BGP Link-State Extensions for Seamless BFD
draft-ietf-idr-bgp-ls-sbfd-extensions-00

Abstract

   Seamless Bidirectional Forwarding Detection (S-BFD) defines a
   simplified mechanism to use Bidirectional Forwarding Detection (BFD)
   with large portions of negotiation aspects eliminated, thus providing
   benefits such as quick provisioning as well as improved control and
   flexibility to network nodes initiating the path monitoring. The
   link-state routing protocols (IS-IS and OSPF) have been extended to
   advertise the Seamless BFD (S-BFD) Discriminators.

   This draft defines extensions to the BGP Link-state address-family to
   carry the S-BFD Discriminators information via BGP.

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.

Status of This Memo

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1. Introduction

Seamless Bidirectional Forwarding Detection (S-BFD) [RFC7880] defines
a simplified mechanism to use Bidirectional Forwarding Detection
(BFD) [RFC5880] with large portions of negotiation aspects
eliminated, thus providing benefits such as quick provisioning as
well as improved control and flexibility to network nodes initiating
the path monitoring.

For monitoring of a service path end-to-end via S-BFD, the headend/
initiator node needs to know the S-BFD Discriminator of the
destination/tail-end node of that service. The link-state routing
protocols (IS-IS, OSPF and OSPFv3) have been extended to advertise
the S-BFD Discriminators. With this a initiator node can learn the
S-BFD discriminator for all nodes within its IGP area/level or
optionally within the domain. With networks being divided into
multiple IGP domains for scaling and operational considerations, the
service endpoints that require end to end S-BFD monitoring often span
across IGP domains.

BGP Link-State (BGP-LS) [RFC7752] enables the collection and
distribution of IGP link-state topology information via BGP sessions
across IGP areas/levels and domains. The S-BFD discriminator(s) of a
node can thus be distributed along with the topology information via
BGP-LS across IGP domains and even across multiple Autonomous Systems
(AS) within an administrative domain.

This draft defines extensions to BGP-LS for carrying the S-BFD
Discriminators information.

2. Terminology

This memo makes use of the terms defined in [RFC7880].

3. Problem and Requirement

Seamless MPLS [I-D.ietf-mpls-seamless-mpls] extends the core domain
and integrates aggregation and access domains into a single MPLS
domain. In a large network, the core and aggregation networks can be
organized as different ASes. Although the core and aggregation
networks are segmented into different ASes, an E2E LSP can be created
using hierarchical BGP signaled LSPs based on iBGP labeled unicast
within each AS, and eBGP labeled unicast to extend the LSP across AS
boundaries. This provides a seamless MPLS transport connectivity for
any two service end-points across the entire domain. In order to
detect failures for such end to end services and trigger faster
protection and/or re-routing, S-BFD MAY be used for the Service Layer
(e.g. for MPLS VPNs, PW, etc.) or the Transport Layer monitoring.
This brings up the need for setting up S-BFD session spanning across
AS domains.

In a similar Segment Routing (SR) [RFC8402] multi-domain network, an
end to end SR Policy [I-D.ietf-spring-segment-routing-policy] path
may be provisioned between service end-points across domains either
via local provisioning or by a controller or signalled from a Path
Computation Engine (PCE). Monitoring using S-BFD can similarly be
setup for such a SR Policy.

Extending the automatic discovery of S-BFD discriminators of nodes
from within the IGP domain to across the administrative domain using
BGP-LS enables setting up of S-BFD sessions on demand across IGP
domains. The S-BFD discriminators for service end point nodes MAY be
learnt by the PCE or a controller via the BGP-LS feed that it gets
from across IGP domains and it can signal or provision the remote
S-BFD discriminator on the initiator node on demand when S-BFD
monitoring is required. The mechanisms for the signaling of the
S-BFD discriminator from the PCE/controller to the initiator node and
setup of the S-BFD session is outside the scope of this document.

Additionally, the service end-points themselves MAY also learn the
S-BFD discriminator of the remote nodes themselves by receiving the
BGP-LS feed via a route reflector (RR) or a centralized BGP Speaker
that is consolidating the topology information across the domains.
The initiator node can then itself setup the S-BFD session to the
remote node without a controller/PCE assistance.

While this document takes examples of MPLS and SR paths, the S-BFD
discriminator advertisement mechanism is applicable for any S-BFD
use-case in general.

