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Export BGP community information in IP Flow Information Export (IPFIX)
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Abstract

This draft specifies an extension to the IPFIX information model defined in [RFC7012] to export the BGP community [RFC1997] information. Three information elements, `bgpCommunity`, `bgpSourceCommunityList` and `bgpDestinationCommunityList`, are introduced in this document to carry the BGP community information. `bgpCommunity`, containing exactly one BGP community value, is used to consist the list in `bgpSourceCommunityList` and `bgpDestinationCommunityList`, which are corresponding to a specific flow's source IP and destination IP respectively.

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[1.](#) Introduction

IP Flow Information Export (IPFIX) [[RFC7011](#)] provides network administrators with traffic flow information using the information elements (IEs) defined in [[IANA-IPFIX](#)] registries. Based on the traffic flow information, network administrators know the amount and direction of the traffic in their network, then they can optimize their network when needed. For example, they can steer some flows from the congested links to the low utilized links.

[IANA-IPFIX] has already defined the following IEs for traffic flow information exporting in different grain: sourceIPv4Address, sourceIPv4Prefix, destinationIPv4Address, destinationIPv4Prefix, bgpSourceAsNumber, bgpDestinationAsNumber, bgpNextHopIPv4Address, etc. In some circumstances, however, especially when traffic engineering and optimization are used in the Tier 1 or Tier 2 operators' backbone networks, traffic flow information based on these

IEs is not suitable. Flow information based on IP address or IP prefix is much more meduculous. On the contrary, flow information based on AS number is too coarse. BGP community [[RFC1997](#)], which describes a group of routes sharing some common properties, is preferably used for fine granularity traffic engineering

[Community-TE] [[RFC4384](#)]. Unfortunately, [[IANA-IPFIX](#)] has no IE defined for BGP community information, yet.

Flow information based on BGP community can be collected by a mediator defined in [[RFC6183](#)]. Mediator is responsible for the correlation between flow information and BGP community. However no IEs are defined in [[RFC6183](#)] for exporting BGP community information in IPFIX. Furthermore, to correlate the BGP community with the flow information, mediator needs to learn BGP routes and lookup in the BGP routing table to get the matching entry for the specific flow. Neither BGP route learning nor routing table lookup is trivial for a mediator. Mediator is mainly introduced to release the performance requirement for the exporter [[RFC5982](#)]. In fact, to obtain the information for BGP related IEs that have already been defined, such as `bgpSourceAsNumber`, `bgpDestinationAsNumber`, and `bgpNextHopIPv4Address`, etc, exporter has to hold the up-to-date BGP routing table and look up in the BGP routing table. The exporter can get the community information in the same procedure. So, getting BGP community information adds no more requirement for exporter. Some vendors have already implemented this feature in their exporters using private IEs. So, exporter is RECOMMENDED to export the BGP community information in IPFIX directly, other than the mediator.

This draft specifies an extension to the IPFIX information model defined in [[RFC7012](#)] to export the BGP community information. Three IEs, `bgpCommunity`, `bgpSourceCommunityList` and `bgpDestinationCommunityList`, are introduced to complete this task. `bgpCommunity` contains one BGP community value. `BgpSourceCommunityList` consists of a list of `bgpCommunity` corresponding with the source IP address of a specific flow, and `bgpDestinationCommunityList` consists of a list of `bgpCommunity` corresponding with the destination IP address of a specific flow.

`BgpCommunity`, `bgpSourceCommunityList` and `bgpDestinationCommunityList` IEs are applicable for both IPv4 and IPv6 traffic. Both exporter and mediator can use these three IEs to export BGP community information

in IPFIX.

2. Terminology

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. BGP Community Information Elements

In order to export BGP community information along with other flow information defined by IPFIX, we need to introduce three new IEs. One is `bgpCommunity`, which is used to identify that the value in this IE is BGP community [[RFC1997](#)]. The other two are `bgpSourceCommunityList` and `bgpDestinationCommunityList`. They both are `basicList` [[RFC6313](#)] of `bgpCommunity`. `bgpSourceCommunityList` and `bgpDestinationCommunityList` are used to export BGP community information corresponding to a specific flow's source IP and destination IP respectively. Flow information based on BGP community can then be accumulated and analysed by the collector or other applications.

The details of these three new introduced IEs are illustrated below, including name, ID, type, semantics, description and units.

3.1. `bgpCommunity`

ElementID	to be assigned by IANA, 458 is suggested
Name	<code>bgpCommunity</code>
Data Type	<code>unsigned32</code>
Data Type Semantics	<code>identifier</code>
Description	BGP community as defined in [RFC1997]

Units	none
-------	------

Figure 1: bgpCommunity

3.2. bgpSourceCommunityList

ElementID	to be assigned by IANA, 459 is suggested
Name	bgpSourceCommunityList
Data Type	basicList, as specified in [RFC6313]
Data Type Semantics	list
Description	zero or more BGP communities corresponding with source IP address of a specific flow
Units	none

Figure 2: bgpSourceCommunityList

3.3. bgpDestinationCommunityList

ElementID	to be assigned by IANA, 460 is suggested
-----------	--

Name	bgpDestinationCommunityList
Data Type	basicList, as specified in [RFC6313]
Data Type Semantics	list
Description	zero or more BGP communities corresponding with destination IP address of a specific flow
Units	none

Figure 3: bgpDestinationCommunityList

4. Security Considerations

This document only defines three new IEs for IPFIX. So, this document itself does not directly introduce security issues. The same security considerations as for the IPFIX Protocol Specification [\[RFC7011\]](#) and Information Model [\[RFC7012\]](#) apply.

