Domain Path (D-PATH) for Ethernet VPN (EVPN) Interconnect Networks
draft-sr-bess-evpn-dpath-00

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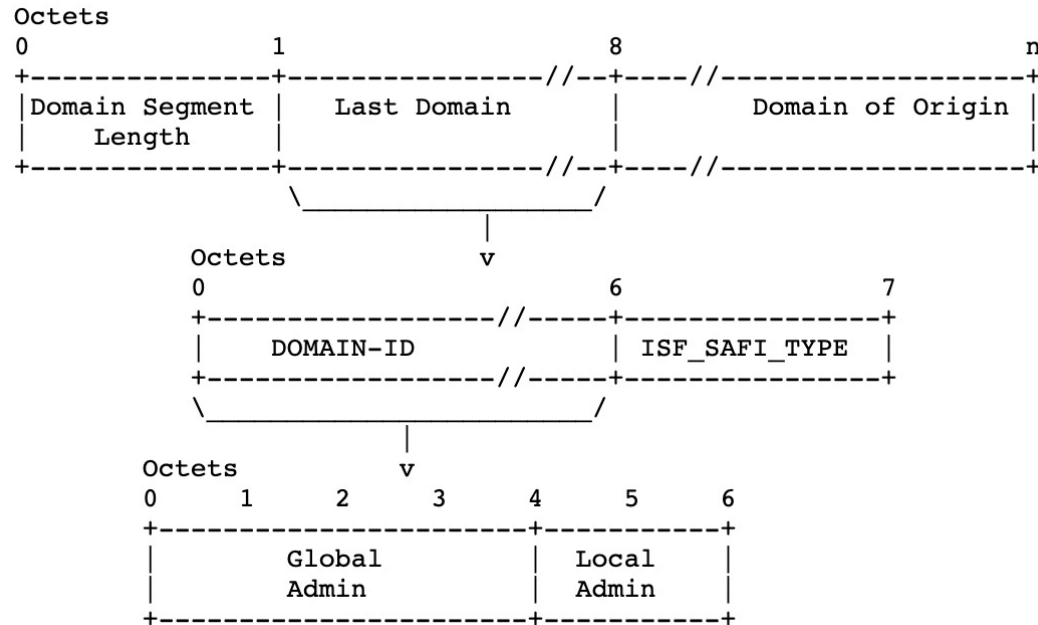IETF112, Nov 2021
Online

Agenda

1. D-PATH Attribute – Refresh
2. Extension of D-PATH for EVPN Layer-2 routes
3. Next-steps

D-PATH Attribute Refresh
I-D.ietf-bess-evpn-ipvpn-interworking

```
Octets
0               1               8                               n
+---------------+----------------//--+----//------------------+
|Domain Segment |   Last Domain      |     Domain of Origin    |
|    Length     |                    |                         |
+---------------+----------------//--+----//------------------+
                _____/
                         |
        Octets           v
        0                        6               7
        +------------------//-----+---------------+
        |      DOMAIN-ID          |  ISF_SAFI_TYPE |
        +------------------//-----+---------------+
        _____/
                    |
    Octets          v
    0    1    2    3    4    5    6
    +----------------------+-----------+
    |      Global          |  Local    |
    |      Admin           |  Admin    |
    +----------------------+-----------+
```

