Address-Prefix-Based Outbound Route Filter for BGP-4

Status of This Memo

Abstract

   This document defines a new Outbound Router Filter (ORF) type for
   BGP, termed "Address Prefix Outbound Route Filter", that can be used
   to perform address-prefix-based route filtering. This ORF-type
   supports prefix-length- or range-based matching, wild-card-based
   address prefix matching, as well as the exact address prefix matching
   for address families.

1. Introduction

   The Outbound Route Filtering Capability defined in [BGP-ORF] provides
   a mechanism for a BGP speaker to send to its BGP peer a set of
   Outbound Route Filters (ORFs) that can be used by its peer to filter
   its outbound routing updates to the speaker.

   This documents defines a new ORF-type for BGP, termed "Address Prefix
   Outbound Route Filter (Address Prefix ORF)", that can be used to
   perform address-prefix-based route filtering. The Address Prefix ORF
   supports prefix-length- or range-based matching, wild-card-based
   address prefix matching, as well as the exact address prefix matching
   for address families [BGP-MP].

2. Address Prefix ORF-Type

   The Address Prefix ORF-Type allows one to express ORFs in terms of
   address prefixes. That is, it provides address-prefix-based route
   filtering, including prefix-length- or range-based matching, as well
   as wild-card address prefix matching.

   Conceptually, an Address Prefix ORF entry consists of the fields
   <Sequence, Match, Length, Prefix, Minlen, Maxlen>.

The "Sequence" field specifies the relative ordering of the entry
among all the Address Prefix ORF entries.

The "Match" field specifies whether this entry is "PERMIT" (value 0)
or "DENY" (value 1).

The "Length" field indicates the length (in bits) of the address
prefix. A length of zero indicates a prefix that matches all (as
specified by the address family) addresses (with the prefix itself of
zero octets).

The "Prefix" field contains an address prefix of an address family.

The "Minlen" field indicates the minimum prefix length (in bits) that
is required for "matching". The field is considered unspecified with
a value of 0.

The "Maxlen" field indicates the maximum prefix length (in bits) that
is required for "matching". The field is considered unspecified with
a value of 0.

The fields "Sequence", "Length", "Minlen", and "Maxlen" are all
unsigned integers.

This document imposes the following requirement on the values of
these fields:

    $0 <= Length < Minlen <= Maxlen$

However, tests related to the "Minlen" or "Maxlen" value should be
omitted when the "Minlen" or "Maxlen" field (respectively) is
unspecified.

In addition, the "Maxlen" value must be no more than the maximum
length (in bits) of a host address for a given address family
[BGP-MP].

3. Address Prefix ORF Encoding

   The value of the ORF-Type for the Address Prefix ORF-Type is 64.

   An Address Prefix ORF entry is encoded as follows. The "Match" field
   of the entry is encoded in the "Match" field of the common part
   [BGP-ORF], and the remaining fields of the entry are encoded in the
   "Type specific part", as shown in Figure 1.

```
            +-------------------------------+
            |   Sequence (4 octets)         |
            +-------------------------------+
            |   Minlen   (1 octet)          |
            +-------------------------------+
            |   Maxlen   (1 octet)          |
            +-------------------------------+
            |   Length   (1 octet)          |
            +-------------------------------+
            |   Prefix   (variable length)  |
            +-------------------------------+
```
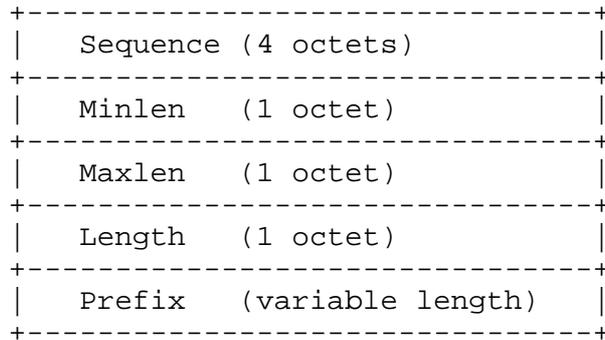
            Figure 1: Address Prefix ORF Encoding

   Note that the "Prefix" field contains the address prefix followed by
   enough trailing bits to make the end of the field fall on an octet
   boundary. The value of the trailing bits is irrelevant.

4. Address Prefix ORF Matching

   In addition to the general matching rules defined in [BGP-ORF],
   several Address-Prefix-ORF-specific matching rules are defined as
   follows.

   Consider an Address Prefix ORF entry, and a route maintained by a BGP
   speaker with Network Layer Reachability Information (NLRI) in the
   form of <Prefix, Length>.

   The route is considered as "no match" to the ORF entry if the NLRI is
   neither more specific than, nor equal to, the <Prefix, Length> fields
   of the ORF entry.

   When the NLRI is either more specific than, or equal to, the <Prefix,
   Length> fields of the ORF entry, the route is considered as a match
   to the ORF entry only if the NLRI match condition as listed in Table
   1 is satisfied.

```
          ORF Entry                      NLRI
       Minlen     Maxlen          Match Condition
     +-----------------------------------------------------+
     | un-spec.   un-spec.        NLRI.length == ORF.length |
     +-----------------------------------------------------+
     | specified  un-spec.        NLRI.length >= ORF.Minlen |
     +-----------------------------------------------------+
     | un-spec.   specified       NLRI.length <= ORF.Maxlen |
     +-----------------------------------------------------+
     | specified  specified       NLRI.length >= ORF.Minlen |
     |                        AND NLRI.length <= ORF.Maxlen |
     +-----------------------------------------------------+
```

     Table 1: Address Prefix ORF Matching

   When more than one Address Prefix ORF entry matches the NLRI of the
   route, the "first-match" rule applies. That is, the ORF entry with
   the smallest sequence number (among all the matching ORF entries) is
   considered as the sole match, and it would determine whether the
   route should be advertised.

   The assignment of the sequence numbers is a local matter for the BGP
   speaker that sends the Address Prefix ORF entries.

5. IANA Considerations

   This document specifies a new Outbound Route Filtering (ORF) type,
   Address Prefix ORF. The value of the ORF-type is 64.

6. Security Considerations

   This extension to BGP does not change the underlying security issues
   in [BGP-4].

7. Normative References

   [BGP-4]   Rekhter, Y., Ed., Li, T., Ed., and S. Hares, Ed., "A Border
              Gateway Protocol 4 (BGP-4)", RFC 4271, January 2006.

   [BGP-MP]   Bates, T., Chandra, R., Katz, D., and Y. Rekhter,
              "Multiprotocol Extensions for BGP-4", RFC 4760, January
              2007.

   [BGP-ORF] Chen, E., and Y. Rekhter, "Outbound Route Filtering
              Capability for BGP-4", RFC 5291, August 2008.

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