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MVPN: S-PMSI Wild Card Selectors

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Abstract

In the procedures for Multicast Virtual Private Networks, individual customer multicast flows can be assigned to specific multicast tunnels through a service provider network. This document specifies the encoding and semantics of "wild card selectors", which can be used to assign certain sets of customer multicast flows as a group to specific multicast tunnels.

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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

Note: this document uses terminology from [\[MVPN\]](#), and in particular uses the prefixes "C-" and "P-" as specified in section 3.1 of [\[MVPN\]](#).

As specified in [\[MVPN\]](#) and [\[MVPN-BGP\]](#), one can use an S-PMSI A-D route or an S-PMSI Join Message to assign a particular C-multicast flow, identified as (C-S,C-G), to a particular S-PMSI.

However, [\[MVPN-BGP\]](#) does not specify any means of encoding wild cards ("*", in multicast terminology) in the Source or Group fields. Similarly, [\[MVPN\]](#) does not specify any means of encoding wild cards in the C-Source or C-Group fields of the S-PMSI Join messages.

This omission makes it difficult to provide optimized multicast routing for customers that use ASM ("Any Source Multicast") multicasts, in which flows may be traveling along "shared" C-trees. We use the term "shared C-trees" to refer both to the the unidirectional "RPT trees" used in "PIM sparse mode" [\[PIM\]](#), and to the bidirectional trees used in BIDIR-PIM [\[BIDIR-PIM\]](#).

When a customer is using ASM multicast, it is useful to be able to select the set of flows that are traveling along a shared C-tree, and to bind that entire set of flows to a specified P-tunnel. Conceptually, we would like to have a way to express that we want (C-*,C-G) traffic bound to the specified P-tunnel. A multicast data packet whose source address is C-S and whose destination address is an ASM group address is said to be traveling a shared C-tree from the perspective of a given router if that router's decision to forward the packet is based upon (C-*,C-G) state rather than upon (C-S,C-G) state. Creation and use of these multicast states is specified in [\[PIM\]](#) and/or [\[MVPN-BGP\]](#).

It is also useful to be able to use an S-PMSI A-D route to say "by default, all multicast traffic (within a given VPN) that has not been bound to any other P-tunnel is bound to the specified P-tunnel". To do this we, need to have a way to express that we want (C-*, C-*) traffic bound to the P-tunnel.

When an MVPN customer is using BIDIR-PIM, it is useful to be able to

use an S-PMSI A-D route to say "by default, all BIDIR-PIM multicast traffic (within a given VPN) that has not been bound to any other P-tunnel is bound to the specified P-tunnel". To do this we, need to have a way to express a (C-*, C-*) wildcard that is restricted to BIDIR-PIM C-groups.

The Wild Card Selectors specified in this document provide additional functionality:

- One can send an S-PMSI A-D route or S-PMSI Join Message whose semantics are "assign all the traffic traveling the (C-*,C-G) tree to this S-PMSI".
- One can send an S-PMSI A-D route or S-PMSI Join Message whose semantics are "use this S-PMSI as the default method for carrying any (C-S,C-G) or (C-*,C-G) traffic that isn't assigned to a different S-PMSI". That is, it allows for the use of S-PMSIs as the default PMSIs for carrying data traffic. It is also possible to separately assign BIDIR-PIM C-groups by default to a particular P-Tunnel.

This document specifies the encoding of the wild card selectors, and provides rules for their usage and interpretation when S-PMSIs are instantiated as unidirectional P-tunnels. Rules for their usage and interpretation when S-PMSIs are instantiated as bidirectional P-tunnels may be found in [[MVPN-BIDIR](#)].

Note that, per [[MVPN-BGP](#)], an S-PMSI A-D route is carried in the Network Layer Reachability Information (NLRI) field of an MP_REACH_NLRI attribute (see [[BGP-MP](#)]). Every S-PMSI A-D route has a particular address family (IPv4 or IPv6), as specified in the Address Family Information AFI field of the MP_REACH_NLRI attribute. A wild card selector in a particular S-PMSI A-D route always refers only to multicast flows of that same address family.

In the following, we will sometimes talk of a PE receiving traffic from a PMSI and then discarding it. If PIM is being used as the multicast control protocol between PEs, this always implies that the discarded traffic will not be seen by PIM on the receiving PE.

In the following, we will sometimes speak of an S-PMSI A-D route being "ignored". When we say the route is "ignored", we do not mean that its normal BGP processing is not done, but that the route is not considered when determining which P-tunnel to use when sending multicast data, and that the MPLS label values it conveys are not used. We will generally use "ignore" in quotes to indicate this meaning.

