                 Advertising Node Administrative Tags in IS-IS
                      draft-ietf-isis-node-admin-tag-11

Abstract

   This document describes an extension to the IS-IS routing protocol to
   add an optional capability that allows tagging and grouping of the
   nodes in an IS-IS domain. This allows simple management and easy
   control over route and path selection, based on local configured
   policies. This document describes an extension to the IS-IS protocol
   to advertise node administrative tags. The node administrative tags
   can be used to express and apply locally defined network policies
   which is a very useful operational capability. Node administrative
   tags may be used either by IS-IS itself or by other applications
   consuming information propagated via IS-IS.

   This document describes the protocol extensions to disseminate node
   administrative tags in IS-IS protocols.

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

   This Internet-Draft is submitted in full conformance with the
   provisions of BCP 78 and BCP 79.

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1. Introduction

   It is useful to assign a node administrative tag to a router in the
   IS-IS domain and use it as an attribute associated with the node.

The node administrative tag can be used in variety of applications, for example:

(a)   Traffic-engineering applications to provide different path-selection criteria.

(b)   Prefer or prune certain paths in Loop Free Alternate (LFA) backup selection via local policies as defined in [I-D.ietf-rtgwg-lfa-manageability].

This document provides mechanisms to advertise node administrative tags in IS-IS for various applications, including (but not limited to) route and path selection. Route and path selection functionality applies to both Traffic Engineering (TE) and non-TE applications. Hence the new sub-TLV for carrying node administrative tags is included in the Router CAPABILITY TLV [RFC4971].

2. Node Administrative Tags

An administrative tag is a 32-bit unsigned integer value that can be used to identify a group of nodes in the IS-IS domain. An IS-IS router should advertise the set of groups it is part of in the specific IS-IS level.

As an example, all edge network devices in a given network may be configured with a certain tag value, whereas all core network devices may be configured with another, different tag value.

3. Node Administrative Tag Sub-TLV

The new sub-TLV defined is carried within an IS-IS Router CAPABILITY TLV (IS-IS TLV type 242) [RFC4971] in the Link State PDUs originated by the device. Router CAPABILITY TLVs [RFC4971] can have 'level-wide' or 'domain-wide' flooding scope. The choice of flooding scope in which a specific node administrative tag shall be flooded, is purely a matter of local policy, and is defined by the needs of the operator's usage. An operator MAY choose to advertise a set of node administrative tags across levels and another different set of node administrative tags within the specific level. Alternatively, the operator may use the same node administrative tags both within the 'domain-wide' flooding scope as well as within one or more 'level-wide' flooding scope.
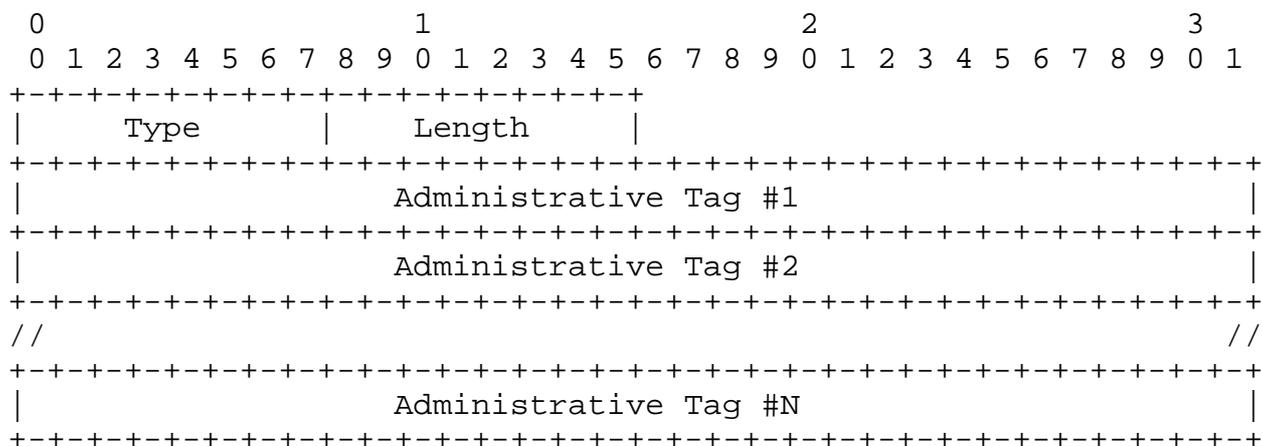
The format of the Node Administrative Tag sub-TLV (see Section 3.1) does not include a topology identifier. Therefore it is not possible to indicate a topology-specific context when advertising node administrative tags. Hence, in deployments using multi-topology

