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Canonical textual representation of BGP Path Attributes
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Abstract

Various implementations of the Border Gateway Protocol (BGP) use different formats for displaying the Path Attributes. This document defines the preferred textual formatting which is recommended for the implementations to use for human interfaces.

To achieve consistent value formatting, this document formally updates RFC 9026 by canonicalizing the well-known community name formats.

This document updates RFC 4360, RFC 4577, RFC 7432, and ... by specifying the canonical textual formatting of extended communities specified there.

About This Document

This note is to be removed before publishing as an RFC.

The latest revision of this draft can be found at https://marenamat.github.io/ietf-draft-marenamat-idr-bgp-attribute-formatting/draft-marenamat-idr-bgp-attribute-formatting.html. Status information for this document may be found at https://datatracker.ietf.org/doc/draft-marenamat-idr-bgp-attribute-formatting/.

Discussion of this document takes place on the Inter-Domain Routing Working Group mailing list (mailto:idr@ietf.org), which is archived at https://mailarchive.ietf.org/arch/browse/idr/. Subscribe at https://www.ietf.org/mailman/listinfo/idr/.

Source for this draft and an issue tracker can be found at https://github.com/marenamat/ietf-draft-marenamat-idr-bgp-attribute-formatting.

Status of This Memo

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

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Table of Contents

1. Introduction

Over 30 years of BGP existence have created a difference in router user interfaces. While diversity is a good thing, displaying the same route attributes differently leads to user confusion and elevated need for learning vendor specifics. With the advent of APIs, often based on NETCONF and YANG, a need for canonical representation has arised.

While most attributes are either a value, or a structure of values, which can be easily modeled by YANG, with complex attributes like extended communities, there is a lot of subvariants and semantics in their values. Users and implementations usually format these values in a structured form which is hard to be modeled by YANG.

This document aims to summarize all of these in one place and specifies a standard way of defining canonical formatting for new BGP path attributes.

Deprecated and historic attributes are out of scope of this document.

2. Conventions and Definitions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

3. Simple Path Attributes

The following attributes, are listed simply for the sake of completeness. Their formatting is simple and easy to model coherently.

* Type 1 - ORIGIN

* Type 3 - NEXT_HOP

* Type 4 - MULTI_EXIT_DISC (MED)

* Type 5 - LOCAL_PREF

* Type 6 - ATOMIC_AGGREGATE

* Type 7 - AGGREGATOR

* Type 9 - ORIGINATOR_ID

* Type 10 - CLUSTER_LIST

4. AS_PATH Attribute

The AS_PATH attribute contains segments of ASN values. While this attribute is technically possible to be modelled coherently by YANG, there are situations where the AS_PATH value is expected to be rendered as a whole. In such cases, the contents of each segment SHOULD be displayed as decimal values separated by single spaces (ASCII 32).

In addition to that, boundary between two AS_SEQUENCE segments MAY be delimited by | (ASCII 124), and AS_CONFED_SEQUENCE SHOULD be parenthesized (ASCII 40 and 41).

Example: (65501 65502) 65503 65504 | 65505 65506 65506 65506

This would be an AS_CONFED_SEQUENCE of 65501 and 65502 followed by AS_SEQUENCE of 65503 and 65504, and another AS_SEQUENCE containing 65505 and then 65506 three times.

TODO: ABNF here?

5. COMMUNITIES Attribute

The COMMUNITIES attribute [RFC1997] is a set of uint32 values, which are semantically a pair of an AS number and an arbitrary uint16 value. Following the syntax used in [RFC8642] and in vast majority of current implementations, the value SHOULD be formatted as two decimal values with no leading zeros, joined by a single colon (ASCII 58) with no whitespace.

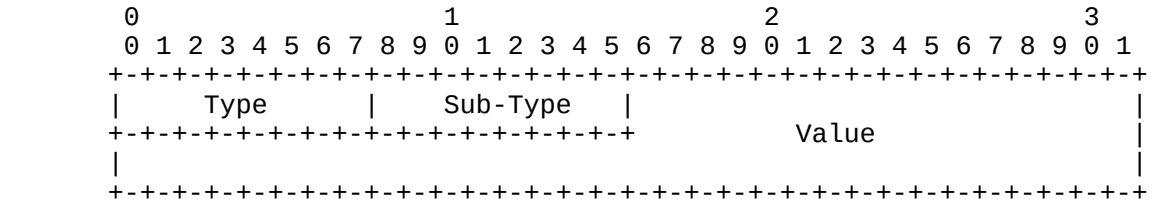
In addition to that, it is RECOMMENDED to format well-known communities as their string name.

