Inter-Domain Routing   P. Sarkar, Ed.
Internet-Draft   H. Gredler
Intended status: Standards Track   Individual Contributor
Expires: November 14, 2016   S. Litkowski
                                                               Orange
                                                          May 13, 2016

        Advertising Node Admin Tags in BGP Link-State Advertisements
           draft-psarkar-idr-bgp-ls-node-admin-tag-extension-04

Abstract

   This document describes the protocol extensions to collect node
   administrative tags adevertised in IGP Link State advertisements and
   disseminate the same in BGP Link-State advertisement protocol, to
   facilitate inter-AS TE applications that may need the same node
   administrative tags to associate a subset of network devices spanning
   across more than one AS with a specific functionality.

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].

Status of This Memo

Copyright Notice

Table of Contents

1. Introduction

   Advertising Node Administrative Tags in Link State protocols like IS-
   IS [I-D.ietf-isis-node-admin-tag] and OSPF
   [I-D.ietf-ospf-node-admin-tag] allows adding an optional operational
   capability, that allows tagging and grouping of the nodes in a IGP
   domain. This, among other applications, allows simple management and
   easy control over route and path selection, based on local configured
   policies. However node administrative tags advertised in IGP
   advertisements let network operators associate nodes within a single
   AS (if not a single area). This limits the use of such node
   administrative tags and applications that need to associate a subset
   of network devices spanning across multiple AS with a specific
   functionality cannot use them.

   To address the need for applications that require visibility into
   LSDB across IGP areas, or even across ASes, the BGP-LS address-

family/sub-address-family have been defined that allows BGP to carry
LSDB information. The BGP Network Layer Reachability Information
(NLRI) encoding format for BGP-LS and a new BGP Path Attribute called
BGP-LS attribute are defined in [I-D.ietf-idr-ls-distribution]. The
identifying key of each LSDB object, namely a node, a link or a
prefix, is encoded in the NLRI and the properties of the object are
encoded in the BGP-LS attribute. Figure 1 describes a typical
deployment scenario. In each IGP area, one or more nodes are
configured with BGP-LS. These BGP speakers form an IBGP mesh by
connecting to one or more route-reflectors. This way, all BGP
speakers - specifically the route-reflectors - obtain LSDB
information from all IGP areas (and from other ASes from EBGP peers).
An external component connects to the route-reflector to obtain this
information (perhaps moderated by a policy regarding what information
is sent to the external component, and what information isn't).

```
                        +------------+
                        |  Consumer  |
                        +------------+
                              ^
                              |
                              v
            +--------------------+
            |    BGP Speaker     |          +-----------+
            |  (Route-Reflector) |          |  Consumer |
            +--------------------+          +-----------+
                  ^     ^     ^                   ^
                  |     |     |                   |
          +---------------+   |   +------------------+   |
          |               |   |   |                  |   |
          v               v                       v   v
    +-----------+   +-----------+           +-----------+
    |    BGP    |   |    BGP    |           |    BGP    |
    |  Speaker  |   |  Speaker  |    . . .  |  Speaker  |
    +-----------+   +-----------+           +-----------+
          ^               ^                       ^
          |               |                       |
         IGP             IGP                     IGP
```
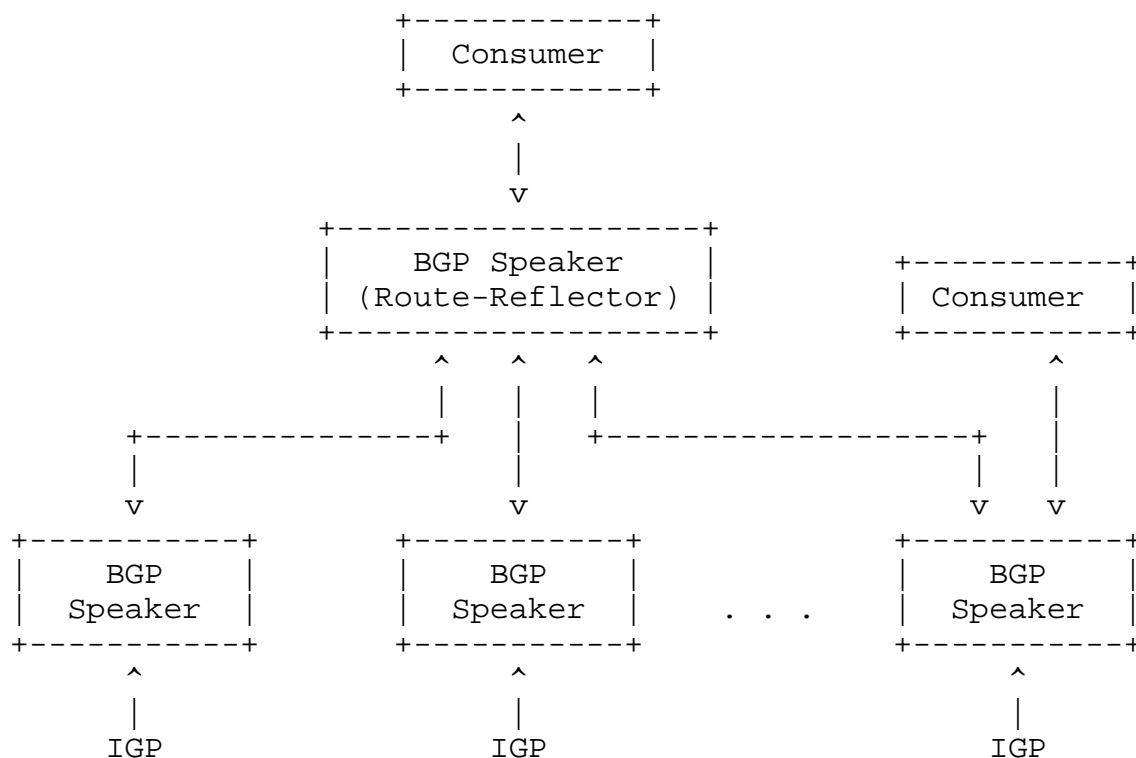
Figure 1: Link State info collection

