Efficient Layer 2 Multicast with Point-to-Point Pseudowires
draft-cheng-pals-p2p-pw-multicast-01

Abstract

Multicast services such as Evolved Multimedia Broadcast/Multicast Service (eMBMS) become more and more popular in mobile networks. In mobile transport network, it is important for the operators to provide efficient transport of multicast services with existing network devices. This document describes a mechanism of using point-to-point Pseudowires (PW) [RFC3985] to achieve efficient layer 2 multicast transportation in mobile transport networks. The document gives a multicast method by utilizing a Point-to-Point (P2P) path between nodes in a packet transport network, according to the destination IP address. With it, the PTN nodes can replicate and forward the service message, which are received from the multicast server, to the plurality of multicast clients corresponding to the destination IP address.

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This Internet-Draft will expire on May 21, 2020.

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1. Introduction

Multicast services such as evolved Multimedia Broadcast/Multicast Service (eMBMS) become more and more popular in mobile networks. In mobile transport network, it is important for the operators to provide efficient transport of multicast services with existing network devices.
PTN network comprise at least one root node and at least one leaf node, the multicast source server is connected to the root node, and the multicast clients are connected to the leaf node. Figure 1 shows a typical topology of mobile transport network, which is composed of the layer 3 network at the core and the layer 2 network at the aggregation and edge. R-1 and R-2 connect to the upstream layer 3 network, in which the multicast source locates. This document focuses on the efficient multicast service transportation in the layer 2 segment of the network using point-to-point (P2P) Pseudowires (PW) [RFC3985].

1.1. Conventions used in this document

1.1.1. Terminology

The terminology is defined as [RFC3985].
1.1.2. Requirements Language

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.

2. Efficient Multicast with P2P PWs

This section describes the mechanism of efficient layer 2 multicast transportation with point-to-point PWs.

In the layer 2 multicast segment, nodes which connect to the L3 network are called Root nodes, and nodes which connect to the multicast clients are called Leaf nodes. For each multicast service, between the Root nodes and the Leaf nodes, 1-hop P2P PWs are provisioned between the adjacent nodes. The multicast tree from the Root nodes to the Leaf nodes is the concatenation of P2P PWs provisioned by NMS or central controller.

Multicast traffic is carried by the P2P PWs. On each PW hop, the PW label is popped, and the forwarding is performed according to the layer 2 multicast forwarding table of the node. The layer 2 multicast forwarding entries can be either statically provisioned by NMS or central controller, or dynamically generated via IGMP snooping [RFC4541]. For multicast traffic received on a specific P2P PW, the outbound PWs and ACs are determined by the corresponding L2 multicast forwarding table. For packets to be forwarded to next P2P PW, the PW label is pushed according to the forwarding table. With this mechanism, on each P2P PW in the network, at most one copy of the multicast traffic is delivered.

On the Leaf nodes, IGMP snooping [RFC4541] is used to optimize the layer 2 multicast forwarding to the clients, so that only the clients which express interests to the multicast service would receive the corresponding multicast traffic.

3. Protection Mechanism

For layer 2 multicast service, 1+1 protection is provided. The working and protection multicast trees are provisioned separately by NMS or central controller, and multicast service is carried on both the working multicast tree and the protection multicast tree simultaneously. In network topology of Figure 1, the Root node of the working PW is R-1, while the Root node of the protection PW is R-2. Each Leaf node has a working PW from its working upstream, and a protection PW from the protection upstream. According to the
result of OAM detection mechanism, the Leaf nodes choose to receive multicast traffic from either the working or protection PW.

4. OAM

PW OAM mechanisms as defined in [RFC5085] [RFC6428] are deployed on each P2P PW, including both the working PWs and protection PWs. When failure occurs on a working PW, the node which detects the failure SHOULD send AIS message as defined in [RFC6427] to notify its downstream nodes of the failure. This AIS message is propagated along the multicast tree to the downstream Leaf nodes. Then the Leaf nodes which are impacted by the failure can switchover to receive the multicast service traffic from the protection PWs.

5. IANA Considerations

This document makes no request of IANA.

Note to RFC Editor: this section may be removed on publication as an RFC.

6. Security Considerations

This document describes a layer 2 multicast mechanism with point-to-point PWs and NMS or controller provisioned multicast tree. The security considerations as specified in [RFC3985] apply to this document.

7. Acknowledgements

The authors would like to thank Jun Wu, Kai Liu and Yongjian Hu for the review and comments.

8. Normative References


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