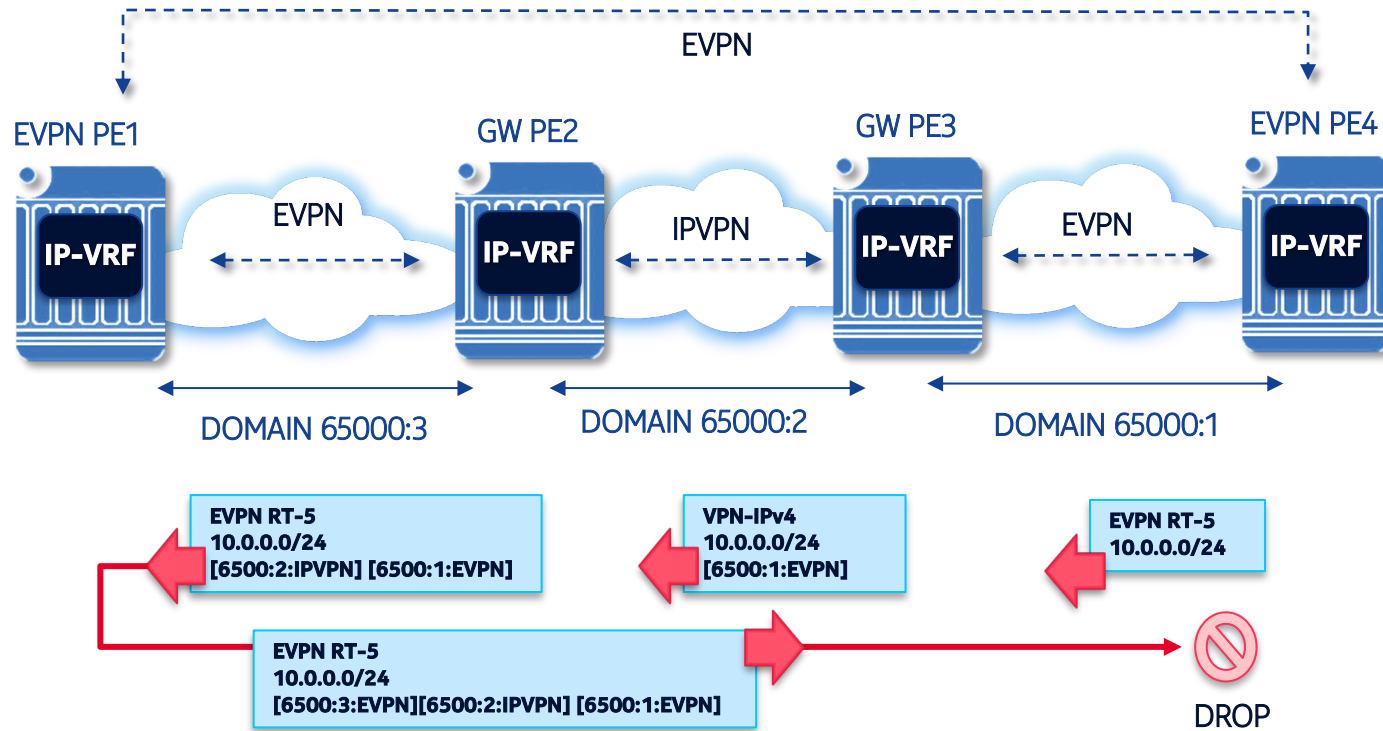### Domain PATH Attribute (D-PATH) definition
- Optional, transitive
- Composed of a sequence of domain segments
- Each domain segment defined by length and a sequence of Domains
- Domain is represented by <DOMAIN-ID:ISF_SAFI_TYPE>, where the ISF_SAFI_TYPE can be evpn, ip, vpn-ip, zero
- Each service Gateway with an IP-VRF connecting two domains appends the <DOMAIN-ID:ISF_SAFI_TYPE> of the domain of origin before re-advertising into another domain

D-PATH impacts on BGP procedures
- Control Plane loop protection
- Best path selection
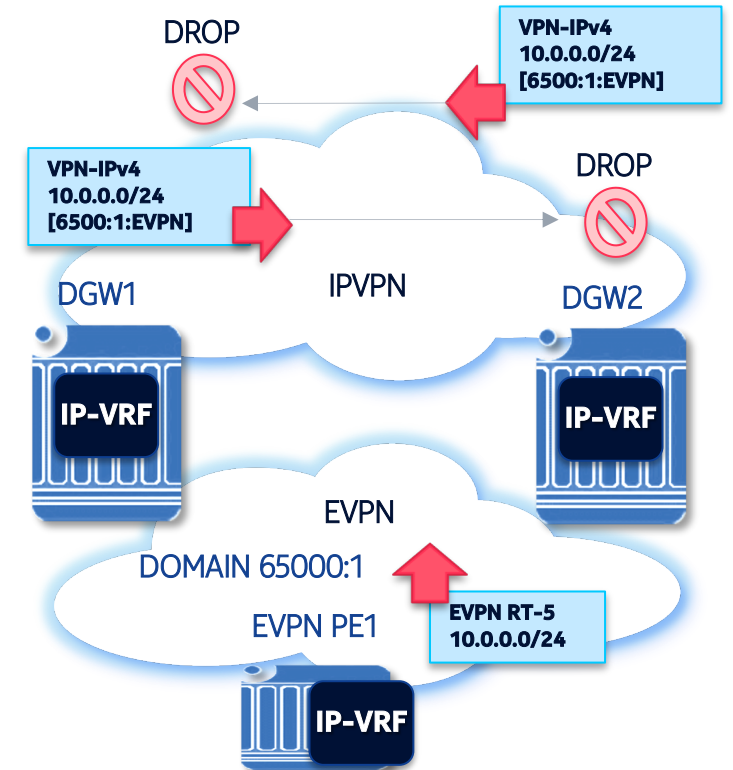
D-PATH Attribute Refresh
Use-case examples