routing [RFC5120], advertising a separate set of node administrative
tags for each topology SHOULD NOT be supported.

3.1. TLV format

[RFC4971], defines Router CAPABILITY TLV which may be used to
advertise properties of the originating router. The payload of the
Router CAPABILITY TLV consists of one or more nested Type/Length/
Value (TLV) triplets.

The new Node Administrative Tag sub-TLV, like other IS-IS sub-TLVs,
is formatted as Type/Length/Value (TLV) triplets. Figure 1 below
shows the format of the new sub-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     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                     Administrative Tag #1                     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                     Administrative Tag #2                     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
//                                                             //
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                     Administrative Tag #N                     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Type : TBA, Suggested value 21

** RFC Editor** Please replace above suggested value with the IANA-assigned
value.

Length: An 8-bit 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 set of multiple 4-octets defining the node
        administrative tags.

              Figure 1: IS-IS Node Administrative Tag sub-TLV

4. Elements of Procedure

4.1. Interpretation of Node Administrative Tags

   The meaning of node administrative tags is generally opaque to IS-IS.
   A router advertising one or more node administrative tag(s) may be
   configured to do so without knowing (or even explicitly supporting)
   functionality implied by the tag. This section describes general
   rules/regulations and guidelines for using and interpreting a node
   administrative tag which will facilitate interoperable
   implementations by vendors.

   Interpretation of tag values is specific to the administrative domain
   of a particular network operator. Hence tag values SHOULD NOT be
   propagated outside the administrative domain to which they apply.
   The meaning of a node administrative tag is defined by the network
   local policy and is controlled via configuration. If a receiving
   node does not understand the tag value, it ignores the specific tag
   and floods the Router CAPABILITY TLV without any change, as defined
   in [RFC4971].

   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. Each tag carried by the
   Node Administrative Tag sub-TLVs should be used to indicate a
   characteristic of a node that is independent of the characteristics
   indicated by other administrative tags within the same or another
   instance of a Node Administrative Tag sub-TLV. The list of Node
   administrative tags carried in a Node Administrative Tag sub-TLV MUST
   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).

4.2. Use of Node Administrative Tags

   The node administrative tags are not meant to be extended by future
   IS-IS standards. New IS-IS extensions are not expected to require
   use of node administrative tags or define well-known tag values.
   Node administrative tags are for generic use and do not require IANA
   registry. Future IS-IS extensions requiring well-known values MAY
   define their own data signalling tailored to the needs of the feature
   or MAY use the capability TLV as defined in [RFC4971].

Node administrative tags are expected to be associated with a stable
attribute. In particular, node administrative tags MUST NOT be
associated with something whose state can oscillate frequently, e.g.,
the reachability of a specific destination.

While no specific limit on the number of node administrative tags
that may be advertised has been defined, it is expected that only a
modest number of tags will be required in any deployment.

4.3. Processing Node Administrative Tag Changes

Multiple Node Administrative Tag sub-TLVs MAY appear in a Router
CAPABILITY TLV or Node Administrative Tag sub-TLVs MAY be contained
in different instances of Router CAPABILITY TLVs. The node
administrative tags associated with a node that originates tags for
the purpose of any computation or processing at a receiving node
SHOULD be a superset of node administrative tags from all the TLVs in
all the instances of Router CAPABILITY TLVs received in the Link-
State PDU(s) advertised by the corresponding IS-IS router. When a
Router CAPABILITY TLV is received that changes the set of node
administrative tags applicable to any originating node, a receiving
node MUST repeat any computation or processing that makes use of node
administrative tags.

