Signaling-based configuration for supporting multiple upstream interfaces in IGMP/MLD proxies

draft-contreras-pim-multiif-config-00

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**Background** (draft-asaeda-pim-multiif-igmpmldproxy-05)

- There are many situations where an IGMP/MLD proxy is multiply attached to the same or different networks
  - (e.g., Internet and Intranet, different slices in 5G) or by means of different interfaces (e.g., ethernet and wireless link, LTE and WiFi)
- RFC4605 does not support such multihoming situations.
- The purpose is to enable an IGMP/MLD proxy device to use multiple upstream interfaces and receive multicast packets through these interfaces.
Upstream Selection Mechanisms

- Static Upstream Interface Selection
  - Channel-Based Selection
  - Subscriber-Based Selection
  - Priority-Based Selection

- Automatic Upstream Interface Selection
  - Signaling-based Upstream Interface Configuration
    - This requires IGMP/MLD extensions
    - Proposal: to leverage on the extension mechanism defined in RFC9279

- Controller-based Upstream Interface Configuration
  - SDN-like centralized control
Motivation

• To allow hosts to express their preferences to the proxy in respect to:
  • The upstream interface to be used for retrieving a content from specific source(s)
  • The possibility of simultaneously receive the content from more than one of those upstream interfaces, for robustness
• To allow hosts to know what is the proxy upstream interface being used for delivering a requested content
Two aspects to consider

- Policies defined in the IGMP/MLD Proxy for selecting upstream interfaces
  - Specific user (source IP)
  - (S,G)
  - (*,G)
  - (S,*)

- Signaling situations
  - Multicast channel/source state retrieval per upstream interface
  - Multicast channel/source request from one or more upstream interfaces
  - Maintenance of multicast membership on the downstream interfaces including information of the upstream interface used per channel and source

These can be common to the other Upstream Selection Mechanisms

These are particular of this signaling method and can be defined as extensions following RFC9279
Signaling logic

Multicast channel/source state retrieval per upstream interface

Proxy

Host

Report extension (6.1.1)

Query extension (6.2.1)

Multicast channel/source request from one or more upstream interfaces

Proxy

Host

Report extension (6.1.2)

Query extension (6.2.2)

Information of the upstream interface used per channel and source (as part of the Query message)

Proxy

Host

Query extension (6.2.2)
Proposed extensions (1/4)
Report message extensions

• Multicast channel/source state retrieval per upstream interface
  • Purpose: to get from the proxy information about the upstream interface(s) and source(s) providing the multicast addresses indicated in the message.

```
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---------------------------------------------+
<table>
<thead>
<tr>
<th>Discovery Request Type</th>
<th>Discovery Request Length</th>
</tr>
</thead>
</table>
+---------------------------------------------+
```

* Discovery Request Type: 2 octets. The type of the Discovery Request TLV extension is TBD-1.

* Discovery Request Length: 2 octets. This field specifies the total length in octets of the TLV. Since no Value field is considered for this TLV, the length is set to 0.

• **Note**: initial “discovery” term will be changed to “state retrieval” in -01 version to avoid confusion
Proposed extensions (2/4)

Report message extensions

- Request of channel/source from one or more upstream interfaces
  - Purpose: to request to the proxy the subscription to one multicast group indicating the sources and upstream interfaces of interest.
Proposed extensions (3/4)
Query message extensions

- Response for state retrieval of upstream interface(s) and associated sources for a session/channel
  - Purpose: to serve as response of the state retrieval message from the proxy

where

* Source Address index enumerates the Source Address Record stated in the conventional MLD Query message for the Multicast Address Group stated there.
* Reserved field is reserved for future use.
* List of Upstream Interfaces indicates the number of candidate upstream interfaces for the multicast address record. This number should be higher or equal to the value in Simult If. Otherwise, the robust reception will be ignored. (Note: to be revisited after further analysis)
* Upstream Interface index provides the identifier of the candidate upstream interface. This identifier follows the encoding in [RFC8343].

<table>
<thead>
<tr>
<th>0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1</td>
</tr>
<tr>
<td>Discovery Response Type</td>
</tr>
<tr>
<td>Discovery Response Value</td>
</tr>
</tbody>
</table>

* Discovery Response Type: 2 octets. The type of the Discovery Request TLV extension is TBD-3.
* Discovery Request Length: 2 octets. This field specifies the total length in octets of the TLV.
* Discovery Response Value: the value of this extension is encoded as follows:
Proposed extensions (4/4)

Query message extensions

- Provision of information of the upstream interface used for subscribed contents
  - Purpose: to provide information from the proxy about the upstream interfaces and associated sources for multicast address groups of the conventional Query message.

```
+------------+----------------+----------------+----------------+
| 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 |
| +-------------------------------------------+----------------+----------------+----------------|
| | Query with Ups Info Type | Query with Ups Info Length |
| +-------------------------------------------+----------------+----------------+----------------|
| | Query with Ups Info Value |
| +---------------------------|
```

* Query with Upstream Interface Information Type: 2 octets. The type of the Discovery Request TLV extension is TBD-4.

* Query with Upstream Interface Information Length: 2 octets. This field specifies the total length in octets of the TLV.

* Query with Upstream Interface Information Value: the value of this extension is the same as in the Discovery Response case.
Next steps

• Collect feedback from the WG
• Refine the proposed extensions and correct typos
• Extend the content to IGMP
• Include content for the include / exclude modes in the extensions of the Report message

• Provide a new version for IETF#118 and discuss again

• Comments are more than welcome