Multicast VPN using BIER

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http://www.ietf.org/id/draft-rosen-l3vpn-mvpn-bier-01.txt

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Outline

- Introduction
- P-tunnels and PMSI
- Explicit Tracking
- Data Plane

Introduction

- Multicast Virtual Private Network (MVPN) carries multicast traffic over a Service Provider (SP) backbone network requires multicast tunnels to carry them

- Bit Index Explicit Replication (BIER) is an architecture to provide optimal multicast forwarding through a "multicast domain"

- This draft specifies the protocol and procedures to allow MVPN to use BIER to carry multicast traffic over an SP backbone network

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P-tunnels

- [RFC-6513] and [RFC-6514] specify protocols and procedures for carrying customer multicast traffic through an SP - backbone network
  - Multicast provider tunnels (P-tunnels) are created to carry multicast traffic
  - Specification allows for several P-tunnel technologies, including
    - MLDP (Multicast Label Distribution Protocol)
    - P2MP-TE (Point-to-MultiPoint Traffic Engineering)
    - IR (Ingress Replication)
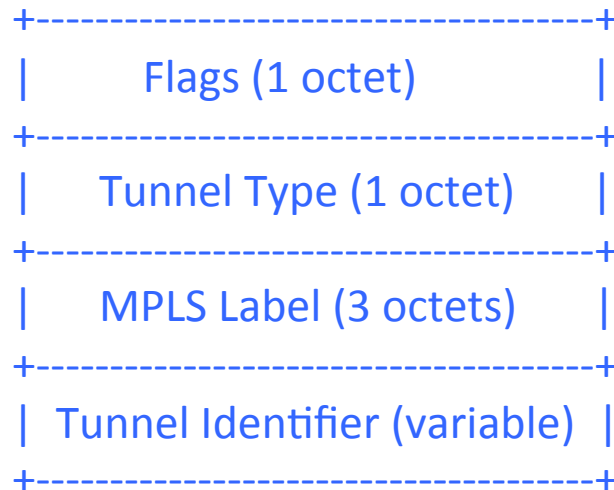 - BIER now added as an additional P-tunnel technology

Terminology

- BFR – Bit-Forwarding Router
- BFIR/BFER – Bit-Forwarding Ingress/Egress Router
- MVPN – Multicast Virtual Private Network
- P-Tunnel – tunnel through the SP network; transport multicast data
- C-S, C-G – multicast source, group used by a VPN customer
- C-Flow – A customer multicast flow
- I-PMSI AD route – Inclusive Provider Multicast Service Interface Auto Discovery route, carried in a BGP update message to advertise the default MVPN p-tunnel
- S-PMSI AD route – Selective PMSI AD route; carried in BGP update messages to bind c-flows to particular p-tunnels
- PTA – PMSI Tunnel Attribute; BGP attribute carried to identify a particular p-tunnel. Also carries information to multiplex/de-multiplex c-flows when traffic from multiple VPNs are carried in a single p-tunnel

BIER P-tunnel

- No explicit multicast tunnel building with BIER
  - Can however be modeled as an implicit P2MP tunnel through a BIER domain (from a BFIR to all the BFERs)
- BIER "tunnel" not specific to any VPN
  - Aggregates traffic from multiple MVPNs
  - Control plane will leverage existing procedures
- BIER carries traffic within one BIER domain
  - MVPN allows P-tunnels to be "segmented" at "border routers" (such as ABRs or ASBRs)
  - BIER domain will correspond to P-tunnel segment
    - BIER domain coextensive with IGP network or area
    - Area Border Routers (ABRs) and/or Autonomous System Border Routers (ASBRs) need to be capable of acting as BFIRs and BFERs

PMSI Tunnel Attribute (PTA)

- Identifies the P-tunnel to which one or more flows are bound

```
+------------------------------------+
|           Flags (1 octet)          |
+------------------------------------+
|        Tunnel Type (1 octet)       |
+------------------------------------+
|        MPLS Label (3 octets)       |
+------------------------------------+
|     Tunnel Identifier (variable)   |
+------------------------------------+
```

- Tunnel Type
  - New tunnel type for "BIER"
- Tunnel Identifier
  - BFR-Prefix of the originator of the route carrying the PTA
- Leaf-Info-Required bit (in Flags octet)
  - Set in S-PMSI A-D route and clear in I-PMSI A-D route

Upstream Assigned Label

- ## MPLS Label
  - Upstream-assigned by the router originating the PMSI route to which PTA is attached
  - MPLS label in two x-PMSIs (x $\rightarrow$ I or S) originated by an ingress PE for BIER MUST be different if
    - They carry a different set of Route Targets (RTs)
    - Ingress PE supports extranet and routes are from different VRFs
    - Ingress PE supports "Extranet separation" and only one of the routes carry the "Extranet Separation" EC
  - Thus at a given egress PE, two packets with same upstream-assigned label will be *from* the same ingress VRF (of ingress PE), and destined *to* the same set of egress VRFs on the egress PE

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Explicit Tracking

- For BFIRs to determine the set of BFERs to which packets are to be delivered, explicit tracking, as specified in [RFC6513] and [RFC6514] will be used
  - BFIR originates S-PMSI A-D route (for each C-flow) with LIR bit set in the PTA
  - Per [RFC6513], BFERs having interested receivers for the C-flow will respond with a Leaf A-D route
  - The BFIR will match the received Leaf A-Ds to the originated S-PMSI to determine the receivers
  - If a matching I or (*,*) S-PMSI exists for the C-flow, explicit tracking will be done via S-PMSI for the C-flow which includes a PTA specifying "no tunnel type"

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Transmitting an MVPN data packet

- Ingress PE finds matching x-PMSI route (following rules of [RFC6625]) with PTA specifying "BIER"

- MPLS label from matching route is pushed on to the packet label stack and forwarded according to procedures of [BIER_ARCH] and [BIER_ENCAPS]

- Since the payload is an MPLS packet with upstream assigned label, the I bit is set and the BFIR-ID MUST be included in the BIER header

Receiving an MVPN data packet

- A BFER receiving an bier-encapsulated MVPN data packet sends the below information to the multicast flow layer

  - the "BFR-prefix" corresponding to the BIER-ID in the packet BIER-header

  - the "payload", an MPLS packet with an upstream assigned top label

- The BFR-prefix provides the context in which the upstream assigned label is interpreted

Questions?

References

[BIER_ARCH]

Wijnands, IJ., "Multicast using Bit Index Explicit Replication Architecture", internet-draft, draft-wijnands-bier-architecture-00, September 2014.

[BIER_ENCAPS]

Wijnands, IJ., "Multicast encapsulation using Bit Index Explicit Replication Architecture", internet-draft, draft-wijnands-mpls-bier-encapsulation-00, September 2014.

[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

[RFC6625]

Rosen, E., Rekhter, Y., Hendrickx, W., and R. Qiu, "Wildcards in Multicast VPN Auto-Discovery Routes", RFC 6625, May 2012.