                         BGP Large Communities
                  draft-ietf-idr-large-community-07

Abstract

   This document describes the BGP Large Communities attribute, an
   extension to BGP-4. This attribute provides a mechanism to signal
   opaque information within separate namespaces to aid in routing
   management. The attribute is suitable for use with four-octet ASNs.

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 [RFC2119].

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1. Introduction

   BGP implementations typically support a routing policy language to
   control the distribution of routing information. Network operators
   attach BGP communities to routes to associate particular properties
   with these routes. These properties may include information such as
   the route origin location, or specification of a routing policy
   action to be taken, or one that has been taken, and is applied to all
   routes contained in a BGP Update Message where the Communities
   Attribute is included. Because BGP communities are optional
   transitive BGP attributes, BGP communities may be acted upon or
   otherwise used by routing policies in other Autonomous Systems (ASes)
   on the Internet.

   BGP Communities attributes are a variable length attribute consisting of a
set of one or more four-octet values, each of which specify a community
[RFC1997]. Common
   use of the individual values of this attribute type splits this single 32-bit
value field into
   two 16-bit values. The most significant word is interpreted as an
   Autonomous System Number (ASN) and the least significant word is a
   locally defined value whose meaning is assigned by the operator of
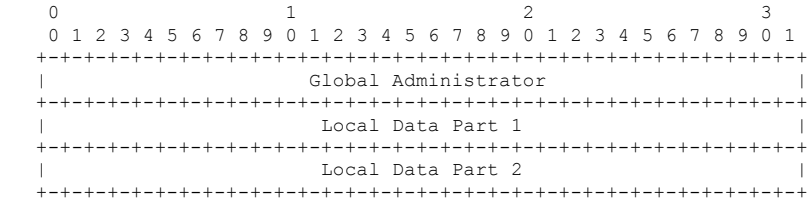   the Autonomous System in the most significant word.

   Since the adoption of four-octet ASNs [RFC6793], the BGP Communities
   attribute can no longer accommodate the above encoding, as a two-
   octet word cannot fit a four-octet ASN. The BGP Extended Communities
   attribute [RFC4360] is also unsuitable. The six-octet length of the Extended
Community value precludes the common operational practice of
   encoding four octet ASNs in both the Global Administrator and the Local
Administrator sub-fields.

   To address these shortcomings, this document defines a BGP Large
   Communities attribute encoded as a unordered set of one or more twelve-octet
values,
   each consisting of a four-octet Global Administrator field and two
   four-octet operator-defined fields, each of which can be used to
   denote properties or actions significant to the operator of the
   Autonomous System assigning the values.

2. BGP Large Communities Attribute

   This document creates the BGP Large Communities attribute as an
   optional transitive path attribute of variable length. All routes
   with the BGP Large Communities attribute belong to the community
   specified in the attribute.