EVPN

EVPN PE1   GW PE2   GW PE3   EVPN PE4

IP-VRF   EVPN   IP-VRF   IPVPN   IP-VRF   EVPN   IP-VRF

DOMAIN 65000:3   DOMAIN 65000:2   DOMAIN 65000:1

EVPN RT-5
10.0.0.0/24
[6500:2:IPVPN] [6500:1:EVPN]

VPN-IPv4
10.0.0.0/24
[6500:1:EVPN]

EVPN RT-5
10.0.0.0/24

EVPN RT-5
10.0.0.0/24
[6500:3:EVPN][6500:2:IPVPN] [6500:1:EVPN]

DROP

Use-Case 1
Multi-Domain propagation of routes
Traceability, loop protection, best path selection

DROP

VPN-IPv4
10.0.0.0/24
[6500:1:EVPN]

VPN-IPv4
10.0.0.0/24
[6500:1:EVPN]

DROP

DGW1   IPVPN   DGW2

IP-VRF   IP-VRF

EVPN

DOMAIN 65000:1

EVPN PE1   EVPN RT-5
10.0.0.0/24

IP-VRF

D-PATH used with non-Inter-Subnet-Forwarding EVPN
MAC/IP Advertisement routes

When used with MAC/IP routes D-PATH is a sequence of Layer-2 Domains

- DOMAIN-ID is a Layer2-Domain identifier configured in a MAC-VRF and SAFI type is set to either 70 (EVPN) or 0 (local route).
- D-PATH identifies the sequence of Layer2-Domains the route has gone through
- Added/modified by a Layer2-Domain Gateway PE that re-advertises the route and may be added by a PE that originates the route

Use Cases

- Control Plane loop detection/protection on RFC9014 Inter-connect gateways
- MAC/IP Advertisement route traceability
- Best path selection

Best Path Selection

- Section 4.2 summarizes the current best path selection for MAC/IP routes including the impact of D-PATH in such selection

