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Advertising Node Administrative Tags in IS-IS
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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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time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on November 4, 2016.

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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 route and path selection. Route and path selection functionality applies to both Traffic Engineering (TE) and non-TE applications. Hence the new 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

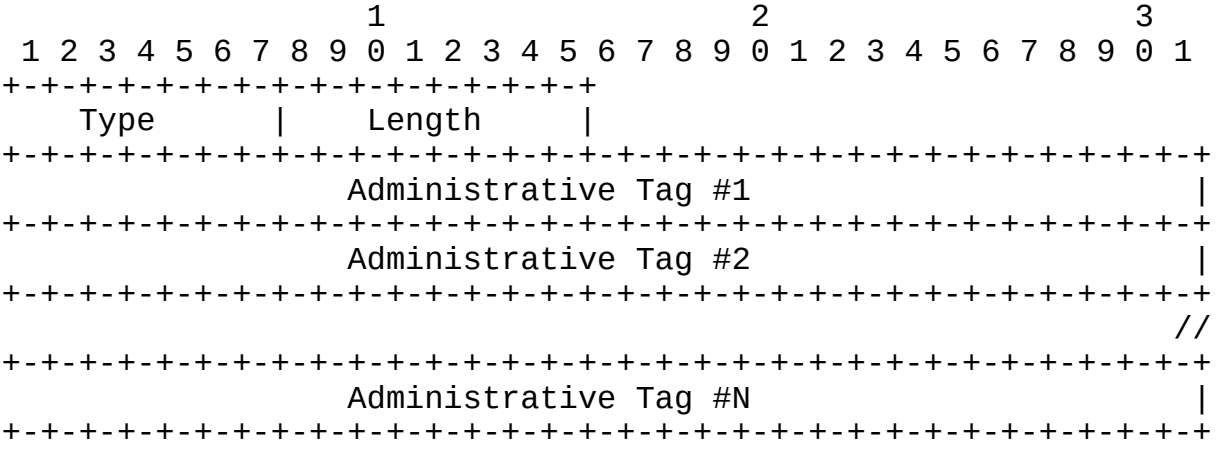
The new sub-TLV defined is carried within a IS-IS Router CAPABILITY TLV (IS-IS TLV type 242) [RFC4971] in the Link State PDUs originated by the device. Router Capablity TLVs [RFC4971] can have ’level-wide’ or ’domain-wide’ flooding scope. The choice of flooding scope in which a specific node administrative tag shall be flooded, is purely a matter of local policy, and is defined by the needs of the operator’s usage. Operator MAY choose to advertise a set of node administrative tags across levels and another diiferent 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 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.



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 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].

Being part of the Router CAPABILITY TLV, the node administrative tag sub-TLV MUST be reasonably small and stable. In particular, but not limited to, implementations supporting the node administrative tags MUST NOT associate advertised tags to changes in the network topology (both within and outside the IS-IS domain) or the reachability of routes.

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. 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 is 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. The 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].

These two documents need to be enhanced to include the node administrative tag related configurations.

9. IANA Considerations

This specification updates one IS-IS registry: IS-IS Router Capabality (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

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11. Acknowledgments

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12.3. URIs

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

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