IDR Working Group
Internet-Draft
Intended status: Standards Track
Expires: September 22, 2016

Q. Liang
S. Hares
J. You
Huawei
R. Raszuk
Bloomberg LP
D. Ma
Cisco

March 21, 2016

BGP Flow Specification MPLS action
draft-liang-idr-flowspec-mpls-action-00

Abstract

This document specifies a BGP Flow specification policy action to push/pop/swap MPLS labels.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at http://datatracker.ietf.org/drafts/current/.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on September 22, 2016.

Copyright Notice

Table of Contents

1. Introduction

This section provides the background for proposing a new action for BGP Flow specification [RFC5575] that push/pops MPLS labels or swaps MPLS labels. For those familiar with BGP Flow specification ([RFC5575], [RFC7674] [I-D.ietf-idr-flow-spec-v6], [I-D.ietf-idr-flowspec-l2vpn], and MPLS ([RFC3107]) can skip this background section.

1.1. Background

[RFC5575] defines the flow specification (FlowSpec) that is an n-tuple consisting of several matching criteria that can be applied to IP traffic. The matching criteria can include elements such as source and destination address prefixes, IP protocol, and transport protocol port numbers. A given IP packet is said to match the defined flow if it matches all the specified criteria. [RFC5575] also defines a set of filtering actions, such as rate limit, redirect, marking, associated with each flow specification. A new Border Gateway Protocol ([RFC4271]) Network Layer Reachability Information (BGP NLRI) (AFI/SAFI: 1/133 for IPv4, AFI/SAFI: 1/134 for VPNv4) encoding format is used to distribute traffic flow specifications.

[RFC3107] specifies the way in which the label mapping information for a particular route is piggybacked in the same Border Gateway Protocol Update message that is used to distribute the route itself. Label mapping information is carried as part of the Network Layer Reachability Information (NLRI) in the Multiprotocol Extensions attributes. The Network Layer Reachability Information is encoded as one or more triples of the form <length, label, prefix>. The NLRI contains a label is indicated by using Subsequent Address Family Identifier (SAFI) value 4.

[RFC4364] describes a method in which each route within a Virtual Private Network (VPN) is assigned a Multiprotocol Label Switching (MPLS) label. If the Address Family Identifier (AFI) field is set to 1, and the SAFI field is set to 128, the NLRI is an MPLS-labeled VPN-IPv4 address.

1.2. MPLS Flow Specification Deployment

In BGP VPN/MPLS networks when flow specification policy rules exist on multiple forwarding devices in the network bound with labels from one or more LSPs, only the ingress LSR (Label Switching Router) needs to identify a particular traffic flow based on the matching criteria for flow. Once the flow is match by the ingress LSR, the ingress LSR steers the packet to a corresponding LSP (Label Switched Path). Other LSRs of the LSP just need to forward the packet according to the label carried in it.

2. Terminology

Flow Specification (FlowSpec): A flow specification is an n-tuple consisting of several matching criteria that can be applied to IP traffic, including filters and actions. Each FlowSpec consists of a set of filters and a set of actions.

2.1. 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].

3. Overview of Proposal

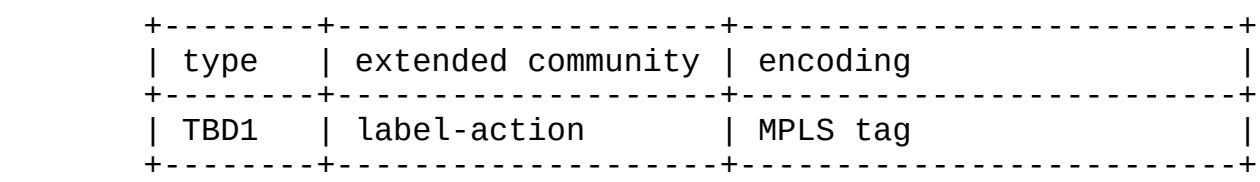
This document proposes adding a BGP-FS action in an extended community alters the label switch path associated with a matched flow. If the match does not have a label switch path, this action is skipped.

The BGP flow specification (BGP-FS) policy rule could match on the destination prefix and then utilize a BGP-FS action to adjust the label path associated with it (push/pop/swap tags.) Or a BGP-FS policy rule could match on any set of BGP-FS match conditions associated with a BGP-FS action that adjust the label switch path (push/pop/swap).

draft-ietf-yong-flowspec-mpls-match provides a match BGP-FS that may be used with this action to match and direct MPLS packets.