When there is a change or removal of an administrative affiliation of
a node, the node MUST re-originate the Router CAPABILITY TLV(s) with
the latest set of node administrative tags. On a receiving router,
on detecting a change in contents (or removal) of existing Node
Administrative Tag sub-TLV(s) or addition of new Node Administrative
Tag sub-TLV(s) in any instance of Router CAPABILITY TLV(s),
implementations MUST take appropriate measures to update their state
according to the changed set of node administrative tags. The exact
actions needed depend on features working with node administrative
tags and is outside of scope of this specification.

5. Applications

[RFC7777] lists several non-normative examples of how implementations
might use node administrative tags. These examples are given only to
demonstrate generic usefulness of the router tagging mechanism. An
implementation supporting this specification is not required to
implement any of the use cases. The following is a brief list of
non-normative use cases listed in [RFC7777]. Please refer to RFC7777
section 3 [1] for more details.

1. Auto-discovery of Services

2. Policy-based Fast-Re-Route (FRR)

(a)   Administrative limitation of LFA scope

        (b)   Optimizing LFA calculations

    3. Controlling Remote LFA tunnel termination

    4. Mobile back-haul network service deployment

    5. Policy-based Explicit Routing

6. Security Considerations

    Node administrative tags, like link administrative tags [RFC5305],
    can be used by operators to indicate geographical location or other
    sensitive information. The information carried in node
    administrative tags, like link administrative tags, can be leaked to
    an IGP snooper. Hence this document does not introduce any new
    security issues.

    Advertisement of tag values for one administrative domain into
    another involves the risk of misinterpretation of the tag values (if
    the two domains have assigned different meanings to the same values),
    and may have undesirable and unanticipated side effects.

    Security concerns for IS-IS are already addressed in [ISO10589],
    [RFC5304], and [RFC5310] and are applicable to the mechanisms
    described in this document. Extended authentication mechanisms
    described in [RFC5304] or [RFC5310] SHOULD be used in deployments
    where attackers have access to the physical networks and nodes
    included in the IS-IS domain are vulnerable.

7. Operational Considerations

    Operators can assign meaning to the node administrative tags which is
    local to the operator's administrative domain. The operational use
    of node administrative tags is analogical to the IS-IS prefix tags
    [RFC5130] and BGP communities [RFC1997]. Operational discipline and
    procedures followed in configuring and using BGP communities and IS-
    IS prefix tags are also applicable to the usage of node
    administrative tags.

    Defining language for local policies is outside the scope of this
    document. As in the case of other policy applications, the pruning
    policies can cause the path to be completely removed from the
    forwarding plane, and hence have the potential for more severe
    operational impact (e.g., node unreachability due to path removal) by
    comparison to preference policies that only affect path selection.

8. Manageability Considerations

   Node administrative tags are configured and managed using routing
   policy enhancements. YANG [RFC6020] is a data modeling language used
   to specify configuration data models. The IS-IS YANG data model is
   described in [I-D.ietf-isis-yang-isis-cfg] and the routing policy
   configuration model is described in [I-D.ietf-rtgwg-policy-model].
   At the time of writing this document, some work to enhance these two
   documents, to include the node administrative tag related
   configurations, is already in progress, or shall be taken up soon.

9. IANA Considerations

   This specification updates one IS-IS registry: IS-IS Router
   CAPABILITY (TLV-242) Sub-TLVs Registry

   i) Node-Admin-Tag Sub-TLV, Type: TBD, suggested value 21

   ** RFC Editor** Please replace above suggested value with the IANA-
   assigned value.

10. Contributors

   Many many thanks to Ebben Aries and Rafael Rodriguez for their help
   with reviewing and improving the text of this document. Many thanks
   to Harish Raguveer for his contributions to initial versions of the
   draft as well. Finally, many thanks to Li Zhenbin for providing some
   valuable use cases.

11. Acknowledgments

   Many thanks to Les Ginsberg, Dhruv Dhody, Uma Chunduri, and Chris
   Bowers for providing useful inputs.

12. References

12.1. Normative References

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12.3. URIs

   [1] http://tools.ietf.org/html/rfc7777#section-3

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