EVN6: A Framework of Mapping of Ethernet Virtual Network to IPv6 Underlay
draft-xie-v6ops-evn6-00

Chongfeng Xie(Presenter) China Telecom

Xing Li CERNET Center/Tsinghua University

Congxiao Bao CERNET Center/Tsinghua University

Mark Smith

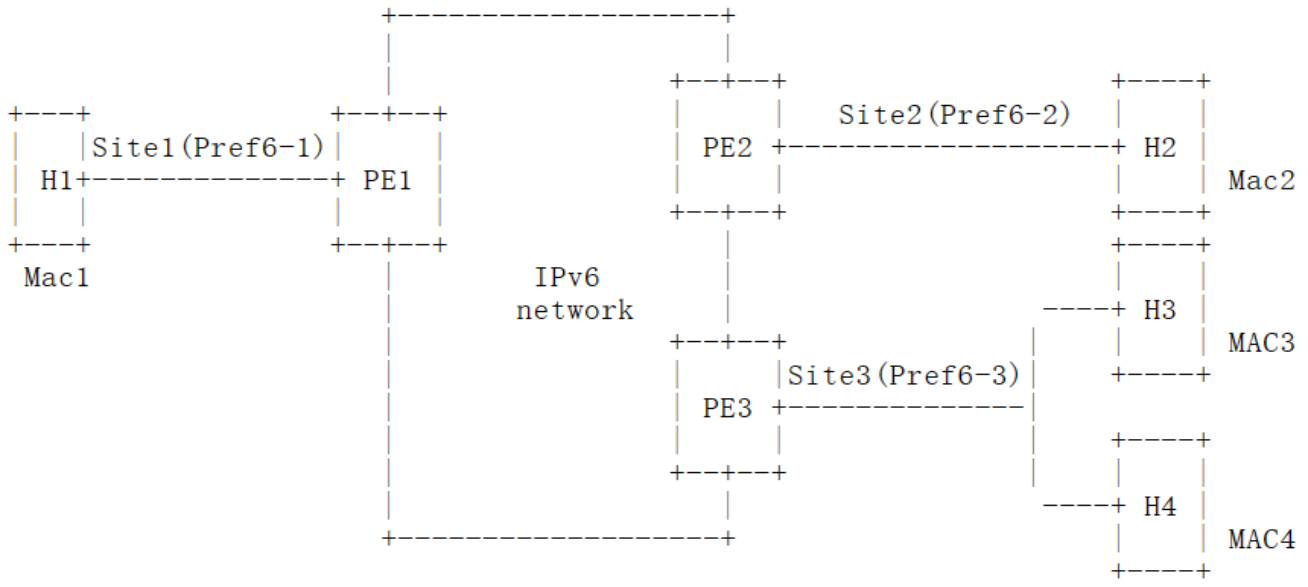
v6ops@IETF 119, March 2024

Overview

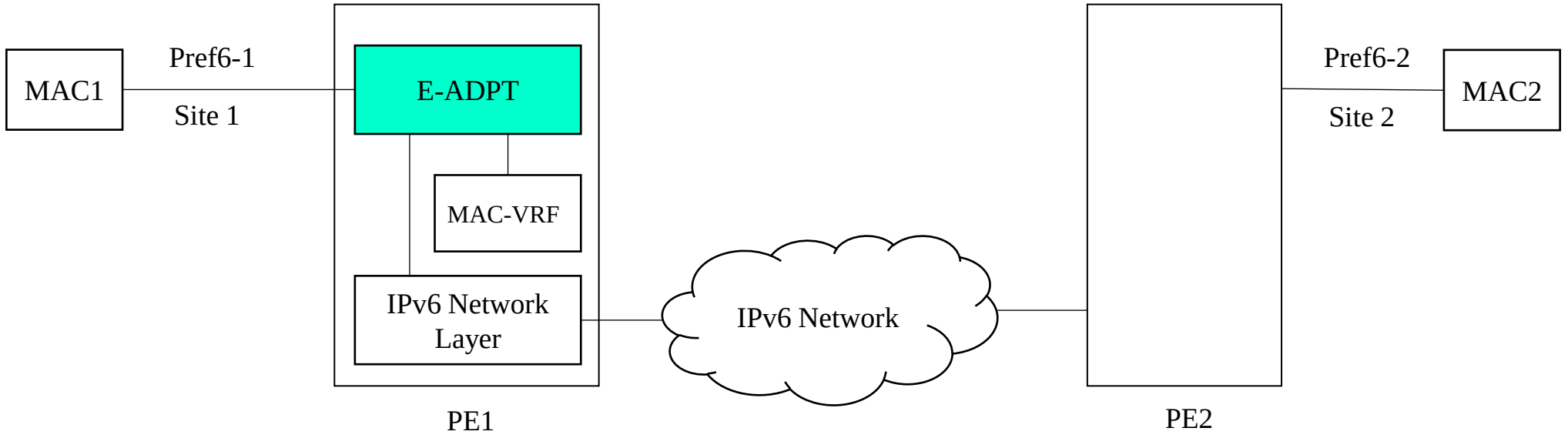
- EVN6 is Layer-2 network model built on top of the IPv6 underlay to provide connectivity between dispersed customer sites.
- Ethernet network is statelessly mapped to IPv6 underlay with encapsulation. It is used to carry the Ethernet data from the individual hosts to others.
- Its purpose is to improve L2 transmission efficiency, guarantee security and provide address-based ECMP by using the capabilities of IPv6.
- This draft was firstly proposed in October 2023 to 6man WG, then moved to v6ops WG in November 2023.