For the sake of formatting consistency, the "Standby PE" as defined in [RFC9026] is hereby renamed to STANDBY_PE. The semantics stays the same.

TODO: ABNF here?

6. EXTENDED_COMMUNITIES Attribute

The EXTENDED_COMMUNITIES attribute [RFC4360] is a set of uint64 values with a complicated structure. Copying a modified schema from Section 2 of [RFC4360], the Type denotes how the value is further split into sub-values, and the Sub-Type denotes the meaning.



In general, the display format consists of the sub-type identifier followed by a colon and then formatted values, separated by colons (ASCII 58). Each sub-type has a string representation, which is a sequence of lowercase ascii letters, numbers and hyphens. The sub-type identifiers MUST be unique to the extent that the identifier together with the display format allows to determine the Type and Sub-Type values.

Every new definition of a Extended Community Type or Sub-Type SHOULD include a canonical textual representation of the value.

The following sections specify how the already specified Extended Community variants are expected to be formatted. The syntax is either reflecting the current practice adopted by the majority of vendors, or trying to unify the formatting where no majority exists.

6.1. Display format for AS-Specific and IPv4-Specific Type values

Two-Octet AS-Specific Extended Community (Type 0x00 and 0x40) ([RFC4360]) Sub-Type identifier followed by the ASN (Global Administrator) and local value (Local Administrator)

Example: route-target:65499:42

IPv4-Address-Specific Extended Community (Type 0x01 and 0x41) ([RFC4360]) Sub-Type identifier followed by the IPv4 address (Global Administrator) and local value (Local Administrator)

Example: route-origin:192.0.2.67:42

Four-Octet AS-Specific Extended Community (Type 0x02 and 0x42) ([RFC5668]) Sub-Type identifier followed by the ASN (Global Administrator) with an L suffix, and local value (Local Administrator). While it's possible, in some cases, to distinguish between four-octet and two-octet ASN without the suffix, it SHOULD be used in all cases to avoid confusion.

Example: route-target:65544L:22, route-origin:65511L:12345

6.2. Display format for Opaque Extended Community (Type 0x03 and 0x43)

Specified in [RFC4360].

(TODO)

6.2.1. Default Gateway Extended Community

Specified in Section 7.8 of [RFC7432]. Formatted as evpn-default-gateway with no colons.

6.3. Display format for EVPN Extended Communities (Type 0x06)

6.3.1. ESI Label Extended Community

Specified in Section 7.5 of [RFC7432]. Formatted as esi-label followed by flags and label value.

Flags: S for Single-Active, A for All-Active

Example: esi-label:A:67

6.3.2. ES-Import Route Target Extended Community

Specified in Section 7.6 of [RFC7432]. Formatted as es-import-target followed by the ES-Import value formatted as single bytes in hexadecimal notation.

Example: es-import-target:fe:ed:0d:b8:1e:a9

6.3.3. MAC Mobility Extended Community

Specified in Section 7.7 of [RFC7432]. Formatted as mac-mobility followed by flags and sequence number.

Flags: S for sticky/static, nothing otherwise

Example: mac-mobility:S:67, mac-mobility::42

7. Security Considerations

There are no security considerations in formatting the path attributes.

8. IANA Considerations

8.1. BGP Well-known Communities

IANA is requested to rename the "Standby PE" BGP community value (0xFFFF0009) to STANDBY_PE.

8.2. Registries for BGP Extended Communities

IANA is requested to add a column "Identifier" to all the Sub-Type registries as specified in Section 5.2 of [RFC7153]. The identifiers MUST NOT be reused in any other Sub-Type registries, unless explicitly specified.

The following data should be used to fill the newly added columns.

8.2.1. EVPN Extended Community Sub-Types

Sub-Type Value	Name	Identifier
0x00	MAC Mobility	mac-mobility
0x01	ESI Label	esi-label
0x02	ES-Import Route Target	es-import-target

Table 1

8.2.2. Transitive Two-Octet AS-Specific Extended Community Sub-Types

Sub-Type Value	Name	Identifier
0x02	Route Target	route-target
0x03	Route Origin	route-origin
0x05	OSPF Domain Identifier	ospf-domain-ident

Table 2

9. References

9.1. Normative References

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9.2. Informative References

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