link Opaque LSA.

   There is a known OSPFv2 protocol problem in verifying the
   bidirectional connectivity with parallel unnumbered links. If there
   are two parallel unnumbered links between a pair of routers and each
   link is only advertised from a single direction, such two
   unidirectional parallel links could be considered as a valid single
   bidirectional link during the OSPF route computation on some other
   router. If each link is advertised with both its Local and Remote
   Interface IDs, the advertisement of each link from both sides of
   adjacency can be verified by cross-checking the Local and Remote
   Interface IDs of both advertisements.

   From the perspective of the advertising router, the Local Interface
   ID is a known value. However, the Remote Interface ID needs to be
   learned before it can be advertised. [RFC4203] suggests using the TE
   Link Local LSA [RFC3630] to communicate the Local Interface ID to
   neighbors on the link. Though such a mechanism works, it has some
   drawbacks.

   This document proposes an extension to OSPF link-local signaling
   (LLS) [RFC5613] to advertise the Local Interface ID.

1.1. Interface ID Exchange Using Link Local TE Opaque LSA

   Usage of the Link Local TE Opaque LSA to propagate the Local
   Interface ID to the neighbors on the link is described in [RFC4203].
   This mechanism has the following problems:

   o LSAs can only be flooded over an existing adjacency that is in
      Exchange state or greater. The adjacency state machine progresses
      independently on each side of the adjacency and, as such, may
      reach the Full state on one side before the Link Local TE Opaque
      LSA arrives. The consequence of this is that the link can be
      initially advertised without the Remote Interface ID. Later, when
      the Link Local TE Opaque LSA arrives, the link must be advertised
      again but this time with the valid Remote Interface ID.
      Implementations may choose to wait before advertising the link,
      but there is no guarantee that the neighbor will ever advertise
      the Link Local TE Opaque LSA with the Interface ID. In summary,
      the existing mechanism does not guarantee that the Remote
      Interface ID is known at the time the link is advertised.

   o The Link Local TE Opaque LSA is defined for MPLS Traffic
      Engineering, but the knowledge of the Remote Interface ID is
      useful also for cases where MPLS TE is not used. One example is
      the mentioned lack of a valid 2-way connectivity check for
      parallel point-to-point links between OSPF routers.

1.2. 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.

2. Interface ID Exchange Using OSPF LLS

   To address the problems described earlier and to allow the Interface
   ID exchange to be part of the neighbor discovery process, we propose
   to extend OSPF link-local signaling to advertise the Local Interface
   ID in OSPF Hello and Database Description (DD) packets.

2.1. Local Interface ID TLV

   The Local Interface ID TLV is an LLS TLV. It has the following
   format:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|             Type              |            Length             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                      Local Interface ID                       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
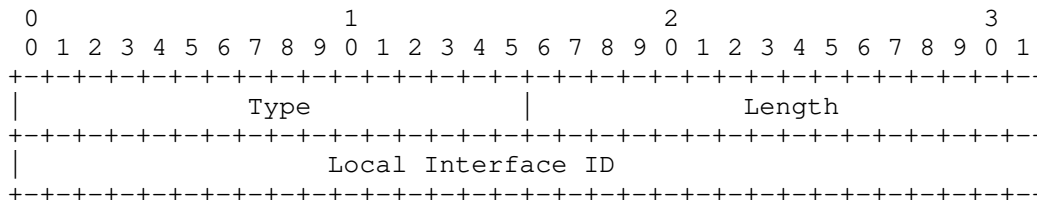
      Type: 18

      Length: 4 octets

      Local Interface ID: The value of the Local Interface ID.

   Local Interface ID TLV signaling using LLS is applicable to all OSPF
   interface types other than virtual links.

3. Backward Compatibility with RFC 4203

   If the Local Interface ID signaling via the Link Local TE Opaque LSA
   is supported in addition to the new LLS mechanism, implementations
   that support Local Interface ID signaling using LLS MUST prefer the
   Local Interface ID value received through LLS over the value received
   through the Link Local TE Opaque LSA if both are received from the
   same OSPF router.

   Implementations that support Local Interface ID signaling via the
   Link Local TE Opaque LSA MAY continue to do so to ensure backward
   compatibility. If they also support Local Interface ID signaling
   using LLS as described in the document, they MUST signal the same
   Local Interface ID via both mechanisms.

   During the rare conditions in which the Local Interface ID changes, a
   timing interval may exist where the received values of the Local
   Interface ID advertised through LLS and the Link Local TE Opaque LSA
   may differ. Such a situation is temporary, and received values via
   both mechanisms should become equal as soon as the next Hello and/or
   Link Local TE Opaque LSA is regenerated by the originator.

4. IANA Considerations

   IANA has allocated the following code point in the "Link Local
   Signalling TLV Identifiers (LLS Types)" subregistry of the "Open
   Shortest Path First (OSPF) Link Local Signalling (LLS) - Type/Length/
   Value Identifiers (TLV)" registry.

   18 - Local Interface ID TLV

5. Security Considerations

   The security considerations for "OSPF Link-Local Signaling" [RFC5613]
   also apply to the Local Interface ID TLV described in this document.
   The current usage of a neighbor's Local Interface ID is to
   disambiguate parallel links between OSPF routers. Hence,
   modification of the advertised Local Interface ID TLV may result in
   the wrong neighbor Interface ID being advertised in the OSPFv2
   Extended Link Opaque LSA [RFC7684] and could prevent the link from
   being used. If authentication is being used in the OSPF routing
   domain [RFC5709][RFC7474], then the Cryptographic Authentication TLV
   [RFC5613] SHOULD also be used to protect the contents of the LLS
   block.

   Receiving a malformed LLS Local Interface ID TLV MUST NOT result in a
   hard router or OSPF process failure. The reception of malformed LLS
   TLVs or sub-TLVs SHOULD be logged, but such logging MUST be rate-
   limited to prevent denial-of-service (DoS) attacks.

   The Interface ID is assigned by the advertising OSPF router as a
   locally unique identifier and need not be unique in any broader
   context; it is not expected to contain any information about the
   device owner or traffic transiting the device, so there are no
   privacy concerns associated with its advertisement.

6. References

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