For the purpose of advertising node administrative tags within BGP
Link-State advertisements, a new Node Attribute TLV to be carried in
the corresponding BGP-LS Node NLRI is proposed. For more details on
the Node Attribute TLVs please refer to section 3.3.1 in
[I-D.ietf-idr-ls-distribution]

2. Per-Node Administrative Tag

   An administrative Tag is a 32-bit integer value that can be used to
   identify a group of nodes in the entire routing domain. The new sub-
   TLV specifies one or more administrative tag values. A BGP Link-
   State speaker that also participates in the IGP link state
   advertisements exchange may learn one or more node administrative
   tags advertised by another router in the same IGP domain. Such BGP-
   LS speaker shall encode the same set of node administrative tags in
   the corresponding Node Attribute TLV representing the network device
   that originated the node administrative tags.

   The node administrative tags advertised in IGP link state
   advertisements will have either per-area(or levels in IS-IS)scope or
   'global' scope. Operator may choose to a set of node administrative
   tags across areas (or levels in IS-IS) and another advertise set of
   node administrative tags within the specific area (or level). But
   evidently two areas within the same AS or two different may use the
   same node administrative tag for different purposes. In such case
   applications will need to distinguish between the per-area(or level)
   scoped administrative tags originated from a specific node against
   those originated from the same node with 'global' scope.

   A BGP-LS router in a given AS while copying the node administrative
   tags learnt from IGP link-state advertisements, MUST also copy the
   scope associated with the node administrative tags. Refer to
   Section 3.1 for how to encode the associated scope of a node
   administrative tags as well.

   To be able to distinguish between the significance of a per-area(or
   level) administrative tag learnt in one area, from that advertised in
   another area, or another AS, any applications receiving such a BGP-LS
   advertisements MUST consider the scope associated with each node
   administrative tag with 'per-area (or per-level) along with the
   area(or level in IS-IS) associated with corresponding IGP link state
   advertisement and the AS number associated with the originating node.
   The area(or level) associated with corresponding IGP link state
   advertisement and the AS number associated with the originating node
   can be derived from appropriate node attributes (already defined in
   BGP-LS [I-D.ietf-idr-ls-distribution]) attached with the
   corresponding Node NLRI.

3. BGP-LS Extensions for Per-Node Administrative Tags

   The BGP-LS NLRI can be a node NLRI, a link NLRI or a prefix NLRI.
   The corresponding BGP-LS attribute is a node attribute, a link
   attribute or a prefix attribute. BGP-LS
   [I-D.ietf-idr-ls-distribution] defines the TLVs that map link-state

information to BGP-LS NLRI and BGP-LS attribute. This document adds
an new Node Attribute TLV called 'Node Admin Tag TLV' to encode node
administrative tags information.

[I-D.ietf-isis-node-admin-tag] defines the 'Node Admin Tag' sub-TLV
in the Router Capability TLV (type 242) in IS-IS Link State PDUs to
encode node administrative tags. Similarly
[I-D.ietf-isis-node-admin-tag] defines the 'Node Administrative Tag'
TLV in OSPF Router Information LSAs to encode node administrative
tags in OSPF Link State update packets. The node administrative tags
TLVs learnt from the IGP link state advertisements of a specific node
will all be inserted in a new Node Admin Tag TLV and added to the
corresponding Node are mapped to the corresponding BGP-LS Node NLRI.
Node administrative tags from IGP advertisements are mapped to the
corresponding Node Admin Tag TLV in the following way.