Examples in EVPN Interconnect Networks (RFC9014)
Loop Protection for re-advertised EVPN routes
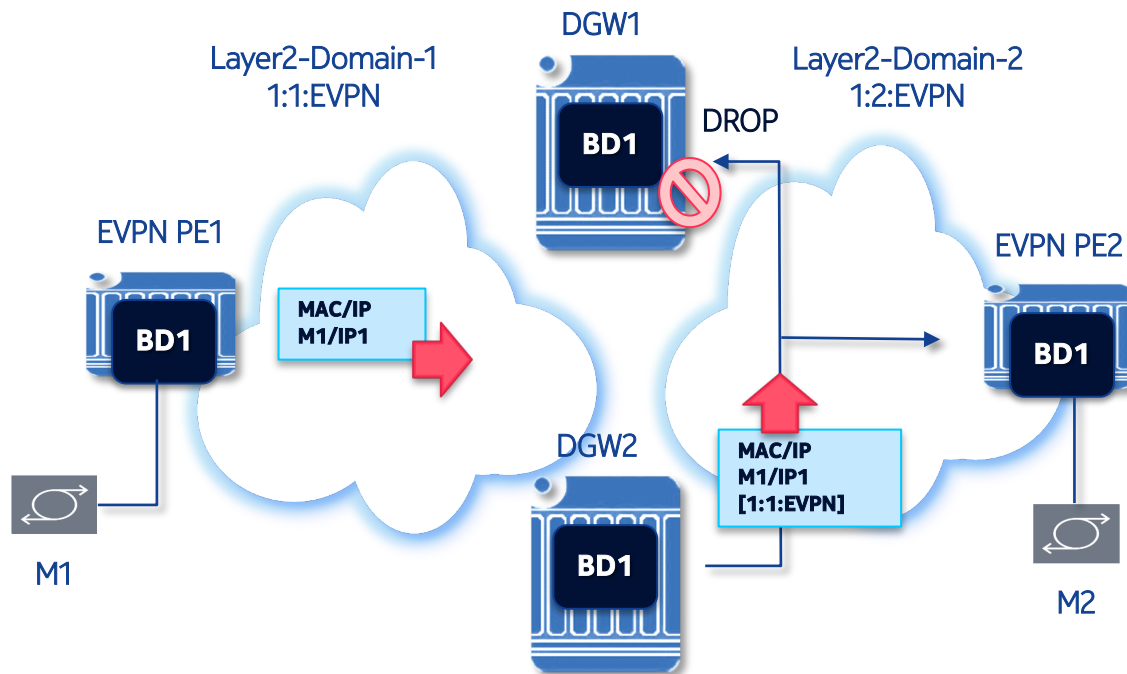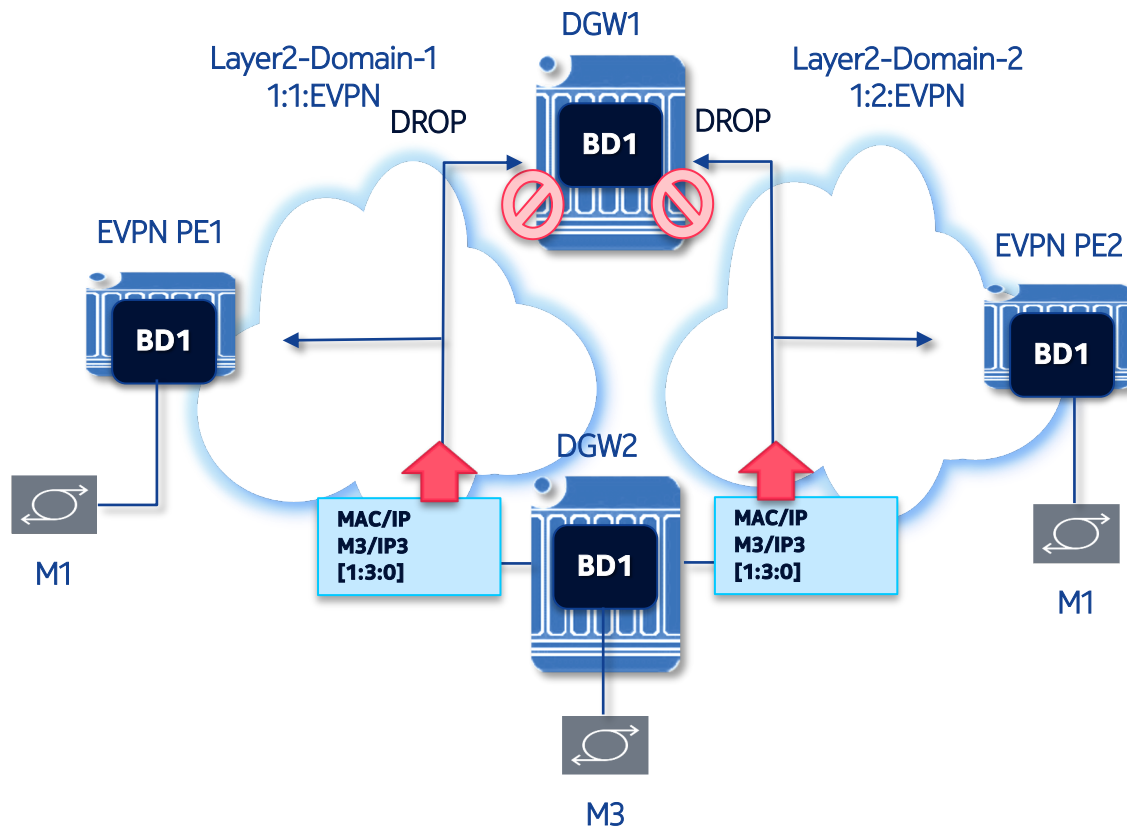

Loop Protection on the DCGWs

- DGW1 and DGW2 can compare the D-PATH of the incoming routes with their local list of Layer2-Domain-IDs, and detect a loop if any of the local Layer2-Domain-IDs matches a domain in the received D-PATH.
- This procedure prevents the re-advertisement of the route back into Layer2-Domain-1.

Traceability on PE2

- PE2 has the visibility of the Layer2-Domains through which the route has gone, and
- PE2 can also use the D-PATH for best path selection in case PE2 receives a MAC/IP Advertisement route for M1/IP1 by some other means.

Examples in EVPN Interconnect Networks (RFC9014)
Loop Protection for DCGW local routes

Loop Protection on the DCGWs for local routes with shared local domain-id (shown in diagram)
- DGW2 advertises local M3/IP3 with a local domain-id, i.e. 1:3
- If local domain 1:3 is configured on both DGWs, DGW1 will identify 1:3 as local and will declare the route as looped

Loop Protection with non-shared local domain-ids (not shown)
- If DGW2 and DGW1 do not share local domain-ids, DGW1's MAC3/IP3 route will NOT be dropped at DGW1
- DGW1 will select one (lowest domain-id) and readvertise M3/IP3 into domain-2 with {1:1:EVPN, 1:3:0}
- The route from DGW1 will be:
  - Detected as looped in DGW2
  - Not selected by PE2 vs the route from DGW2, due to the D-PATH length in best path selection

Next steps

Authors seeking feedback

Thank you