4. Protocol Extensions

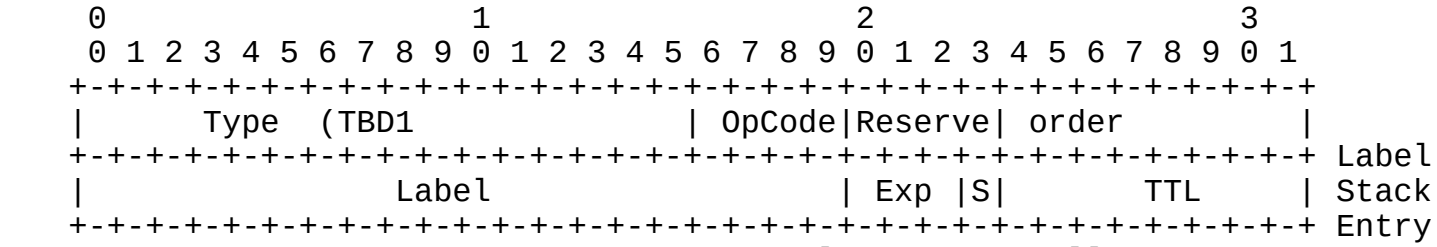
A new label-action is defined as BGP extended community value based on Section 7 of [RFC5575].



type	extended community	encoding
TBD1	label-action	MPLS tag

Figure 1

Label-action is described below:



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			
Type (TBD1		OpCode | Reserve | order	
Label		Exp | S | TTL	Label Stack Entry

The use and the meaning of these fields are as follows:

Type: the same as defined in [RFC4360]

Figure 2

OpCode: Operation code

OpCode	Function
0	Push the MPLS tag
1	Pop the outermost MPLS tag in the packet
2	Swap the MPLS tag with the outermost MPLS tag in the packet
3~15	Reserved

* where:

* When the Opcode field is set to 0, the label stack entry Should be pushed on the MPLS label stack.

* When the OpCode field is set to 1, the label stack entry is invalid, and the router SHOULD pop the existing outermost MPLS tag in the packet.

* When the OpCode field is set to 2, the router SHOULD swap the label stack entry with the existing outermost MPLS tag in the packet. If the packet has no MPLS tag, it just pushes the label stack entry.

* Note-1: The OpCode 0 or 1 may be used in some SDN networks, such as the scenario described in [I-D.filsfils-spring-segment-routing-central-epe].

* The OpCode 2 can be used in traditional BGP MPLS/VPN networks.

Reserved: all zeros

Order: within multiple label actions A FlowSpec rule MAY be associated with one or more ordering label-action each in an extended community. If multiple label-actions occur, this field gives the order of this action within that group. If two MPLs actions arrive with the same order the last mpls action received for an order will be used.

Label: the same as defined in [RFC3032]

Bottom of Stack (S): the same as defined in [RFC3032]. It SHOULD be invalid, and set to zero by default. It MAY be modified by the forwarding router locally.

Time to Live (TTL): the same as defined in [RFC3032]. It MAY be modified by the forwarding router locally.

Experimental Use (Exp): the same as defined in [RFC3032]. It MAY be modified by the forwarding router according to the local routing policy.

5. Deployment Examples

5.1. Exampel 1 - MPLS Filter + MPLS Action

Forwarding information for the traffic
for source: IP2, Destination: IP1

Purpose of BGP-FS filters: send DDoS traffic to IDS/IPS server

```
          PE1:   in(<IP2,IP1>) --> out(Label1)
       ASBR1: in(Label1) --> out(Label1)
       ASBR2: in(Label1) --> out(Label2)
       PE2:   in(Label2) --> out(--)

            |<------AS1----->|    |<------AS2----->|
            +-----+    +------+    +------+    +-----+
VPN 1,IP1..| PE1 |====|ASBR-1|----|ASBR-2|====| PE2 |..IDS/IPS
      IP2  +-----+    +------+    +------+    +-----+
                |-----label 1---------||-label 2---------|
            |---------BGP VPN Flowspec LSP--------->|
```

Figure 1 - Forwarding Diagram

```
        locally configured filters
          Filters:
             destination ip prefix:IP2/32
             source      ip prefix:IP1/32
          Action:
             put on LSP with Label 1

       PE-2 Installs:
             BGP-FS Filter:
                MPLS filter for Label 1 and label 2
         BGP-FS Actions:
            Traffic-Rate limit
            MPLS POP

       PE-2 Sends to ASBR-2
          BGP-FS Filter
            MPLS filter for label 1 and Label 2
          BGP-FS Actions:
            Traffic-Rate limit
            Label SWAP 1 to 2

       PE-1 Sends to ASBR 1
          BGP-FS filter
                MPLS filter for label 1
              BGP-FS Actions
              Traffic-Rate limit
```

