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Expires: August 2005

February 2005

A Policy Control Mechanism in IS-IS Using Administrative Tags

<draft-ietf-isis-admin-tags-03.txt>

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Abstract

This document describes an extension to the IS-IS protocol to add operational capabilities that allow for ease of management and control over IP prefix distribution within an IS-IS domain. This document enhances the IS-IS protocol by extending the information that a Intermediate System (IS) [router] can place in Link State Protocol Data Units (LSPs) for policy use. This extension will provide operators with a mechanism to control IP prefix distribution throughout multi-level IS-IS domains. Additionally, the information can be placed in LSPs that have TLVs as yet undefined, if this information is used to convey the same meaning in these future TLVs as it is used in the currently defined TLVs.

Conventions used in this document

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.

1. Introduction

As defined in [2] and extended in [3], the IS-IS protocol may be used to distribute IPv4 prefix reachability information throughout an IS-IS domain. In addition, thanks to extensions made in [6] and [7], IS-IS may be used to distribute IPv6 reachability information.

The IPv4 prefix information is encoded as TLV type 128 and 130 in [2], with additional information carried in TLV 135 as specified in [3] and TLV 235 as defined in [6]. In particular, the extended IP Reachability TLV (TLV 135) contains support for a larger metric space, an up/down bit to indicate redistribution between different levels in the hierarchy, an IP prefix, and one or more sub-TLVs that can be used to carry specific information about the prefix. TLV 235 is a derivative of TLV 135, with the addition of Multi-Topology membership information [6]. The IPv6 prefix information is encoded as TLV 236 in [7] and TLV 237 in [6].

As of this writing no sub-TLVs have been defined; however, this draft proposes 2 new sub-TLVs for TLV 135, TLV 235, TLV 236 and TLV 237 that may be used to carry administrative information about an IP prefix.

2. Sub-TLV Additions

This draft proposes 2 new "Administrative Tag" sub-TLVs to be added to TLV 135, TLV 235, TLV 236 and TLV 237. These TLVs specify one or more ordered, 32 or 64 bit unsigned integers that may be associated with an IP prefix. Example uses of these tags include controlling redistribution between levels and areas, different routing protocols, or multiple instances of IS-IS running on the same router, or carrying BGP standard or extended communities.

The methods for which their use is employed is beyond the scope of this document and left to the implementer and/or operator.

The encoding of the sub-TLV(s) is discussed in the following subsections.

2.1. 32-bit Administrative Tag Sub-TLV 1

The Administrative Tag SHALL be encoded as one or more 4 octet unsigned integers using Sub-TLV 1 in TLV-135 [3], TLV 235 [6], TLV 236 [7] and TLV 237 [6]. The Administrative Tag Sub-TLV has following structure:

```
1 octet of type (value: 1)
1 octet of length (value: multiple of 4)
one or more instances of 4 octets of administrative tag
```

An implementation MAY consider only one of the encoded tags, in which case the first encoded tag MUST be considered. A tag value of zero is reserved and SHOULD be treated as "no tag".

2.2. 64-bit Administrative Tag Sub-TLV 2

The Administrative Tag SHALL be encoded as one or more 8 octet unsigned integers using Sub-TLV 2 in TLV-135 [3], TLV 235 [6], TLV 236 [7] and TLV 237 [6]. The 64-bit Administrative Tag Sub-TLV has following structure:

```
1 octet of type (value: 2)
1 octet of length (value: multiple of 8)
one or more instances of 8 octets of administrative tag
```


An implementation MAY consider only one of the encoded tags, in which case the first encoded tag MUST be considered. A tag value of zero is reserved and SHOULD be treated as "no tag".

3. Ordering of Tags

The semantics of the tag order are implementation-dependent. That is, there is no implied meaning to the ordering of the tags that indicates a certain operation or set of operations need be performed based on the order of the tags. Each tag SHOULD be treated as an autonomous identifier that MAY be used in policy to perform a policy action. Whether or not tag A precedes or succeeds tag B SHOULD not change the meaning of the tag set. However, an implementation MAY wish to preserve tag ordering such that an ordered set of tags has meaning to the local policy.

