Multicast Extensions to DS-Lite

draft-qin-softwire-dslite-multicast-01

Qian Wang (China Telecom)
Jacni Qin (ZTE)
Peng Sun (ZTE)
Mohamed Boucadair (France Telecom)
Christian Jacquenet (France Telecom)
Basic Requirements

- DS-Lite serviced customers accessing the same advanced services as (IPv4) legacy customers MUST have the same QoE
  - This includes IPTV

- Means to guarantee IPv4 service continuity during the transition period SHOULD be investigated
  - Including the delivery of Multicast-Based services such as live TV broadcasting
Context

• In the current IPv4 network delivering multicast, to make it realistically feasible and efficient,
  – That is to reduce the burden of Access Gateway and the consumption of downstream bandwidth

• The network is optimized by involving Layer 2 infrastructure in the Access Network
  – Traffic is replicated within multicast VLAN
  – IGMP Snooping with Proxying is introduced into L2 Nodes between the Access Gateway and the receivers
Problem Statement

• The current design of DS-Lite covers Unicast exclusively

• If it is used for multicast delivery, similar issue shows up since,
  – AFTR must process a huge number of IGMP Reports received through tunnels and perform as the Replication Point, downstream bandwidth is vastly consumed as well
  – Even worse if the AFTR capability is centralized ...
    • Severe overloading of both device and bandwidth
    • Impossible to deploy Rapid Channel Zapping mechanisms

• While the network optimization can NOT be implemented due to the tunnel encapsulation,
  – This I-D contributes to define an efficient solution for the delivery of multicast service offerings to DS-Lite serviced customers
Solution Overview

• New Entities:
  – **Multicast AFTR**, may be located in the first hop router or upstream in the network, as part of both the IPv4 and IPv6 multicast distribution trees
  – **Multicast B4**, is a functional entity embedded in a CPE

• Multicast Distribution Tree establishment
  – Multicast B4 performs IGMP/MLD Proxying per RFC4605, assuming IGMP-MLD Inter-working function
    • **Only** MLD Report messages are relayed up to the first hop router
  – Multicast AFTR re-Sends PIM Join for the corresponding IPv4 group when receiving MLD or PIM Join for the IPv4-embedded IPv6 group
Solution Overview (Cont.)

• Data Forwarding
  – Multicast AFTR encapsulates IPv4 multicast flows into IPv6 statelessly using the IPv4 (group address)-Embedded IPv6 address as the destination
    • Address format is defined in RFC6052
  – Multicast B4 de-capsulates received IPv6 datagrams that convey original IPv4 multicast packets and forwards them to the IPv4/Dual Stack receivers
Example:

*Multicast AFTR can be also embedded into the Access Gateway*

- IGMP Proxy
  - Converted to MLD, statelessly

- MLD terminated
  - PIM Join sent

- PIM Join re-Sent for IPv4 Group, statelessly

IPv4 Receiver

Multicast B4

Access Gateway

Multicast AFTR

IPv4 multicast

Forwarded as
Native IPv6 multicast

- De-capsulation

IPv4 multicast

- Encapsulation
Changes to the “Unicast DS-Lite”

• The Multicast AFTR does NOT undertake any stateful NAT operation

• Multicast B4 does NOT need to discover a Multicast AFTR

• Two IPv6 prefixes are needed as well as an unified Address Mapping Algorithm
  
  – \texttt{mPrefix64}, for constructing IPv6 address with the original IPv4 group address embedded

  – \texttt{uPrefix64}, for constructing IPv6 address with the IPv4 multicast source embedded
Text Representation Examples

- As an illustration, if a packet is received from 192.1.2.3 and destined to 230.1.2.3, the Multicast AFTR will encapsulate it in an IPv6 packet using ffxx:abc::230.1.2.3 as the destination address and 2001:db8::192.1.2.3 as the multicast source address.

**Destination:**

<table>
<thead>
<tr>
<th>mPrefix64</th>
<th>IPv4 address</th>
<th>IPv4-Embedded IPv6 address</th>
</tr>
</thead>
<tbody>
<tr>
<td>ffxx:abc::/96</td>
<td>230.1.2.3</td>
<td>ffxx:abc::230.1.2.3</td>
</tr>
</tbody>
</table>

**Source:**

<table>
<thead>
<tr>
<th>uPrefix64</th>
<th>IPv4 address</th>
<th>IPv4-Embedded IPv6 address</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001:db8::/96</td>
<td>192.1.2.3</td>
<td>2001:db8::192.1.2.3</td>
</tr>
</tbody>
</table>
Next Step

• Please read the draft and comment on it ...
  
Appendix
Example: Network Optimization together with native IPv6 multicast

Optimization: Lower the Replication point to Layer 2 Nodes

---

IPv4 Multicast

- can be embedded into Access Gateway

Layer 2 Nodes

IPv6 Router

IPv6 Multicast

IPv4 Multicast

Multicast B4

Dual Stack STB

IPv4 STB

IPv4 AFTR

Multicast

Access Gateway
Thank You!