5.2. Example 2 - IP filter + MPLS action

Forwarding information for the traffic from IP1 to IP2 in the Routers:
PE1: in(<IP2,IP1>) --> out(Label2)
ASBR1: in(Label2) --> out(Label3)
ASBR2: in(Label3) --> out(Label4)
PE2: in(Label4) --> out(--)

Labels allocated by Flow policy process
Label4 allocated by PE2
Label3 allocated by ASBR2
Label2 allocated by ASBR1

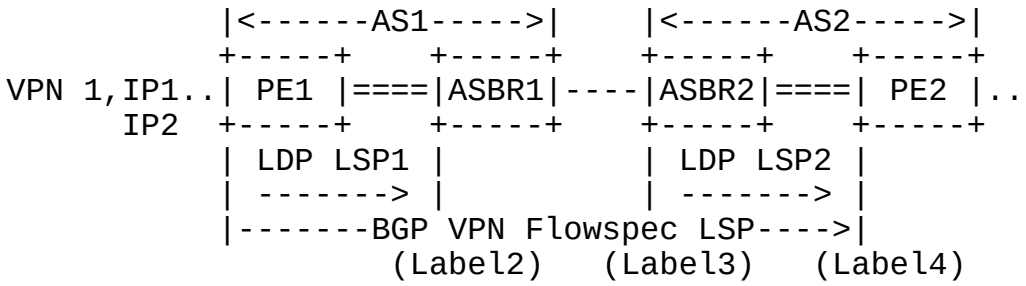


Figure 1 - Forwarding Diagram

BGP-FS rule1 (locally configured)
Filters:
destination ip prefix:IP2/32
source ip prefix:IP1/32
Actions:
traffic-marking: 1
MPLS POP

Note:
The following Extended Communities are added/deleted
[rule-1a] BGP-FS action MPLS POP [used on PE2]
[rule-1b] BGP-FS action SWAP 4 [used on ASBR-2]
[rule-1c] BGP-FS action SWAP 3 [used on ASBR-1]
[rule-1d] BGP-FS action push 2 [used on PE1]

BGP Filter rules

```
     PE-2 Changes BGP-FS rule-1a to rule-1b prior to sending
         Clears Extended Community: BGP-FS action MPLS POP
         Adds   Extended Community: BGP-FS action MPLS SWAP 4

    ASBR-2 receives BGP-FS rule-1b (NRLI + 2 Extended Community)
           Installs the BGP-FS rule-1b (MPLS SWAP 4, traffic-marking)
           Changes BGP-FS rule-1b to rule-1c prior to sending to ASBR1
           Clear Extended Community: BGP-FS action MPLS SWAP 4
           Adds  Extended Community: BGP-FS action MPLS SWAP 3


    ASBR-1 Receives BGP-FS rule-1c (NLRI + 2 Extended Community)
           Installs the BGP-FS rule-1c (MPLS SWAP 3, traffic-marking
           Changes BGP-FS rule-1c to rule-1d prior to sending to PE-2
           Clear Extended Community: BGP-FS action MPLS SWAP 3
           Adds  Extended Community: BGP-FS action MPLS SWAP 2

    PE-1   Receives BGP-FS rule-1d (NLRI + 2 Extended Communities)
           Installs BGP-FS rule-1d action [MPLS SWAP 2, traffic-marking]
```

6. Security Considerations

The validation of BGP Flow Specification policy in NLRI is considered in [I-D.hares-idr-flowspec-combo] for option 1, and for option 2. Additional security has been proposed in [I-D.ietf-idr-bgp-flowspec-oid]. A BGP5575bis document will consider the revised security.

For Option 1, the MPLS Match can be one of the match filters, and and the final match is an "AND" of all the filters. Match filters are tested in the order specified in [I-D.hares-idr-flowspec-combo] and/ or an RFC5575bis document.

[I-D.hares-idr-flowspec-combo] suggests a default order for filters and for the BGP-FS action proposed after [RFC5575], and this document discusses how conflicts between action are handled.

7. IANA Considerations

This section complies with [RFC7153]

IANA is requested to a new entry in "Flow Spec action types registry" with the following values:

Value Name:	Value	Reference
Lable Action	TBD	[this document]

8. Acknowledgement

The authors would like to thank Shunwan Zhuang, Zhenbin Li, Peng Zhou and Jeff Haas for their comments.

9. References

9.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <http://www.rfc-editor.org/info/rfc2119>.

