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        Dissemination of Flow Specification Rules for L2 VPN
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Abstract

   This document defines BGP flow-spec extension for Ethernet traffic
   filtering in L2 VPN network. SAFI=134 in [RFC5575] is redefined for
   dissemination traffic filtering information in an L2VPN environment.
   A new subset of component types and extended community also are
   defined.

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1. Introduction

BGP Flow-spec is an extension to BGP that allows for the
dissemination of traffic flow specification rules. It leverages the

BGP Control Plane to simplify the distribution of ACLs, new filter
rules can be injected to all BGP peers simultaneously without
changing router configuration. The typical application of BGP Flow-
spec is to automate the distribution of traffic filter lists to
routers for DDOS mitigation.

RFC5575 defines a new BGP Network Layer Reachability Information
(NLRI) format used to distribute traffic flow specification rules.
NLRI (AFI=1, SAFI=133)is for IPv4 unicast filtering. NLRI (AFI=1,
SAFI=134)is for BGP/MPLS VPN filtering. The Flow specification match
part only includes L3/L4 information like source/destination prefix,
protocol, ports, and etc, so traffic flows can only be selectively
filtered based on L3/L4 information.

Layer 2 Virtual Private Networks L2VPNs have already been deployed
in an increasing number of networks today. In L2VPN network, we also
have requirement to deploy BGP Flow-spec to mitigate DDoS attack
traffic. Within L2VPN network, both IP and non-IP Ethernet traffic
maybe exist. For IP traffic filtering, the Flow specification rules
defined in [RFC5575] which include match criteria and actions can
still be used, flow specification rules received via new NLRI format
apply only to traffic that belongs to the VPN instance(s) in which
it is imported. For non-IP Ethernet traffic filtering, Layer 2
related information like source/destination MAC and VLAN should be
considered. But the flow specification match criteria defined in
RFC5575 only include layer 3 and layer 4 IP information, layer 2
Ethernet information haven't been included.

There are different kinds of L2VPN networks like EVPN [EVPN], BGP
VPLS [RFC4761], LDP VPLS [RFC4762] and border gateway protocol (BGP)
auto discovery [RFC 6074]. Because the flow-spec feature relies on
BGP protocol to distribute traffic filtering rules, so it can only
be incrementally deployed in those L2VPN networks where BGP is used
for auto discovery and/or signaling purposes such as BGP-based VPLS
[4761], EVPN and LDP-based VPLS [4762] with BGP auto-discovery
[6074].

This draft proposes a new subset of component types and extended
community to support L2VPN flow-spec application. SAFI=134 in
[RFC5575] is redefined for dissemination traffic filtering
information in an L2VPN environment.

2. Layer 2 Flow Specification encoding in BGP

The [RFC5575] defines SAFI 133 and SAFI 134 for "dissemination of
IPv4 flow specification rules" and "dissemination of VPNv4 flow
specification rules" respectively. [draft-ietf-idr-flow-spec-v6-06]

redefines the [RFC5575] SAFIs in order to make them applicable to
both IPv4 and IPv6 applications. This document will further redefine
the SAFI 134 in order to make them applicable to L2VPN applications.

The following changes are defined:

"SAFI 134 for dissemination of L3VPN flow specification rules" to
now be defined as "SAFI 134 for dissemination of VPN flow
specification rules"

For SAFI 134 the indication to which address family it is referring
to will be recognized by AFI value (AFI=1 for VPNv4, AFI=2 VPNv6 and
AFI=25 for L2VPN). Such modification is fully backwards compatible
with existing implementation and production deployments.

3. Ethernet Flow Specification encoding in BGP

The NLRI format for this address family consists of a fixed-length
Route Distinguisher field (8 bytes) followed by a flow specification,
following the encoding defined in this document. The NLRI length
field shall include both the 8 bytes of the Route Distinguisher as
well as the subsequent flow specification.

Flow specification rules received via this NLRI apply only to
traffic that belongs to the VPN instance(s) in which it is imported.
Flow rules are accepted by default, when received from remote PE
routers.