3. Encoding of Wild Cards

Per [MVPN-BGP] [section 4.3](#), the MCAST-VPN NLRI in an S-PMSI A-D route is encoded as follows:

```

+-----+
|      RD      (8 octets)      |
+-----+
| Multicast Source Length (1 octet) |
+-----+
| Multicast Source (Variable)      |
+-----+
| Multicast Group Length (1 octet) |
+-----+
| Multicast Group   (Variable)      |
+-----+
| Originating Router's IP Addr      |
+-----+

```

In S-PMSI A-D routes, the wild card selectors are encoded as follows:

- A source wildcard is encoded as a zero-length source field. That is, the "multicast source length" field contains the value 0x00, and the "multicast source" field is omitted.
- A group wildcard is encoded as a zero-length group field. That is, the "multicast group length" field contains the value 0x00, and the "multicast group" field is omitted.
- We also define a special value of the group wildcard, whose meaning is "all BIDIR-PIM groups". The "BIDIR-PIM group wildcard" is encoded as a group field whose length is 8 bits and whose value is zero. That is, the "multicast group length" field contains the value 0x08, and the "multicast group" field is a single octet containing the value 0x00.

In S-PMSI Join messages, the use of an all-zero C-Source or C-Group field is to be interpreted as specifying a wild card value for the respective field. A wild card represents all C-Source or C-group values of a particular address family (IPv4 or IPv6), as specified by the S-PMSI Join message type. A "BIDIR-PIM group wildcard" for the S-PMSI Join message is not defined in this document.

An implementation that supports wildcards at all MUST support the following two uses of wildcards:

- (C-*,C-G): Source Wildcard, Group specified.
- (C-*,C-*): Source Wildcard, Group Wildcard.

Additionally, if support for customer BIDIR-PIM flows is being provided, support for the "all BIDIR-PIM groups" wildcard is also REQUIRED. With regard to the procedures of [section 4.2](#), the "all BIDIR-PIM groups" wildcard is treated identically to the (C-*,C-*) wildcard, except that it applies only to BIDIR-PIM groups.

This specification does not provide support for the combination of a specified source and a group wildcard. A received S-PMSI A-D route or S-PMSI Join message specifying this combination will be "ignored".

[4. Binding Wild Cards to Unidirectional P-Tunnels](#)

[4.1. Binding \(C-*,C-G\) to a Unidirectional P-Tunnel](#)

Consider an S-PMSI A-D Route whose NLRI specifies (C-*,C-G), and that contains a PMSI Tunnel Attribute (PTA) [[MVPN-BGP](#)] that specifies a unidirectional P-tunnel. The P-tunnel may be a P2MP LSP, or it may be a unidirectional PIM-created multicast distribution tree specified either as (P-*,P-G) or as (P-S,P-G).

Alternately, consider an S-PMSI Join message, whose C-Source and C-Group fields specify (C-*,C-G), and that specifies a unidirectional P-tunnel (either a P2MP LSP or a unidirectional PIM-created multicast distribution tree.)

If C-G is known to be an SSM group address, the S-PMSI A-D route or S-PMSI Join message is "ignored".

The semantics of binding (C-*,C-G) to a unidirectional P-tunnel are the following: the originator of the S-PMSI A-D route or S-PMSI Join message is saying that if it receives, over a VRF interface, any traffic that is traveling on the (C-*,C-G) shared tree, and if it is to forward such traffic to other PEs, then it will transmit such traffic on the specified P-tunnel. Any PE interested in receiving (C-*,C-G) traffic from the originator (i.e., if the originator is PE's upstream multicast hop for the (C-*,C-G) state) MUST join that P-tunnel.

[4.2.](#) Binding (C-*,C-*) to a Unidirectional P-Tunnel

The originator of an S-PMSI A-D Route or an S-PMSI Join message that binds (C-*,C-*) to a unidirectional P-tunnel is saying that by default, if it is required by its C-PIM instance to forward multicast traffic to any other PE, then by default it will send the traffic on the specified tunnel. The default applies to any traffic that has not been explicitly assigned to another P-tunnel.

[5.](#) Use of Wild Cards with Bidirectional P-Tunnels

The specification for the use of wild cards with bidirectional P-Tunnels can be found in [MVPN_BIDIR].

[6.](#) IANA Considerations

This document requires no actions of IANA.

[7.](#) Security Considerations

There are no additional security considerations beyond those of [MVPN] and [MVPN-BGP].

[8.](#) Acknowledgments

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