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3. Abstract

There is a need for Tunnel end-point discovery within and across Autonomous Systems. BGP is the only protocol that is widely-spoken across Autonomous Systems and can carry this information. This document defines how BGP speakers can convey Tunnel end-point reachability information.

4. Introduction
Two end-points of a Tunnel need to know the end-point information and its binding to a network address at the remote point. Normally, this can be statically shared and configured. But in case of a large network where there may be a need for a large number of tunnels, the number of tunnel end-points that need to be exchanged and maintained, grows. It then needs to be exchanged and maintained using an inter-AS protocol.

5. The IPv4-Tunnel SAFI

This document defines a new SAFI called the IPv4-Tunnel SAFI. The <AFI, SAFI> [IANA-AFI] [IANA-SAFI] value pair used to identify this SAFI is (AFI=1, SAFI=TBD).

The tunnel end point address will be carried as an NLRI in the MP_REACH attribute for this SAFI. The NLRI Format will be a 2-byte Reserved field followed by a 4-byte IPv4 address.

6. BGP Attribute

The BGP SSA Attribute [BGP-SSA] will be used to carry the Tunnel end-point information.

The Value Field of the BGP SSA Attribute, MUST contain at least one of the following valid Type codes for this SAFI. It MAY contain one or more TLVs with these Type codes.

Type 1: L2TPv3 Tunnel information
Type 2: mGRE Tunnel information
Type 3: IPSec Tunnel information
Type 4: MPLS Tunnel information

6.1. L2TPv3 Tunnel information TLV

The L2TPv3 Tunnel Information TLV has a type of 1. The value part of the L2TPv3 Tunnel Information Type contains the following:

- Preference (2 Octets)
- Flags (1 Octet)
- Cookie Length (1 Octet)
- Session ID (4 Octets)
- Cookie (Variable)

The L2TPv3 Tunnel Information TLV looks as follows:
where

Length A 2 Octet field that specifies the length of the L2TPv3 attribute in octets. The value contained in this Length field MUST not exceed the total length of the BGP SSA [SSA] Attribute minus the total length of any prior TLVs.

Preference A 2 Octet field containing a Preference associated with the TLV. The Preference value indicates a preferred ordering of tunneling encapsulations according to the sender. The recipient of the information SHOULD take the sender’s preference into account in selecting which encapsulation it will use. A higher value indicates a higher preference.

Flags A 1 Octet field containing flag-bits. The leftmost bit indicates whether Sequence numbering is to be used or not. The remaining bits are reserved for future use.

Cookie Length Cookie Length is a 1 Octet field that contains the length of the Variable length Cookie.

Session ID A 4 Octet field containing a non-zero identifier for a session.

Cookie Cookie is a variable length (maximum 64 bits), value used by L2TPv3 to check the association of a received data message with the
session identified by the Session ID.

The default value of the Length Field for the L2TPv3 Tunnel information TLV is between 8 and 16 bytes, depending on the length of the Cookie field specified in Cookie length. If the length of the TLV is greater than that value, the subsequent portion of the Value field contains one or more sub-TLVs.

A Sub-TLV when present is of the following format:

```
0                   1
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Sub-Type     | Length        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      Value (Variable)         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

where Sub-Type & Length are of 1-Octet each & the Value field is variable as specified by the Length.

6.2. mGRE Tunnel Information TLV

The mGRE Tunnel Information Type has a Type 2. The value part of the mGRE Tunnel Information Type contains the following:

- Preference (2 Octets)
- Flags (1 Octet)
- mGRE Key (0 or 4 Octets)

The mGRE Tunnel Information TLV looks as follows:

```
0                   1
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      Type = 0x02              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      Length  (2 octets)       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      Preference (2 octets)    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|S|K|  Flags                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
<table>
<thead>
<tr>
<th>mGRE Key (4 Octets)</th>
</tr>
</thead>
<tbody>
<tr>
<td>++++++++++++++++++++</td>
</tr>
</tbody>
</table>

Length A 2 Octet field that specifies the length of the mGRE information in octets. The value contained in this Length field MUST not exceed the total length of the BGP SSA [SSA] Attribute minus the total length of any prior TLVs.

Preference A 2 Octet field containing a Preference associated with the TLV. The Preference value indicates a preferred ordering of tunneling encapsulations according to the sender. The recipient of the information SHOULD take the sender’s preference into account in selecting which encapsulation it will use. A higher value indicates a higher preference.

Flags A 1 Octet field containing flag-bits. The leftmost bit indicates whether Sequence numbering is to be used or not. The 2nd bit indicates whether an mGRE Key is present or not. The remaining bits are reserved for future use.

mGRE Key A 4 Octet field containing an optional mGRE Key.

If the Length field of the TLV contains a value greater than 3 Octets plus the value specified in the Key Length, the subsequent portion of the Value field contains one or more sub-TLVs.

A Sub-TLV when present is of the following format:

```
0    1
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
++++++++++++++++++++++++++++++
| Sub-Type   | Length   |
++++++++++++++++++++++++++++++
| Value (Variable) |
++++++++++++++++++++++++++++++
```

where Sub-Type & Length are of 1-Octet each & the Value field is variable as specified by the Length.

6.3. IPSec Tunnel Information TLV
The IPSec Tunnel Information Type has a Type 3. The format of the IPSec Tunnel Information TLV is TBD.

6.4. MPLS TLV

The MPLS TLV has a Type 4. The format of the MPLS TLV is TBD.

7. Capability Advertisement

A BGP speaker that wishes to exchange the IPv4-Tunnel SAFI, MUST use the MP_EXT Capability Code as defined in [BGP-MP], to advertise the corresponding (AFI, SAFI) pair.

A BGP speaker MAY participate in the distribution of IPv4-Tunnel information.

8. Operation

A BGP Speaker that receives the Capability for the IPv4-Tunnel SAFI, MAY advertise the IPv4-Tunnel prefixes to that peer.

In the UPDATE message for this SAFI sent to a peer, a BGP speaker MUST only advertise the SAFI-specific attribute [SSA] TLVs that are defined as valid for this SAFI.

If a BGP Speaker receives an SSA TLV that it does not recognize, it will accept it and propagate it to other peers.

9. Deployment Considerations

In order for the Tunnels to come up between two end-points, the BGP Speakers advertising the Tunnel end-points using the IPv4 Tunnel SAFI, MUST exchange at least one common encapsulation option.

10. Security Considerations

This extension to BGP does not change the underlying security issues.

11. Acknowledgements

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12. References


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16. Expiration Date

This memo is filed as <draft-nalawade-kapoor-tunnel-safi-00.txt>, and expires December, 2003.