IPv4 and IPv6 Infrastructure Addresses in MCAST-VPN Routes

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Abstract

To provide Multicast VPN service, a provider edge router originates "MCAST-VPN" BGP routes. These routes encode addresses from the customer’s address space as well as addresses from the provider’s address space. The customer’s address space may be either IPv4 or IPv6. Independently, the provider’s address space may be either IPv4 or IPv6. The MCAST-VPN BGP routes always contain an "address family" field that specifies whether the customer addresses are IPv4 addresses or whether they are IPv6 addresses. However, there is no field that explicitly specifies whether the provider addresses are IPv4 addresses or whether they are IPv6 addresses. The existing specifications do not explicitly say how to determine whether a given provider address is IPv4 or IPv6, and there are differing precedents about the method used to encode IPv4 addresses in messages that also contain IPv6 addresses. This document removes any ambiguity by specifying that MCAST-VPN routes always encode provider IPv4 addresses as four-octet addresses, and that the distinction between an IPv4 address and an IPv6 address is signaled solely by the length of the address field.

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1. 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 [RFC2119].

2. Introduction

[MVPN-BGP] defines a new set of BGP route types that are used by Service Providers (SPs) to provide Multicast Virtual Private Network service to their customers. These routes have a newly defined BGP NLRI, the "MCAST-VPN" NLRI. MCAST-VPN NLRI is carried in the NLRI field of the MP_REACH_NLRI/MP_UNREACH_NLRI attributes defined in [BGP-MP]. The SAFI field of the MP_REACH_NLRI/MP_UNREACH_NLRI attribute is used to identify the NLRI as being an MCAST-VPN NLRI.

When the SAFI field of an MP_REACH_NLRI/MP_UNREACH_NLRI attribute has the "MCAST-VPN" value, the AFI field has two defined values: 1 and 2. AFI 1 indicates that any customer multicast addresses occurring in the MP_REACH_NLRI/MP_UNREACH_NLRI attribute are IPv4 addresses; AFI 2 indicates that any such addresses are IPv6 addresses.

However, some of the MCAST-VPN routes also contain addresses of Provider Edge (PE) routers in the SP network. An SP with an IPv4 network may provide MVPN service for customers that use IPv6, and an SP with an IPv6 network may provide MVPN service for customers that use IPv4. Therefore the address family of the PE addresses MUST NOT be inferred from the AFI field of the associated MP_REACH_NLRI/MP_UNREACH_NLRI attribute.

The purpose of this document is to make it clear that whenever a PE address occurs in an MCAST-VPN route (whether in the NLRI or in an attribute), the IP address family of that address is determined by the length of the address (a length of 4 octets for IPv4 addresses, a length of 16 octets for IPv6 addresses), NOT by the AFI field of the route.

In particular, if a SP with an IPv4 core network is providing MVPN/IPv6 service to a customer, the PE addresses in the MCAST-VPN routes will be four-octet IPv4 routes, even though the AFI of those routes will have the value 2.

Some previous specifications (e.g., [RFC4659] and [RFC4798]) have taken a different approach, requiring that in any routes containing IPv6 or VPN-IPv6 customer addresses, the IPv4 PE addresses be represented as IPv6-mapped IPv4 addresses. This document does not use that approach. Rather, this specification uses the approach...
adopted in [RFC4684] and [RFC5549]. The MCAST-VPN routes contain enough information to enable the IP address family of the PE addresses to be inferred from the address lengths.

3. PE Addresses in MCAST-VPN Routes

PE addresses occur in MCAST-VPN routes in the following places:

1. "Network Address of Next Hop" field in the MP_REACH_NLRI attribute, as defined in section 3 of [BGP-MP]. This field is preceded by a "length of next hop address" field. Hence it is always clear whether the address is an IPv4 address (length is 4) or an IPv6 address (length is 16). If the length of next hop address is neither 4 nor 16, the MP_REACH_NLRI attribute MUST be considered to be "incorrect", and MUST be handled as specified in section 7 of [BGP-MP].

2. "Intra-AS I-PMSI A-D route". All MCAST-VPN routes begin with a one-octet route type field, followed by a one-octet "NLRI length" field. In the Intra-AS I-PMSI A-D route, the length is followed by an 8-octet RD, which is then followed by the "Originating Router’s IP Address" field. The length of this field (4 octets for IPv4 or 16 octets for IPv6 can thus be inferred from the NLRI length field (which will be either 12 or 24, respectively). If the inferred length of the "Originating Router’s IP Address" field is neither 4 nor 16, the MP_REACH_NLRI attribute MUST be considered to be "incorrect", and MUST be handled as specified in section 7 of [BGP-MP].

