IPSec for BGP Enabled Service over SRv6

https://datatracker.ietf.org/doc/draft-wang-bess-secservice/

Haibo Wang/**Linda Dunbar**/Cheng Sheng/Hang Shi

Huawei, Futurewei

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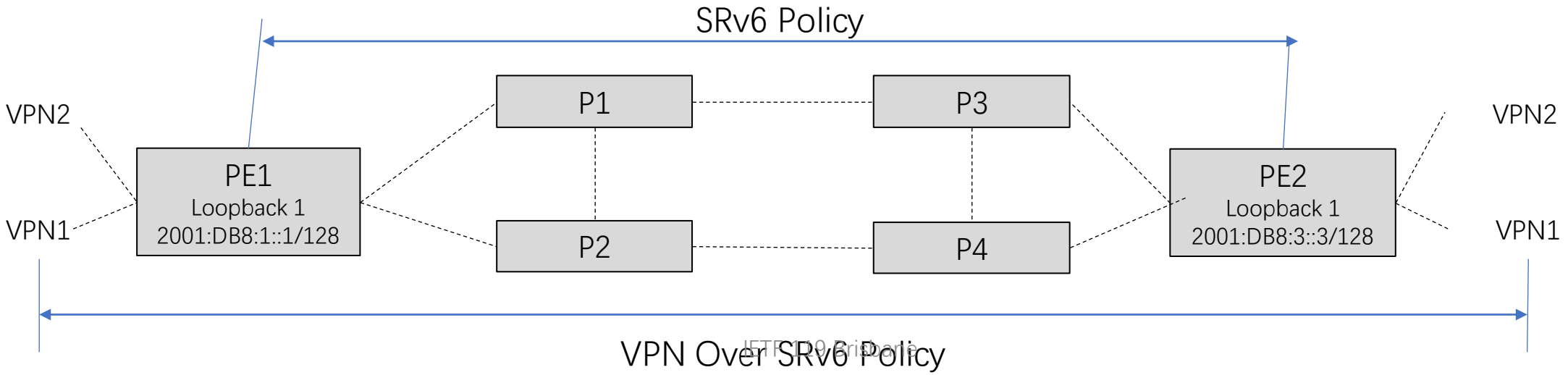
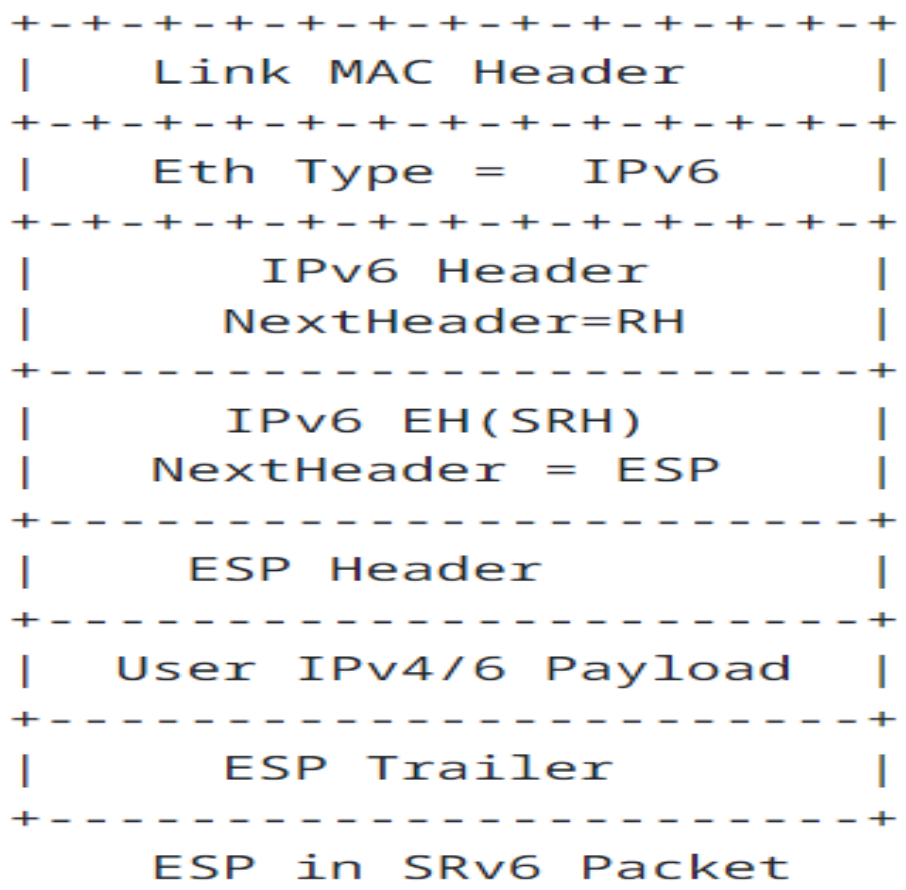
IPSec over SRv6 Use Case

- Some customers in financial industry build their own backbone network and use SRv6 to orchestrate service.
- Normally, SRv6 domain is considered secure(RFC 8754, RFC 8402, RFC 8986)
- But financial data needs additional security. IPSec is used to encrypted the data end to end in case of any intrusion in the backbone network
- SRH needs to be outside of encryption