Each IS that receives an LSP with TLV(s) 135 and/or 235 and/or 236 and/or 237, that have associated SubTLV(s) 1 and/or 2, MAY operate on the tag values as warranted by the implementation. If an

implementation needs to change tag values, for example, at an area boundary, then the TLV(s) SHOULD be copied to the newly generated Level-1 or Level-2 LSP at which point, the contents of the SubTLV(s) MAY change as dictated by the policy action. In the event that no change is required, the SubTLV(s) SHOULD be copied in order into the new LSP, such that ordering is preserved.

4. Compliance

A compliant IS-IS implementation MUST be able to assign one tag to any IP prefix in any of the following TLVs: TLV 135, TLV 235, TLV 236, TLV 237.

A compliant IS-IS implementation MAY be able to assign more than one tag to any IP prefix in any of the following TLVs: TLV 135, TLV 235, TLV 236, TLV 237.

A compliant IS-IS implementation MAY be able to rewrite or remove one or more tags associated with a prefix in any of the following TLVs: TLV 135, TLV 235, TLV 236, TLV 237.

5. Operations

An administrator associates an Administrative Tag value with some interesting property. When IS-IS advertises reachability for some IP

prefix that has that property, it adds the Administrative Tag to the IP reachability information TLV for that prefix, and the tag "sticks" to the prefix as it is flooded throughout the routing domain.

Consider the network in figure 1. We wish to "leak" L1 prefixes [5] with some property, A, from L2 to the L1 router R1. Without policy-groups, there is no way for R2 to know property A prefixes from property B prefixes.

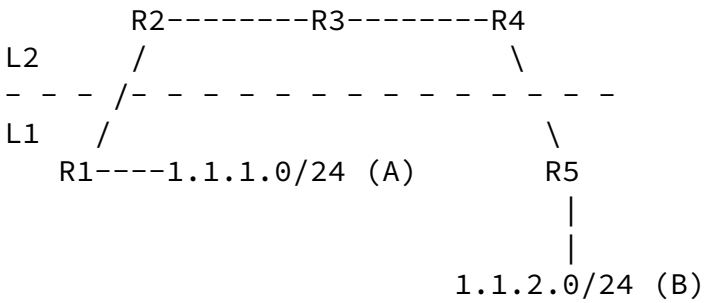

Figure 1

We associate Administrative Tag 100 with property A, and have R5 attach that value to the IP extended reachability information TLV for prefix 1.1.2.0/24. R2 has a policy in place to "match prefixes with Administrative Tag 100, and leak to L1."

The previous example is rather simplistic; it seems that it would be just as easy for R2 simply to match the prefix 1.1.2.0/24. However, if there are a large number of routers that need to apply some policy according to property A and large number of "A" prefixes, this mechanism can be quite helpful.

6. Security Considerations

This document raises no new security issues for IS-IS, as any annotations to IP prefixes should not pass outside the administrative control of the network operator of the IS-IS domain. Such an allowance would violate the spirit of Interior Gateway Protocols in general and IS-IS in particular

7. IANA Considerations

The authors have chosen "1" as the type code of the 32-bits Administrative Tag Sub-TLV and "2" as the type code of the 64-bits Administrative Tag Sub-TLV. These values must be allocated by IANA.

8. Intellectual Property Statement

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8.1. IPR Disclosure Acknowledgement

By submitting this Internet-Draft, I certify that any applicable patent or other IPR claims of which I am aware have been disclosed, and any of which I become aware will be disclosed, in accordance with RFC 3668.

9. Acknowledgments

The authors would like to thank Henk Smit for clarifying the best place to describe this new information, Tony Li and Tony Przygienda for useful comments on this draft, Danny McPherson for some much needed formatting assistance, and Mike Shand for useful discussions on encoding structure of the sub-TLV.

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