Network Working Group
Request for Comments: 5543
Category: Standards Track

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May 2009

BGP Traffic Engineering Attribute

Status of This Memo

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Abstract

This document defines a new BGP attribute, the Traffic Engineering attribute, that enables BGP to carry Traffic Engineering information.

The scope and applicability of this attribute currently excludes its use for non-VPN reachability information.

1. Introduction

In certain cases (e.g., Layer-1 VPNs (L1VPNs) [RFC5195]), it may be useful to augment the VPN reachability information carried in BGP with Traffic Engineering information.

This document defines a new BGP attribute, the Traffic Engineering attribute, that enables BGP [RFC4271] to carry Traffic Engineering information.

Section 4 of [RFC5195] describes one possible usage of this attribute.

The scope and applicability of this attribute currently excludes its use for non-VPN reachability information.

Procedures for modifying the Traffic Engineering attribute, when re-advertising a route that carries such an attribute, are outside the scope of this document.

2. Specification of Requirements

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].

3. Traffic Engineering Attribute

The Traffic Engineering attribute is an optional, non-transitive BGP attribute.

The information carried in this attribute is identical to what is carried in the Interface Switching Capability Descriptor, as specified in [RFC4203] and [RFC5307].

The attribute contains one or more of the following:

```
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Switching Cap |   Encoding    |           Reserved            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  Max LSP Bandwidth at priority 0              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  Max LSP Bandwidth at priority 1              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  Max LSP Bandwidth at priority 2              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  Max LSP Bandwidth at priority 3              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  Max LSP Bandwidth at priority 4              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  Max LSP Bandwidth at priority 5              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  Max LSP Bandwidth at priority 6              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  Max LSP Bandwidth at priority 7              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|             Switching Capability specific information         |
|                           (variable)                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

The Switching Capability (Switching Cap) field contains one of the values specified in Section 3.1.1 of [RFC3471].

The Encoding field contains one of the values specified in Section 3.1.1 of [RFC3471].

The Reserved field SHOULD be set to 0 on transmit and MUST be ignored on receive.

Maximum LSP (Label Switched Path) Bandwidth is encoded as a list of eight 4-octet fields in the IEEE floating point format [IEEE], with priority 0 first and priority 7 last. The units are bytes (not bits!) per second.

The content of the Switching Capability specific information field depends on the value of the Switching Capability field.

When the Switching Capability field is PSC-1, PSC-2, PSC-3, or PSC-4, the Switching Capability specific information field includes Minimum LSP Bandwidth and Interface MTU.

```
    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
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                  Minimum LSP Bandwidth                        |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |           Interface MTU       |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Minimum LSP Bandwidth is encoded in a 4-octet field in the IEEE floating point format. The units are bytes (not bits!) per second. Interface MTU is encoded as a 2-octet integer.

When the Switching Capability field is Layer-2 Switch Capable (L2SC), there is no Switching Capability specific information field present.

When the Switching Capability field is Time-Division-Multiplex (TDM) capable, the Switching Capability specific information field includes Minimum LSP Bandwidth and an indication of whether the interface supports Standard or Arbitrary SONET/SDH (Synchronous Optical Network / Synchronous Digital Hierarchy).

```
    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
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                  Minimum LSP Bandwidth                        |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |   Indication  |
   +-+-+-+-+-+-+-+-+
```

Minimum LSP Bandwidth is encoded in a 4-octet field in the IEEE floating point format. The units are bytes (not bits!) per second. The indication of whether the interface supports Standard or Arbitrary SONET/SDH is encoded as 1 octet. The value of this octet is 0 if the interface supports Standard SONET/SDH, and 1 if the interface supports Arbitrary SONET/SDH.

When the Switching Capability field is Lambda Switch Capable (LSC), there is no Switching Capability specific information field present.

4. Implication on Aggregation

Routes that carry the Traffic Engineering attribute have additional semantics that could affect traffic-forwarding behavior. Therefore, such routes SHALL NOT be aggregated unless they share identical Traffic Engineering attributes.

Constructing the Traffic Engineering attribute when aggregating routes with identical Traffic Engineering attributes follows the procedure of [RFC4201].

5. Implication on Scalability

The use of the Traffic Engineering attribute does not increase the number of routes, but may increase the number of BGP Update messages required to distribute the routes, depending on whether or not these routes share the same BGP Traffic Engineering attribute (see below).

When the routes differ other than in the Traffic Engineering attribute (e.g., differ in the set of Route Targets and/or NEXT_HOP), use of the Traffic Engineering attribute has no impact on the number of BGP Update messages required to carry the routes. There is also no impact when routes share all other attribute information and have an aggregated or identical Traffic Engineering attribute. When routes share all other attribute information and have different Traffic Engineering attributes, routes must be distributed in per-route BGP Update messages, rather than in a single message.

6. IANA Considerations

This document defines a new BGP attribute, Traffic Engineering. This attribute is optional and non-transitive.

7. Security Considerations

This extension to BGP does not change the underlying security issues currently inherent in BGP. BGP security considerations are discussed in RFC 4271.

8. Acknowledgements

The authors would like to thank John Scudder and Jeffrey Haas for their review and comments.

9. References

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9.2. Informative References

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