4. BGP-LS Extensions for S-BFD Discriminator

The BGP-LS [RFC7752] specifies the Node NLRI for advertisement of
nodes and their attributes using the BGP-LS Attribute. The S-BFD
discriminators of a node are considered as its node level attribute
and advertised as such.

This document defines a new BGP-LS Attribute TLV called the S-BFD
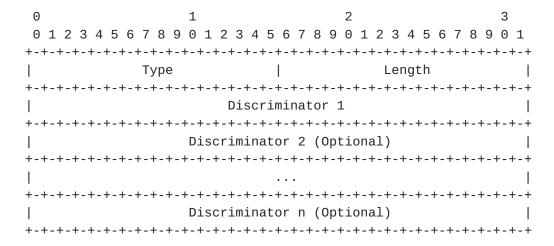Discriminators TLV and its format is as follows:

```
 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            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       Discriminator 1                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  Discriminator 2 (Optional)                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             ...                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  Discriminator n (Optional)                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Figure 1: S-BFD Discriminators TLV

where:

o Type: TBD (see IANA Considerations Section 5)

o Length: variable. Minimum of 8 octets and increments of 4 octets
   there on for each additional discriminator

o Discriminators : multiples of 4 octets, each carrying a S-BFD
   local discriminator value of the node. At least one discriminator
   MUST be included in the TLV.

The S-BFD Discriminators TLV can only be added to the BGP-LS
Attribute associated with the Node NLRI that originates the
corresponding underlying IGP TLV/sub-TLV as described below. This
information is derived from the protocol specific advertisements as
below..

o IS-IS, as defined by the S-BFD Discriminators sub-TLV in
   [RFC7883].

o OSPFv2/OSPFv3, as defined by the S-BFD Discriminators TLV in
   [RFC7884].

When the node is not running any of the IGPs but running a protocol
like BGP, then the locally provisioned S-BFD discriminators of the
node MAY be originated as part of the BGP-LS attribute within the
Node NLRI corresponding to the local node.

5. IANA Considerations

This document requests assigning code-points from the registry "BGP-
LS Node Descriptor, Link Descriptor, Prefix Descriptor, and Attribute
TLVs" based on table below. The column "IS-IS TLV/Sub-TLV" defined
in the registry does not require any value and should be left empty.

```
+---------------+-------------------------+----------+
| Code Point    | Description             | Length   |
+---------------+-------------------------+----------+
|      TBD      | S-BFD Discriminators TLV | variable |
+---------------+-------------------------+----------+
```

6. Manageability Considerations

This section is structured as recommended in [RFC5706].

The new protocol extensions introduced in this document augment the
existing IGP topology information that was distributed via [RFC7752].
Procedures and protocol extensions defined in this document do not
affect the BGP protocol operations and management other than as
discussed in the Manageability Considerations section of [RFC7752].
Specifically, the malformed NLRIs attribute tests in the Fault
Management section of [RFC7752] now encompass the new TLVs for the
BGP-LS NLRI in this document.

6.1. Operational Considerations

No additional operation considerations are defined in this document.

6.2. Management Considerations

No additional management considerations are defined in this document.

7. Security Considerations

The new protocol extensions introduced in this document augment the
existing IGP topology information that was distributed via [RFC7752].
Procedures and protocol extensions defined in this document do not
affect the BGP security model other than as discussed in the Security
Considerations section of [RFC7752]. More specifically the aspects
related to limiting the nodes and consumers with which the topology
information is shared via BGP-LS to trusted entities within an
administrative domain.

Advertising the S-BFD Discriminators via BGP-LS makes it possible for
attackers to initiate S-BFD sessions using the advertised

information. The vulnerabilities this poses and how to mitigate them
are discussed in [RFC7752].

8. Acknowledgements

The authors would like to thank Nan Wu for his contributions to this
work.

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Authors' Addresses

   Zhenbin Li
   Huawei
   Huawei Bld., No.156 Beiqing Rd.
   Beijing 100095
   China

   Email: lizhenbin@huawei.com

   Shunwan Zhuang
   Huawei
   Huawei Bld., No.156 Beiqing Rd.
   Beijing 100095
   China

   Email: zhuangshunwan@huawei.com

Ketan Talaulikar
Cisco Systems
India

Email: ketant@cisco.com

Sam Aldrin
Google, Inc

Email: aldrin.ietf@gmail.com

Jeff Tantsura
Apstra

Email: jefftant.ietf@gmail.com

Greg Mirsky
ZTE Corp.

Email: gregimirsky@gmail.com