3. "S-PMSI A-D Route". In this route, the "NLRI length" field is followed by an 8-octet RD, a variable length "multicast source" field, a variable length "multicast group" field, and an "Originating Router’s IP Address" field. The two variable length fields have their own length fields. From these two length fields and the NLRI length field, one can compute the length of the "Originating Router’s IP Address" field, which again is either 4 for IPv4 or 16 for IPv6. If the computed length of the "Originating Router’s IP Address" field is neither 4 nor 16, the MP_REACH_NLRI attribute MUST be considered to be "incorrect", and MUST be handled as specified in section 7 of [BGP-MP].

4. "Leaf A-D Route". In this route, the "NLRI length" field is following by a variable length "route key", which is followed by the "Originating Router’s IP Address" field. The Route Key has its own length field. From the NLRI length and the route key length, one can compute the length of the "Originating..."
Router’s IP Address” field. If the computed length of the
"Originating Router’s IP Address” field is neither 4 nor 16,
the MP_REACH_NLRI attribute MUST be considered to be
"incorrect", and MUST be handled as specified in section 7 of
[BGP-MP].

5. "VRF Route Import Extended Community". The "VRF Route Import
Extended Community", as specified in [MVPN-BGP], can only carry
an IPv4 address. To carry an IPv6 address, the "IPv6 Address
Specific Route Target" as specified in [RFC5701] MUST be used.

4. PMSI Tunnel Attributes in I-PMSI A-D Routes

When a PMSI Tunnel Attribute occurs in an I-PMSI A-D route originated
by a particular PE or ASBR, it identifies a tunnel that the PE/ASBR
uses by default for carrying the multicast traffic of a particular
customer MVPN. The proper encoding and interpretation of the PMSI
Tunnel attribute is affected by both the AFI and "Network Address of
Next Hop" fields.

4.1. Relationship to AFI Value

When the PMSI Tunnel Attribute occurs in a BGP Update message with a
MP_REACH_NLRI attribute whose AFI is 1, the meaning is that the
identified tunnel is used by default to carry IPv4 MVPN traffic for a
particular customer MVPN. When the PMSI Tunnel Attribute occurs in a
BGP Update message with a MP_REACH_NLRI attribute whose AFI is 2, the
meaning is that the identified tunnel is used by default to carry
IPv6 MVPN traffic for a particular customer MVPN. To assign both
IPv4 and IPv6 MVPN traffic to an I-PMSI tunnel, two I-PMSI A-D routes
MUST be used, one whose MP_REACH_NLRI has an AFI of 1, and one whose
MP_REACH_NLRI has an AFI of 2. To use the same tunnel for both IPv4
and IPv6 traffic, the same value of the PMSI Tunnel attribute can be
used in each route.

4.2. Relationship to Next Hop Address Family

If the "Network Address of Next Hop" field in the MP_REACH_NLRI
attribute contains an IPv4 address, then any IP addresses appearing
in the "Tunnel Identifier" field of the PMSI Tunnel Attribute MUST be
IPv4 addresses.

If the "Network Address of Next Hop" field in the MP_REACH_NLRI
attribute contains an IPv6 address, then any IP addresses appearing
in the "Tunnel Identifier" field of the PMSI Tunnel Attribute MUST be
IPv6 addresses.

If these conditions are not met, the PMSI Tunnel Attribute MUST be handled as a "malformed" PMSI Tunnel Attribute, as specified in section 5 [MVPN-BGP].

5. IANA Considerations

This document has no actions for IANA.

6. Security Considerations

This document does not raise any security considerations beyond those raised by [MVPN-BGP].

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8. Authors’ Addresses

Rahul Aggarwal
Juniper Networks
1194 North Mathilda Ave.
Sunnyvale, CA 94089
Email: rahul@juniper.net

Eric C. Rosen
Cisco Systems, Inc.
1414 Massachusetts Avenue
Boxborough, MA, 01719
E-mail: erosen@cisco.com
9. Normative References


[MVPN-BGP], "BGP Encodings and Procedures for Multicast in MPLS/BGP IP VPNs", Rahul Aggarwal, Eric Rosen, Thomas Morin, Yakov Rekhter, 30-Sep-09, draft-ietf-l3vpn-2547bis-mcast-bgp-08.txt

[RFC2119] "Key words for use in RFCs to Indicate Requirement Levels.", Bradner, March 1997

10. Informational References


[RFC5701] "IPv6 Address Specific BGP Extended Community Attribute" Y. Rekhter. RFC 5701, November 2009