Besides the component types defined in [RFC5575] and [draft-ietf-
idr-flow-spec-v6-06], this document proposes the following
additional component types for L2VPN Ethernet traffic filtering:

Type 14 - Source MAC

Encoding: <type (1 octet), [op, value]+>

Defines a list of {operation(op), value} pairs used to match source
MAC. Values are encoded as 6-byte quantities. The operation field is
encoded as ''Numeric operator'' defined in [RFC5575].

Type 15 - Destination MAC

Encoding: <type (1 octet), [op, value]+>

Defines a list of {operation, value} pairs used to match destination
MAC. Values are encoded as 6-byte quantities.

Type 16 -   - Ethernet Type

Encoding: <type (1 octet), [op, value]+>

Defines a list of {operation, value} pairs used to match two-octet
field. Values are encoded as 2-byte quantities.

Ethernet II framing defines the two-octet EtherType field in an
Ethernet frame, preceded by destination and source MAC addresses,
that identifies an upper layer protocol encapsulating the frame data.

Type 17 - DSAP(Destination Service Access Point) in LLC

Encoding: <type (1 octet), [op, value]+>

Defines a list of {operation, value} pairs used to match 1-octet
DSAP in the 802.2 LLC(Logical Link Control Header). Values are
encoded as 1-byte quantities.

Type 18 - SSAP(Source Service Access Point) in LLC

Encoding: <type (1 octet), [op, value]+>

Defines a list of {operation, value} pairs used to match 1-octet
SSAP in the 802.2 LLC. Values are encoded as 1-byte quantities.

Type 19 - Control field in LLC

Encoding: <type (1 octet), [op, value]+>

Defines a list of {operation, value} pairs used to match 1-octet
control field in the 802.2 LLC. Values are encoded as 1-byte
quantities.

Type 20 - SNAP

Encoding: <type (1 octet), [op, value]+>

Defines a list of {operation, value} pairs used to match 5-octet
SNAP(Sub-Network Access Protocol) field. Values are encoded as 5-
byte quantities.

Type 21 - VLAN ID

Encoding: <type (1 octet), [op, value]+>

Defines a list of {operation, value} pairs used to match VLAN ID.
Values are encoded as 1- or 2-byte quantities.

In virtual local-area network (VLAN) stacking case, the VLAN ID is
outer VLAN ID.

Type 22 - VLAN COS

Encoding: <type (1 octet), [op, value]+>

Defines a list of {operation, value} pairs used to match 3-bit VLAN
COS fields [802.1p]. Values are encoded using a single byte, where
the five most significant bits are zero and the three least
significant bits contain the VLAN COS value.

In virtual local-area network (VLAN) stacking case, the VLAN COS is
outer VLAN COS.

Type 23 - Inner VLAN ID

Encoding: <type (1 octet), [op, value]+>

Defines a list of {operation, value} pairs used to match inner VLAN
ID using for virtual local-area network (VLAN) stacking or Q in Q
case. Values are encoded as 1- or 2-byte quantities.

In single VLAN case, the component type MUST not be used.

Type 24 - Inner VLAN COS

Encoding: <type (1 octet), [op, value]+>

Defines a list of {operation, value} pairs used to match 3-bit inner
VLAN COS fields [802.1p] using for virtual local-area network (VLAN)
stacking or Q in Q case. Values are encoded using a single byte,
where the five most significant bits are zero and the three least
significant bits contain the VLAN COS value.

In single VLAN case, the component type MUST not be used.

4. Ethernet Flow Specification Traffic Actions

```
+--------+-------------------+-------------------------+
|  type  | extended community |         encoding        |
+--------+-------------------+-------------------------+
| 0x8006 | traffic-rate      | 2-byte as#, 4-byte float |
| 0x8007 | traffic-action    | bitmask                 |
| 0x8008 | redirect          | 6-byte Route Target     |
| 0x8009 | traffic-marking   | DSCP value              |
+--------+-------------------+-------------------------+
```

Besides to support the above extended communities per RFC5575, this
document also proposes the following BGP extended communities
specifications for Ethernet flow to extend [RFC5575]:

```
+--------+-------------------+-------------------------+
| type   | extended community | encoding               |
+--------+-------------------+-------------------------+
| 0x800A | VLAN COS marking   | COS value              |
+--------+-------------------+-------------------------+
```

The VLAN COS marking extended community instructs a system to modify
the COS bits of a transiting Ethernet packet to the corresponding
value. This extended community is encoded as a sequence of 5 zero
bytes followed by the VLAN COS value encoded in the 3 least
significant bits of 6th byte.