Desired Data Plane

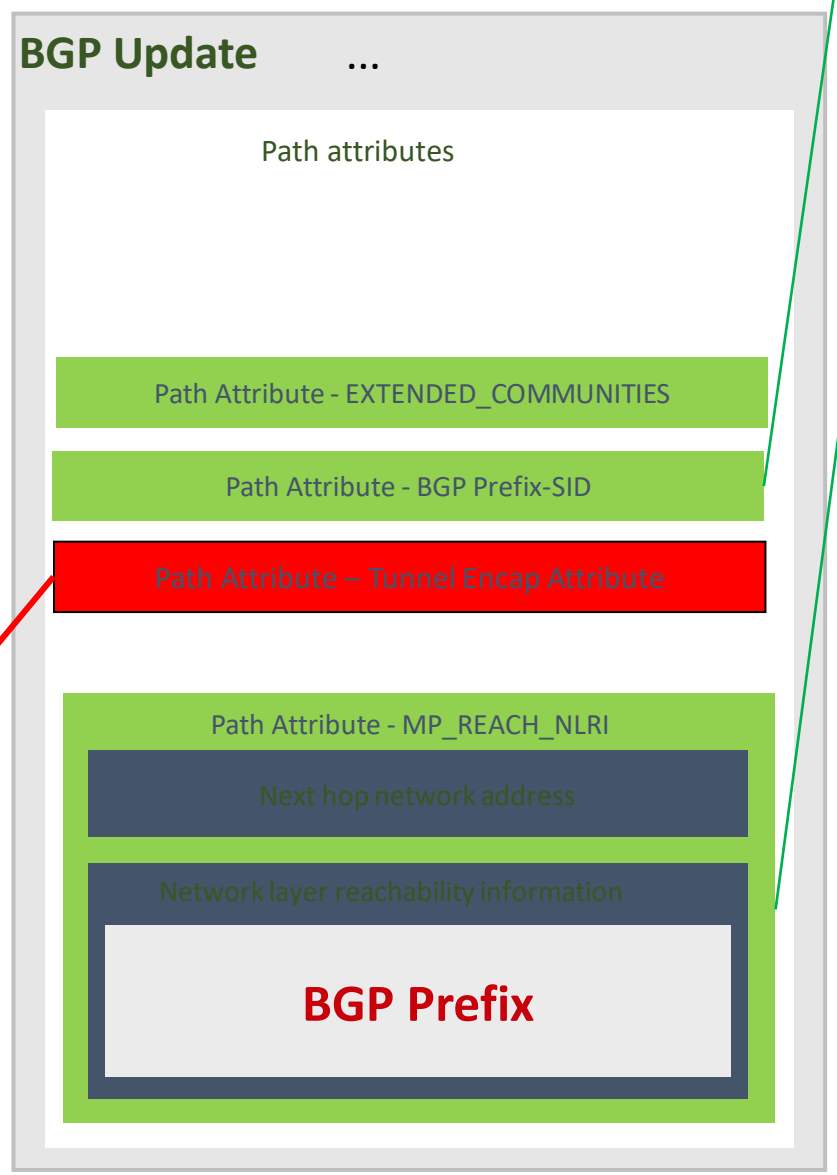


ESP in SRv6 Packet

BGP Update Message Extension

Border Gateway Protocol - UPDATE Message
Marker: ffffffffffffffffffffffffffffffff
Path Attribute - EXTENDED_COMMUNITIES
Flags: 0xc0, Optional, Transitive, Complete
Type Code: EXTENDED_COMMUNITIES (16)
Length: 8
Carried extended communities: (1 community)
Route Target: 1:1 [Transitive 2-Octet AS-Specific]
Type: Transitive 2-Octet AS-Specific (0x00)
Subtype (AS2): Route Target (0x02)
2-Octet AS: 1
4-Octet AN: 1

Tunnel Encap Attribute:
Tunnel-type= ESP-Payload
Tunnel egress endpoint = 2001:DB8:3::3/128
IPsec SubTLVs



Path Attribute - BGP Prefix-SID
Flags: 0xd0, Optional, Transitive, Extended-Length, Complete
Type Code: BGP Prefix-SID (40)
Length: 22
BGP Prefix-SID TLV type: 4
End.DT4: 2001:DB8:130::200

Path Attribute - MP_REACH_NLRI
Flags: 0x90, Optional, Extended-Length, Non-transitive, Complete
1... .... = Optional: Set
.0.. .... = Transitive: Not set
..0. .... = Partial: Not set
...1 .... = Extended-Length: Set
.... 0000 = Unused: 0x0
Type Code: MP_REACH_NLRI (14)
Length: 45
Address family identifier (AFI): **IPv4 (1)**
Subsequent address family identifier (SAFI): **Labeled VPN Unicast (128)**
Next hop network address (24 bytes)
Next Hop: Empty Label Stack RD=0:0 IPv6=**2001:DB8:3::3**
Number of Subnetwork points of attachment (SNPA): 0
Network layer reachability information (16 bytes)
BGP Prefix
Prefix Length: 120
Label Stack: 3 (bottom)
Route Distinguisher: **200:1**
MP Reach NLRI IPv4 prefix: **22.22.22.22**

New Tunnel-type

- Tunnel Encapsulation Attribute:
  - Tunnel-Type = **ESP-Payload**
  - IPSec SA Property Sub-TLV reuse draft-ietf-idr-sdwan-edge-discovery-12:
    - IPsec SA Nonce
    - IPSec Public Key
    - IPsec SA Proposal
- Tunnel Encapsulation Attribute:
  - Tunnel-Type = **ESP-Payload**
  - IPsec SA-ID Sub-TLV (reuse draft-ietf-idr-sdwan-edge-discovery-12)

- Encrypt using ESP then encap into SRv6

Next step

- Similar to Secure EVPN: per route IPSec
- Option 1: merge with Secure EVPN
  - Add a subsection in section 9 to describe encapsulation
  - Add extension of new tunnel type in section 10
- Option 2: Secure EVPN seems not moving forward
  - Ask for WG adoption