[RFC3031] Rosen, E., Viswanathan, A., and R. Callon, "Multiprotocol Label Switching Architecture", RFC 3031, DOI 10.17487/RFC3031, January 2001, <http://www.rfc-editor.org/info/rfc3031>.

[RFC3032] Rosen, E., Tappan, D., Fedorkow, G., Rekhter, Y., Farinacci, D., Li, T., and A. Conta, "MPLS Label Stack Encoding", RFC 3032, DOI 10.17487/RFC3032, January 2001, <http://www.rfc-editor.org/info/rfc3032>.

[RFC3107] Rekhter, Y. and E. Rosen, "Carrying Label Information in BGP-4", RFC 3107, DOI 10.17487/RFC3107, May 2001, <http://www.rfc-editor.org/info/rfc3107>.

[RFC4271] Rekhter, Y., Ed., Li, T., Ed., and S. Hares, Ed., "A Border Gateway Protocol 4 (BGP-4)", RFC 4271, DOI 10.17487/RFC4271, January 2006, <http://www.rfc-editor.org/info/rfc4271>.

[RFC4360] Sangli, S., Tappan, D., and Y. Rekhter, "BGP Extended Communities Attribute", RFC 4360, DOI 10.17487/RFC4360, February 2006, <http://www.rfc-editor.org/info/rfc4360>.

[RFC4364] Rosen, E. and Y. Rekhter, "BGP/MPLS IP Virtual Private Networks (VPNs)", RFC 4364, DOI 10.17487/RFC4364, February 2006, <http://www.rfc-editor.org/info/rfc4364>.

[RFC5575] Marques, P., Sheth, N., Raszuk, R., Greene, B., Mauch, J., and D. McPherson, "Dissemination of Flow Specification Rules", RFC 5575, DOI 10.17487/RFC5575, August 2009, <http://www.rfc-editor.org/info/rfc5575>.

[RFC7153] Rosen, E. and Y. Rekhter, "IANA Registries for BGP Extended Communities", RFC 7153, DOI 10.17487/RFC7153, March 2014, <http://www.rfc-editor.org/info/rfc7153>.

[RFC7674] Haas, J., Ed., "Clarification of the Flowspec Redirect Extended Community", RFC 7674, DOI 10.17487/RFC7674, October 2015, <http://www.rfc-editor.org/info/rfc7674>.

9.2. Informative References

[I-D.filsfils-spring-segment-routing-central-epe] Filsfils, C., Previdi, S., Patel, K., Shaw, S., Ginsburg, D., and D. Afanasiev, "Segment Routing Centralized Egress Peer Engineering", draft-filsfils-spring-segment-routing-central-epe-05 (work in progress), August 2015.

[I-D.hares-idr-flowspec-combo] Hares, S., "An Information Model for Basic Network Policy and Filter Rules", draft-hares-idr-flowspec-combo-01 (work in progress), March 2016.

[I-D.ietf-idr-bgp-flowspec-oid] Uttaro, J., Filsfils, C., Smith, D., Alcaide, J., and P. Mohapatra, "Revised Validation Procedure for BGP Flow Specifications", draft-ietf-idr-bgp-flowspec-oid-02 (work in progress), January 2014.

[I-D.ietf-idr-flow-spec-v6] McPherson, D., Raszuk, R., Pithawala, B., Andy, A., and S. Hares, "Dissemination of Flow Specification Rules for IPv6", draft-ietf-idr-flow-spec-v6-07 (work in progress), March 2016.

[I-D.ietf-idr-flowspec-l2vpn] Weiguo, H., Litkowski, S., and S. Zhuang, "Dissemination of Flow Specification Rules for L2 VPN", draft-ietf-idr-flowspec-l2vpn-03 (work in progress), November 2015.

[I-D.yong-idr-flowspec-mpls-match] Yong , L., Hares , S., Liang , Q., and J. You , "BGP Flow Specification Filter for MPLS Label", March 2016.

Authors' Addresses

Qiandeng Liang
Huawei
101 Software Avenue, Yuhuatai District
Nanjing 210012
China

Email: liangqiandeng@huawei.com

Susan Hares
Huawei
7453 Hickory Hill
Saline, MI 48176
USA

Email: shares@ndzh.com

Jianjie You
Huawei
101 Software Avenue, Yuhuatai District
Nanjing 210012
China

Email: youjianjie@huawei.com

Robert Raszuk
Bloomberg LP
731 Lexington Ave
New York City, NY 10022
USA

Email: robert@raszuk.net

Dan Ma
Cisco

Email: danma@cisco.com