   Each
   BGP Large Community value is encoded as a 12-octet quantity, as follows:

```
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                      Global Administrator                     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       Local Data Part 1                       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       Local Data Part 2                       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

   Global Administrator: A four-octet namespace identifier.

   Local Data Part 1: A four-octet operator-defined value.

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   Local Data Part 2: A four-octet operator-defined value.

   The Global Administrator field is intended to allow different
   Autonomous Systems to define BGP Large Communities without collision.
   This field SHOULD be either one of the reserved values as defined
   below, or an Autonomous System Number (ASN). If it is a reserved
   value, then the Local Data Parts are as defined by the reserved
   value. If it is an ASN then the Local Data Parts are to be
   interpreted as defined by the owner of the ASN.

   There is no significance to the order in which twelve-octet Large Community
   values are encoded in a Large Communities attribute, nor in the order
   of the BGP Large Communities attributes if two or more such attributes
   are encoded in the BGP path attribute payload of a single BGP Update message.
A BGP speaker can
   transmit them in any order.

   Duplicate BGP Large Community values SHOULD NOT be transmitted. A
   receiving speaker SHOULD silently remove duplicate BGP Large
   Community values from a BGP UPDATE message.

3. Aggregation

   If a range of routes is aggregated, then the resulting aggregate
   should have a BGP Large Communities attribute which contains all of
   the BGP Large Communities attributes from all of the aggregated
   routes.

4. Canonical Representation

   The canonical representation of BGP Large Communities is three
   separate unsigned integers in decimal notation in the following
   order: Global Administrator, Local Data 1, Local Data 2. Numbers
   MUST NOT contain leading zeros; a zero value MUST be represented with
   a single zero. Each number is separated from the next by a single
   colon. For example: 64496:4294967295:2, 64496:0:0.

   BGP Large Communities SHOULD be represented in the canonical
   representation.

5. Reserved BGP Large Community values

   The following Global Administrator values are reserved: 0, 65535, and
4294967295. Operators SHOULD NOT use these Global Administrator
   values.

Heitz, et al.   Expires May 7, 2017   [Page 4]

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separators other . [...4]

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Although this document does not define any Special-Use BGP Large
Communities, the Global Administrator values specified above could be
used if there is a future need for them.

6. Error Handling

The error handling of BGP Large Communities is as follows:

o A BGP Large Communities attribute SHALL be considered malformed if
   the length of the BGP Large Communities value, expressed in
   octets, is not a non-zero multiple of 12.

o A BGP UPDATE message with a malformed BGP Large Communities
   attribute SHALL be handled using the approach of "treat-as-
   withdraw" as described in section 2 [RFC7606].

The BGP Large Communities Global Administrator field MAY contain any
value, and a BGP Large Communities attribute MUST NOT be considered
malformed if the Global Administrator field contains an unallocated,
unassigned or reserved ASN or is set to one of the reserved BGP Large
Community values defined in Section 5.

7. Security Considerations

This extension to BGP has similar security implications as BGP
Communities [RFC1997].

This document does not change any underlying security issues
associated with any other BGP Communities mechanism. Specifically,
an AS relying on the BGP Large Communities attribute carried in BGP
must have trust in every other AS in the path, as any intermediate
Autonomous System in the path may have added, deleted, or altered the
BGP Large Communities attribute. Specifying the mechanism to provide
such trust is beyond the scope of this document.

BGP Large Communities do not protect the integrity of each community
value. Operators should be aware that it is possible for a BGP speaker
to alter BGP Large Community values in a BGP Update Message. Protecting
the integrity of the transitive handling of BGP Large Community
attributes in a manner consistent with the intent of expressed BGP
routing policies falls within the broader scope of securing BGP, and is
not specifically addressed here.

Network administrators should note the recommendations in Section 11
of BGP Operations and Security [RFC7454].

8. Implementation status - RFC EDITOR: REMOVE BEFORE PUBLICATION

This section records the status of known implementations of the
protocol defined by this specification at the time of posting of this
Internet-Draft, and is based on a proposal described in [RFC7942].
The description of implementations in this section is intended to
assist the IETF in its decision processes in progressing drafts to
RFCs. Please note that the listing of any individual implementation
here does not imply endorsement by the IETF. Furthermore, no effort

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has been spent to verify the information presented here that was
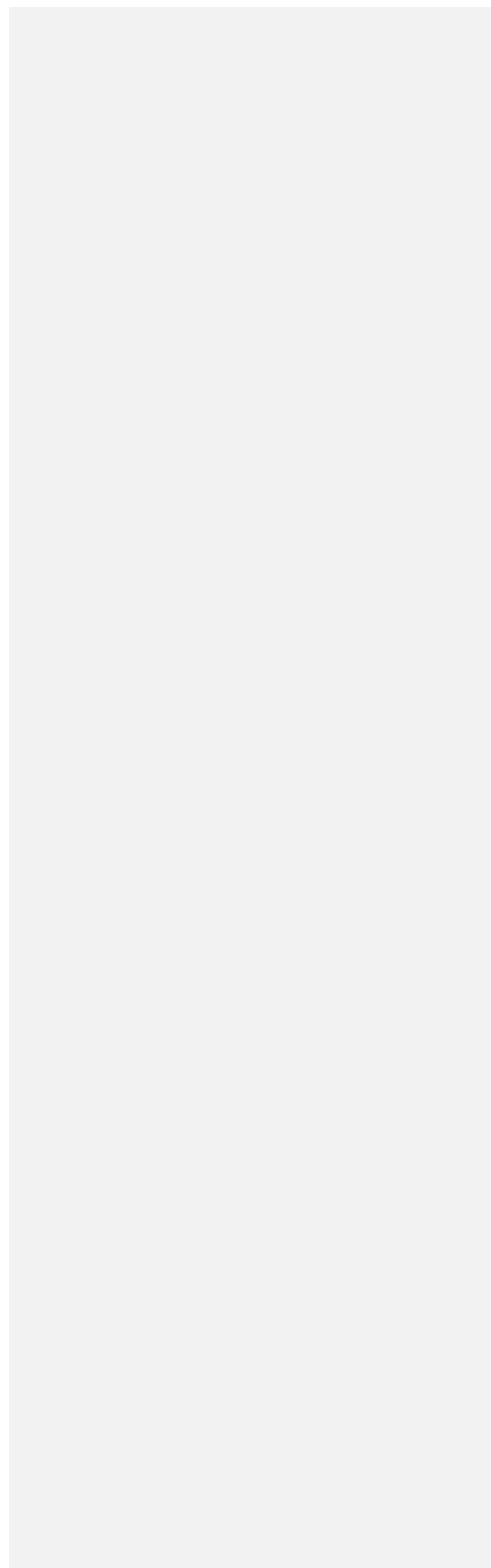
supplied by IETF contributors. This is not intended as, and must not
be construed to be, a catalog of available implementations or their
features. Readers are advised to note that other implementations may
exist.

As of today these vendors have produced an implementation of BGP
Large Communities:

o Cisco IOS XR

o ExaBGP

o GoBGP

o BIRD

o OpenBGPD

o pmacct

o Quagga

The latest implementation news is tracked at
http://largebgpcommunities.net/ [1].

9. IANA Considerations

IANA has made an Early Allocation of the value 32 (LARGE_COMMUNITY)
in the "BGP Path Attributes" registry under the "Border Gateway
Protocol (BGP) Parameters" group and is now asked to make that
Permanent.

10. Contributors

The following people contributed significantly to the content of the
document:

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11. Acknowledgments

The authors would like to thank Ruediger Volk, Russ White, Acee
Lindem, Shyam Sethuram, Jared Mauch, Joel M. Halpern, Jeffrey Haas,
Gunter van de Velde, Marco Marzetti, Eduardo Ascenco Reis, Mark
Schouten, Paul Hoogsteder, Martijn Schmidt, Greg Hankins, Bertrand

12. References

12.1. Normative References

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   [RFC7942] Sheffer, Y. and A. Farrel, "Improving Awareness of Running
              Code: The Implementation Status Section", BCP 205,
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12.3. URIs

   [1] http://largebgpcommunities.net

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, as the protocol limit of six
   octets for each community value cannot accommodate both a four-octet
   Global Administrator value and a four-octet Local Administrator
   value

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   values

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When used in small
   closed environments, the values MAY be any values. Thus,
   implementations MUST allow the operator to specify any value for any
   of the fields.

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A routing policy language MAY use separators other
   than colons. A routing policy language MAY use prefixes and
   postfixes before and after a Large Community.

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(the first
   ASN) [RFC7607]

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(the last ASN)
   [RFC7300]