5. IANA Considerations

This draft specifies three new IPFIX IEs, bgpCommunity, bgpSourceCommunityList and bgpDestinationCommunityList, to export BGP community information along with other flow information.

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The Element IDs for these three IEs are solicited to be assigned by IANA. Number 458, 459 and 460 are suggested for bgpCommunity, bgpSourceCommunityList and bgpDestinationCommunityList, respectively.

6. Acknowledgements

The authors would like to thank Benoit Claise and Paul Aitken for discussion and suggestions to promote this document.

7. References

7.1. Normative References

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[RFC7011] Claise, B., Ed., Trammell, B., Ed., and P. Aitken, "Specification of the IP Flow Information Export (IPFIX) Protocol for the Exchange of Flow Information", STD 77, [RFC 7011](#), DOI 10.17487/RFC7011, September 2013, <<http://www.rfc-editor.org/info/rfc7011>>.

[RFC7012] Claise, B., Ed. and B. Trammell, Ed., "Information Model for IP Flow Information Export (IPFIX)", [RFC 7012](#), DOI 10.17487/RFC7012, September 2013, <<http://www.rfc-editor.org/info/rfc7012>>.

7.2. Informative References

[Community-TE]

Shao, W., Devienne, F., Iannone, L., and JL. Rougier, "On the use of BGP communities for fine-grained inbound traffic engineering", *Computer Science* 27392(1):476-487, November 2015.

[IANA-IPFIX]

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- [RFC6183] Kobayashi, A., Claise, B., Muenz, G., and K. Ishibashi, "IP Flow Information Export (IPFIX) Mediation: Framework", [RFC 6183](#), DOI 10.17487/RFC6183, April 2011, <<http://www.rfc-editor.org/info/rfc6183>>.

[Appendix A](#). Application Example

In this section, we give an example to show the encoding format for the three new introduced IEs.

Flow information including BGP communities is shown in the below table. Suppose we want all the fields to be reported by IPFIX.

Source ip	Destination ip	Source BGP community	Destination BGP community
1.1.1.1	2.2.2.2	1:1001,1:1002,8:1001	2:1002,8:1001
3.3.3.3	4.4.4.4	3:1001,3:1002,8:1001	4:1001,8:1001

Figure 4: Flow information including BGP communities

[A.1](#). Template Record


```

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
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|           SET ID = 2           |           Length = 24           |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|           Template ID = 256    |           Field Count = 4    |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|0| SourceIPv4Address = 8       |           Field length = 4   |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|0| DestinationIPv4Address = 12 |           Field length = 4   |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|0| bgpSourceCommunityList = 459|           Field length = 0xFFFF |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|0| bgpDestinationCommunityList |           Field length = 0xFFFF |
| |           = 460             |                               |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+

```

Figure 5: Template Record Encoding Format

In this example, the Template ID is 256, which will be used in the data record. The field length for bgpSourceCommunityList and bgpDestinationCommunityList is 0xFFFF, which means the length of this IE is variable, the actual length of this IE is indicated by the list length field in the basic list format as per [RFC6313].

A.2. Data Set

The data set is represented 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
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|           SET ID = 256           |           Length = 92           |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|           SourceIPv4Address = 1.1.1.1           |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|           DestinationIPv4Address = 2.2.2.2           |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|           255           |           List length = 17           |semantic=allof |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|           bgpCommunity = 458           |           Field Len = 4           |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|           BGP Source Community Value 1 = 1:1001           |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|           BGP Source Community Value 2 = 1:1002           |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|           BGP Source Community Value 3 = 8:1001           |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+

```

```

|      255      |      List length = 13      |semantic =allof|
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|      bgpCommunity = 458      |      Field Len = 4      |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|      BGP Destination Community Value 1 = 2:1002      |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|      BGP Destination Community Value 2 = 8:1001      |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|      SourceIPv4Address = 3.3.3.3      |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|      DestinationIPv4Address = 4.4.4.4      |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|      255      |      List length = 17      |semantic =allof|
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|      bgpCommunity = 458      |      Field Len = 4      |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|      BGP Source Community Value 1 = 3:1001      |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|      BGP Source Community Value 2 = 3:1002      |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|      BGP Source Community Value 3 = 8:1001      |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|      255      |      List length = 13      |semantic =allof|
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|      bgpCommunity = 458      |      Field Len = 4      |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|      BGP Destination Community Value 1 = 4:1001      |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|      BGP Destination Community Value 2 = 8:1001      |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+

```

Figure 6: Data Set Encoding Format

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