Mboned WG
Internet-Draft
Intended status: Standards Track
Expires: August 11, 2013

C. Wang
W. Meng
ZTE Corporation
B. Khasnabish
ZTE USA,Inc
J. Hu
China Telecom

February 7, 2013

Interconnecting IPv6 Multicast Islands over IPv4 Using IPv6 Multicast Provider Edge Routers
draft-wang-mboned-glo-ipv6-mcast-reachability-00

Abstract

This draft presents a method to interconnect IPv6 multicast islands over an IPv4 cloud. This method relies on IPv6 Multicast Provider Edge routers (6MPE), which support Dual-Stack in order to connect to IPv6 multicast islands and to the IPv4 core. The 6MPE routers extend the Multiprotocol Border Gateway Protocol(MP-BGP), exchange the IPv6 multicast reachability information transparently over the IPv4 core using the MP-BGP.

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at http://datatracker.ietf.org/drafts/current/.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on August 11, 2013.

Table of Contents

1. Introduction 3
2. Keywords and Terminology 5
2.1. Terminology, and Definition of Terms 5
3. MCAST-IPv6 NLRI 6
4. Tunnel Attribute 7
5. Protocol Overview 8
6. Security Considerations 9
7. IANA Considerations 10
8. Normative References 11
Authors' Addresses 12

1. Introduction

There is already an approach for providing IPv6 connectivity over an IPv4 core network named Softwire Mesh Multicast, however, this approach results in inefficient bandwidth and resource utilization. And there is also already an approach for providing IPv4/IPv6 connectivity over VPN core network name MVPN[RFC6513] and MVPN-BGP[RFC6514], however, this approach just provides VPN service over IPv4/IPv6 network. The approach used in this document named IPv6 Multicast Provider Edge (6MPE) is a MVPN-like solution which connects non-VPN IPv6 multicast islands over IPv4 core network.

The 6MPE approach specified in this document requires that the edge routers (the 6MPE routers) be connected to IPv6 multicast islands and support Dual-Stack Multiprotocol-BGP, and the core routers run IPv4 only. And can be used for customers that already have an IPv4 multicast service from the network provider and additionally require an IPv6 multicast service, as well as for customers that require only IPv6 connectivity.

The 6MPE approach specified in this document defines a new Network Layer Reachability Information (NLRI)[RFC4760], MCAST-IPv6 NLRI. The MCAST-IPv6 NLRI is used for 6MPE routers auto-discovery, advertising IPv6 islands multicast routing information exchange among 6MPE routers.

Note that the 6MPE approach specified in this document provides global IPv6 reachability. Deployment of the 6MPE approach over an existing IPv4 cloud does not require an introduction of new mechanisms in the core. Configuration and operations of the 6MPE approach have a lot of similarities with the configuration and operations of an IPv4 MVPN service or IPv6 MVPN service ([RFC6513] and [RFC6514]). However, the configuration and operations of the 6MPE approach are somewhat simpler, since it does not involve all the VPN concepts such as Virtual Routing and Forwarding (VRFs) tables,RD and aggregation etc.

This document cites the format of Route Type defined in MCAST-VPN NLRI and modifies the format to adapt MCAST-IPv6 NLRI, which discussed in following section in details.

This document cites the PMSI Tunnel Attribute defined in MVPN-BGP (RFC6514) and modifies the format to adapt tunnel attribute in 6MPE approach, which discussed in following section in details.

This document cites a BGP Extended Communities defined in MVPN: the source Autonomous System (AS) Extended Community.

In this document an "IPv6 multicast island" is a network running native IPv6 multicast. A typical example of an IPv6 multicast island would be a customer's IPv6 site connected via its IPv6 Customer Edge (CE) to one (or more) Dual-Stack Multicast Provider Edge router(s) of a Service Provider. These IPv6 Multicast Provider Edge routers (6MPE) are connected to an IPv4 core network. Corresponding scenario sees figure 1.

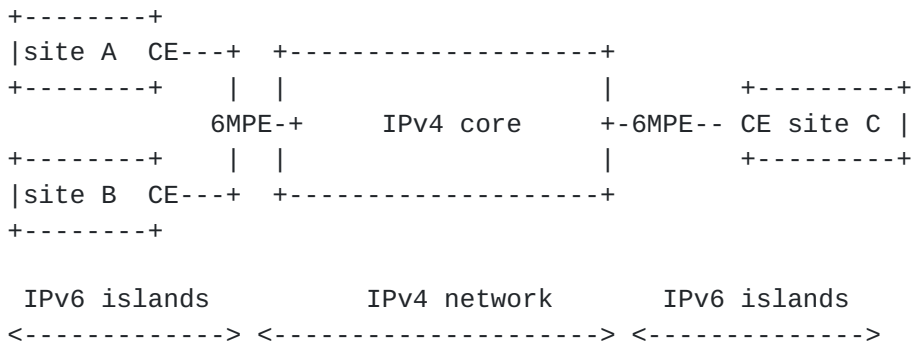

Figure 1: A Framework for IPv6 Multicast Interconnect over IPv4 Network

2. Keywords and Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

2.1. Terminology, and Definition of Terms

In the context of this document, we will refer to the 6MPE auto-discovery/binding information carried in BGP as "6MPE A-D routes". And there are the following types of 6MPE A-D routes:

+ Intra-AS 6MPE A-D route;

+ Inter-AS 6MPE A-D route;

+ 4-MSI 6MPE A-D route;

+ Leaf 6MPE A-D route;

+ Source Active 6MPE A-D route;

In the context of this document, we will refer to the 6MPE customers multicast routing information carried in BGP as "IPv6-multicast routes". And there are the following types of IPv6-multicast routes:

+ (*,G) Join route;

+ (S,G) Join route;

3. MCAST-IPv6 NLRI

This document defines a new BGP NLRI, called the MCAST-IPv6 NLRI. The format of the MCAST-IPv6 NLRI is the same as MCAST-VPN NLRI and the Route Types for 6MPE A-D routes are as follow:

+1 Intra-AS 6MPE A-D route;

+2 Inter-AS 6MPE A-D route;

+3 4-MSI 6MPE A-D route;

+4 Leaf 6MPE A-D route;

+5 Source Active 6MPE A-D route;

+6 (*,G) Join route;

+7 (S,G) Join route;

The MCAST-IPv6 NLRI is carried in BGP using BGP Multiprotocol Extensions with Address Family Identifier(AFI) of 2 and a Subsequent AFI(SAFI) of MCAST-IPv6.

In order for two BGP speakers to exchange MCAST-IPv6 NLRIs, they must use a BGP Capabilities Advertisement to ensure that they both are capable of properly processing such an NLRI. This is done as specified in [RFC4760], by using capability code 1 with an AFI of 2 and an SAFI of MCAST-IPv6.

The format of the Route Type specific MCAST-IPv6 NLRI for various Route Types defined in this document cite from MVPN, except remove the RD field in each Route Type and replace the Originating Router's IP Addr with 6MPE Router-ID.

6MPE Router-ID uniquely identifies a 6MPE router.

4. Tunnel Attribute

This document can define and use a new BGP attribute called the "IPv4-Multicast Service Interface Tunnel (4-MSI) attribute" which is like PMSI Tunnel Attribute defined in MVPN but remove the MPLS Label field or reuse PMSI Tunnel Attribute but set the MPLS Label field invalid value.

The Tunnel Type and the usage are the same as the Tunnel Type in PMSI Tunnel attribute.

5. Protocol Overview

Interconnection of IPv6 multicast islands over an IPv4 network is achieved by executing the following steps:

1. The 6MPE routers MUST have auto-discovery/binding mechanism[RFC6513 and RFC6514] to discovery other 6MPE routers, and trigger IPv4 cloud to build inclusive IPv4-multicast service tunnel as necessary.

2. Exchange IPv6 multicast routing reachability information among 6MPE routers.

3. Trigger IPv4 cloud to build selective IPv4-multicast service tunnel.

In executing step 1-3, the 6MPE routers convey the IPv4 address of 6MPE Router-ID as the BGP Next Hop for the advertised A-D routes. And the IPv4 address MUST be encoded as an IPv4-mapped IPv6 address in the BGP Next Hop field. This encoding is consistent with the definition of an IPv4-mapped IPv6 address in [RFC4291].

4. Binding IPv6 multicast islands' multicast tree to selective IPv4-multicast service tunnel.

5. Transport IPv6 multicast packets from the ingress 6MPE router which is nearby the IPv6 multicast source to the egress 6MPE routers which are nearby the multicast receivers over IPv4-multicast service tunnel.

6. Security Considerations

The security considerations documented in [RFC6513] and [RFC6514] are to be considered. Additional requirements may be added in the future version of this draft.

7. IANA Considerations

This document defines a new NLRI, called "MCAST-IPv6", to be carried in BGP.

8. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC4271] Rekhter, Y., Li, T., and S. Hares, "A Border Gateway Protocol 4 (BGP-4)", RFC 4271, January 2006.

[RFC4291] Hinden, R. and S. Deering, "IP Version 6 Addressing Architecture", RFC 4291, February 2006.

[RFC4760] Bates, T., Chandra, R., Katz, D., and Y. Rekhter, "Multiprotocol Extensions for BGP-4", RFC 4760, January 2007.

[RFC6513] Rosen, E. and R. Aggarwal, "Multicast in MPLS/BGP IP VPNs", RFC 6513, February 2012.

[RFC6514] Aggarwal, R., Rosen, E., Morin, T., and Y. Rekhter, "BGP Encodings and Procedures for Multicast in MPLS/BGP IP VPNs", RFC 6514, February 2012.

Authors' Addresses

Cui Wang
ZTE Corporation
No.50 Software Avenue, Yuhuatai District
Nanjing
China

Email: wang.cui1@zte.com.cn

Wei Meng
ZTE Corporation
No.50 Software Avenue, Yuhuatai District
Nanjing
China

Email: meng.wei2@zte.com.cn,vally.meng@gmail.com

Bhumip Khasnabish
ZTE USA,Inc
55 Madison Avenue, Suite 160
Morristown, NJ 07960
USA

Email: bhumip.khasnabish@zteusa.com,vumip1@gmail.com

Jie Hu
China Telecom
No.118, Xizhimennei
Beijing 100035
China

Email: huj@ctbri.com.cn