TLV Code Point	Description	Length	IS-IS TLV /sub-TLV	OSPF LSA/TLV
TBD	Node Admin Tag TLV	Variable	242/TBD [1]	RI-LSA/TBD [2]

Table 1: Node Admin Tag TLV Mapping from IGP

3.1. Node Admin Tag TLV

The new Node Administrative Tag TLV, like other BGP-LS Node Attribute
TLVs, is formatted as Type/Length/Value (TLV)triplets. Figure 2
below shows the format of the new TLV.

```
   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             |
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
  |            Flags              |
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
  |                     Administrative Tag #1                     |
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
  |                     Administrative Tag #2                     |
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
  //                                                             //
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
  |                     Administrative Tag #N                     |
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

   Type : A 2-octet field specifiying code-point of the new
           TLV type. Code-point: TBA (suggested 1040)

   Length: A 2-octet field that indicates the length of the value
           portion in octets and will be a multiple of 4 octets
           dependent on the number of tags advertised.

   Value: A 2-octet 'Flags' field, followed by a sequence of multiple
           4 octets defining the administrative tags.

   Flags: A 2-octet field that carries flags associated with
          all the administrative flags encoded in this TLV.
          Following is the format of this field.

```
              0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
             +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
             |L|             Reserved        |
             +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

          The following bit flags are defined:

          L bit : If the L bit is set (1), it signifies that
                  all administrative flags encoded in this
                  TLV has per-area(or level in IS-IS) scope,
                  and should not be mixed with ones with same
                  value but with 'global' scope (L bit reset
                  to 0).

           Figure 2: BGP Link-State Node Administrative Tag TLV

This new type of 'Node Admin Tag' TLVs can ONLY be added to the Node
Attribute associated with the Node NLRI that originates the
corresponding node administrative tags in IGP domain.

All the node administrative tags with 'per-area' (or per-level)
scope, originated by a single node in IGP domain SHALL be re-
originated in a single 'Node Admin Tag' TLV and inserted in the Node
NLRI generated for the same node. Similarly, all the node
administrative tags with 'global' scope originated by the same node
in IGP domain SHALL be re-originated in another 'Node Admin Tag' TLV
and inserted in the same Node NLRI generated for the originating
node. Multiple instances of a TLV may be generated by the BGP-lS
router for a given node in the IGP domain. This MAY happen if the
original node's link state advertisement carries more than 16383 node
administrative groups and a single TLV does not provide sufficient
space. As such multiple occurence of the 'Node Admin Tag' TLVs under
a single BGP LS NLRI is cumulative.

While copying node administrative tags from IGP link-state
advertisements to corresponding BGP-LS advertisements, the said BGP-
LS speaker MAY run all the node administrative flags through a
locally configured policy that selects which ones should be exported
and which ones not. And then the node administrative tag is copied
to the BGP-LS advertisement if it is permitted to do so by the said
policy.

4. Elements of Procedure

   Meaning of the Node administrative tags is generally opaque to BGP
   Link-State protocol. Router advertising the node administrative tag
   (or tags) may be configured to do so without knowing (or even
   explicitly supporting) functionality implied by the tag.

   Interpretation of tag values is specific to the administrative domain
   of a particular network operator. The meaning of a node
   administrative tag is defined by the network local policy and is
   controlled via the configuration. However multiple administrative
   domain owners may agree on a common meaning implied by a
   administrative tag for mutual benefit.

   The semantics of the tag order has no meaning. There is no implied
   meaning to the ordering of the tags that indicates a certain
   operation or set of operations that need to be performed based on the
   ordering.

   Each tag SHOULD be treated as an independent identifier that MAY be
   used in policy to perform a policy action. Node administrative tags
   carried by the Node Admin Tag TLV SHOULD be used to indicate a

independent characteristics of the node in IGP domain that originated
it. The TLV SHOULD be considered as an unordered list. Whilst
policies may be implemented based on the presence of multiple tags
(e.g., if tag A AND tag B are present), they MUST NOT be reliant upon
the order of the tags (i.e., all policies should be considered
commutative operations, such that tag A preceding or following tag B
does not change their outcome).

For more details on guidance on usage of node administrative tags
please refer to section 4 [3] in [I-D.ietf-isis-node-admin-tag].

5. Applications

   [I-D.ietf-isis-node-admin-tag] and [I-D.ietf-ospf-node-admin-tag]
   present some applications of node administrative tags.

   The policy-based Explicit routing use case can be extended to inter-
   area or inter-AS scenarios where an end to end path needs to avoid or
   include nodes that have particular properties. Following are some
   examples.

   1. Geopolitical routing : preventing traffic from country A to
       country B to cross country C. In this case, we may use node
       administrative tags to encode geographical information (country).
       Path computation will be required to take into account node
       administrative tag to permit avoidance of nodes belonging to
       country C.