In virtual local-area network (VLAN) stacking case, the VLAN COS is
outer VLAN COS.

5. Security Considerations

No new security issues are introduced to the BGP protocol by this
specification.

6. IANA Considerations

IANA is requested to rename currently defined SAFI 134 per [RFC5575]
to read:

    134   VPN dissemination of flow specification rules

IANA is requested to create and maintain a new registry for "Flow
spec L2VPN Component Types". For completeness, the types defined in
[RFC5575] and [draft-ietf-idr-flow-spec-v6-06] also are listed here.

```
+--------+----------------------------+--------------------------+
|  type  |       RFC or Draft         |        discription       |
+--------+----------------------------+--------------------------+
|    1   |RFC5575                     | Destination Prefix       |
|    1   |draft-ietf-idr-flow-spec-v6-06 | Destination IPv6 Prefix |
|    2   |RFC5575                     | Source Prefix            |
|    2   |draft-ietf-idr-flow-spec-v6-06 | Source IPv6 Prefix     |
|    3   |RFC5575                     | IP Protocol              |
|    3   |draft-ietf-idr-flow-spec-v6-06 | Next Header            |
|    4   |RFC5575                     | Port                     |
|    5   |RFC5575                     | Destination port         |
|    6   |RFC5575                     | Source port              |
|    7   |RFC5575                     | ICMP type                |
|    8   |RFC5575                     | ICMP code                |
|    9   |RFC5575                     | TCP flags                |
|   10   |RFC5575                     | Packet length            |
|   11   |RFC5575                     | DSCP                     |
|   12   |RFC5575                     | Fragment                 |
|   13   |draft-ietf-idr-flow-spec-v6-06 | Flow Label            |
|   14   |This draft                  | Source MAC               |
|   15   |This draft                  | Destination MAC          |
|   16   |This draft                  | Ethernet Type            |
|   17   |This draft                  | DSAP in LLC              |
|   18   |This draft                  | SSAP in LLC              |
|   19   |This draft                  | Control field in LLC     |
|   20   |This draft                  | SNAP                     |
|   21   |This draft                  | VLAN ID                  |
|   22   |This draft                  | VLAN COS                 |
|   23   |This draft                  | Inner VLAN ID            |
|   24   |This draft                  | Inner VLAN COS           |
+--------+----------------------------+--------------------------+
```

IANA is requested to update the reference for the following
assignment in the "BGP Extended Communities Type - extended,
transitive" registry:

Type value Name Reference

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0x080A Flow spec VLAN COS marking [this document]

6.1. Normative References

[1] [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate

     Requirement Levels", BCP 14, RFC 2119, March 1997.

   [2]   [RFC5575] P. Marques, N. Sheth, R. Raszuk, B. Greene, J.Mauch,
         D. McPherson, "Dissemination of Flow Specification Rules", RFC
         5575, August 2009.

   [3]   [RFC4761] K. Kompella, Ed., Y. Rekhter, Ed., "Virtual Private
         LAN Service (VPLS) Using BGP for Auto-Discovery and Signaling",
         RFC4761, January 2007.

   [4]   [RFC4762] M. Lasserre, Ed., V. Kompella, Ed., "Virtual Private
         LAN Service (VPLS) Using Label Distribution Protocol (LDP)
         Signaling", RFC4762, January 2007.

   [5]   [RFC6074] E. Rosen, B. Davie, V. Radoaca, "Provisioning, Auto-
         Discovery, and Signaling in Layer 2 Virtual Private Networks
         (L2VPNs)", RFC6074, January 2011.

6.2. Informative References

   [1]   [EVPN] Sajassi et al., "BGP MPLS Based Ethernet VPN", draft-
         ietf-l2vpn-evpn-07.txt, work in progress, May, 2014.

   [2]   [IEEE 802.1p] Javin, et.al. "IEEE 802.1p: LAN Layer 2 QoS/CoS
         Protocol for Traffic Prioritization", 2012-02-15

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