   2. Legacy node avoidance : in some specific cases, it is interesting
       for service-provider to force some traffic to avoid legacy nodes
       in the network. For example, legacy nodes may not be carrier
       class (no high availability), and service provider wants to
       ensure that critical traffic only uses nodes that are providing
       high availability.

   In case of inter-AS Traffic-Engineering applications, different ASes
   SHOULD share their administrative tag policies. They MAY also need
   to agree upon some common tagging policy for specific applications.

   For more details on some possible applications with node
   administrative tags please refer to section 5 [4] in
   [I-D.ietf-isis-node-admin-tag].

6. IANA Considerations

   This document requests assigning code-points from the registry for
   BGP-LS attribute TLVs based on table Table 2.

7. Manageability Considerations

   This section is structured as recommended in [RFC5706].

7.1. Operational Considerations

7.1.1. Operations

   Existing BGP and BGP-LS operational procedures apply. No new
   operation procedures are defined in this document.

8. TLV/Sub-TLV Code Points Summary

   This section contains the global table of all TLVs/Sub-TLVs defined
   in this document.

```
+----------------+----------------+----------+
| TLV Code Point | Description    | Length   |
+----------------+----------------+----------+
|      1040      | Node Admin Tag | variable |
+----------------+----------------+----------+
```

            Table 2: Summary Table of TLV/Sub-TLV Codepoints

9. Security Considerations

   Procedures and protocol extensions defined in this document do not
   affect the BGP security model. See the 'Security Considerations'
   section of [RFC4271] for a discussion of BGP security. Also refer to
   [RFC4272] and [RFC6952] for analysis of security issues for BGP.

10. Acknowledgements

   TBD.

11. References

11.1. Normative References

   [I-D.ietf-idr-ls-distribution]
             Gredler, H., Medved, J., Previdi, S., Farrel, A., and S.
             Ray, "North-Bound Distribution of Link-State and TE
             Information using BGP", draft-ietf-idr-ls-distribution-13
             (work in progress), October 2015.

   [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate
              Requirement Levels", BCP 14, RFC 2119,
              DOI 10.17487/RFC2119, March 1997,
              <http://www.rfc-editor.org/info/rfc2119>.

   [RFC4271] Rekhter, Y., Ed., Li, T., Ed., and S. Hares, Ed., "A
              Border Gateway Protocol 4 (BGP-4)", RFC 4271,
              DOI 10.17487/RFC4271, January 2006,
              <http://www.rfc-editor.org/info/rfc4271>.

11.2. Informative References

   [I-D.ietf-isis-node-admin-tag]
              Sarkar, P., Gredler, H., Hegde, S., Litkowski, S.,
              Decraene, B., Li, Z., Aries, E., Rodriguez, R., and H.
              Raghuveer, "Advertising Per-node Admin Tags in IS-IS",
              draft-ietf-isis-node-admin-tag-00 (work in progress),
              December 2014.

   [I-D.ietf-ospf-node-admin-tag]
              Hegde, S., Raghuveer, H., Gredler, H., Shakir, R.,
              Smirnov, A., Li, Z., and B. Decraene, "Advertising per-
              node administrative tags in OSPF", draft-ietf-ospf-node-
              admin-tag-00 (work in progress), October 2014.

   [RFC4272] Murphy, S., "BGP Security Vulnerabilities Analysis",
              RFC 4272, DOI 10.17487/RFC4272, January 2006,
              <http://www.rfc-editor.org/info/rfc4272>.

   [RFC5706] Harrington, D., "Guidelines for Considering Operations and
              Management of New Protocols and Protocol Extensions",
              RFC 5706, DOI 10.17487/RFC5706, November 2009,
              <http://www.rfc-editor.org/info/rfc5706>.

   [RFC6952] Jethanandani, M., Patel, K., and L. Zheng, "Analysis of
              BGP, LDP, PCEP, and MSDP Issues According to the Keying
              and Authentication for Routing Protocols (KARP) Design
              Guide", RFC 6952, DOI 10.17487/RFC6952, May 2013,
              <http://www.rfc-editor.org/info/rfc6952>.

11.3. URIs

   [1] http://tools.ietf.org/html/draft-ietf-isis-node-admin-tag-
       00#section-3.1

   [2] http://tools.ietf.org/html/draft-ietf-ospf-node-admin-tag-
       00#section-4.1

   [3] http://tools.ietf.org/html/draft-ietf-isis-node-admin-tag-
       00#section-4

   [4] http://tools.ietf.org/html/draft-ietf-isis-node-admin-tag-
       00#section-5

Authors' Addresses

   Pushpasis Sarkar (editor)
   Individual Contributor

   Email: pushpasis.ietf@gmail.com

   Hannes Gredler
   Individual Contributor

   Email: hannes@gredler.at

   Stephane Litkowski
   Orange

   Email: stephane.litkowski@orange.com