EVN6: Ethernet Virtual Network over IPv6

- **Scenarios:** Campus networks, enterprise branch interconnections, DCN and SD-WAN etc.
- **Mechanism:** Ethernet frame is directly copied in the payload of IPv6 packet. Stateless mapping is used to generate IPv6 addresses from the MAC addresses, Virtual Network Identifier and site prefix.
- **Topology:** Point-to-point, multi-point to multi-point and point to multi-point.



Overall Architecture



VEI: 32-bits Virtual Ethernet Identifier

Pref6: Site Prefix

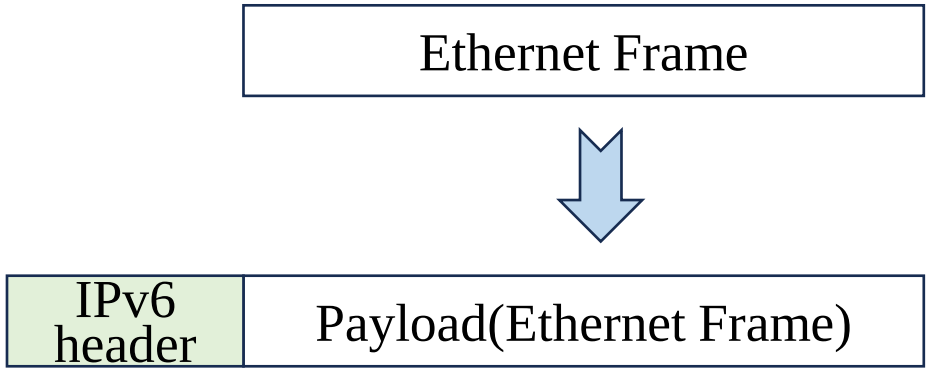
MAC-VRF:

MAC Address	VEI	Length of Pref6	Pref6

Pref6:Site Prefix

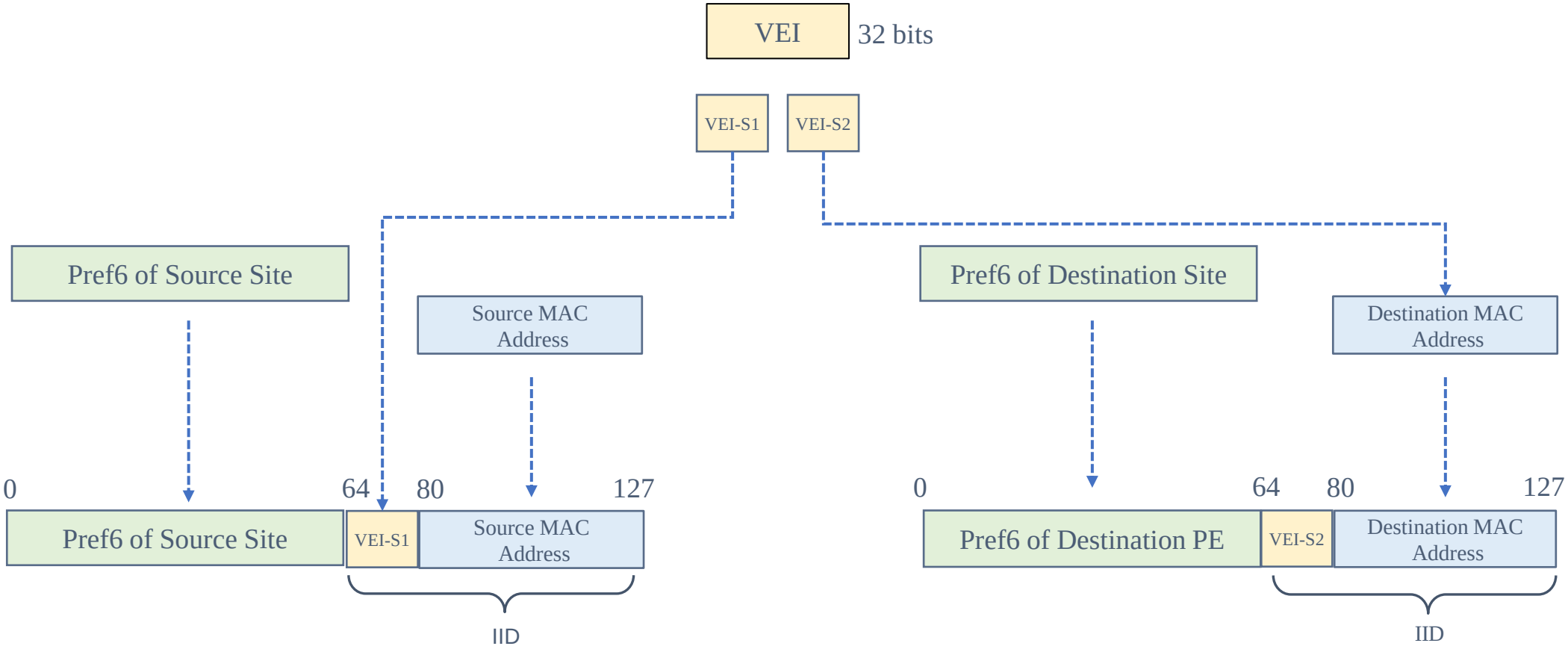
Encapsulation of Ethernet Frame into IPv6 Packet

- The Ethernet frame is directly placed in the payload of IPv6 packet by the E-ADPT of ingress PE.
- The field of ‘Next header’ in IPv6 header is set as143, to indicate that the payload is Ethernet frame.



IPv6 Address Generation by Mapping

Stateless mapping is used to generate IPv6 addresses from the MAC addresses, Virtual Network Identifier and site prefix.



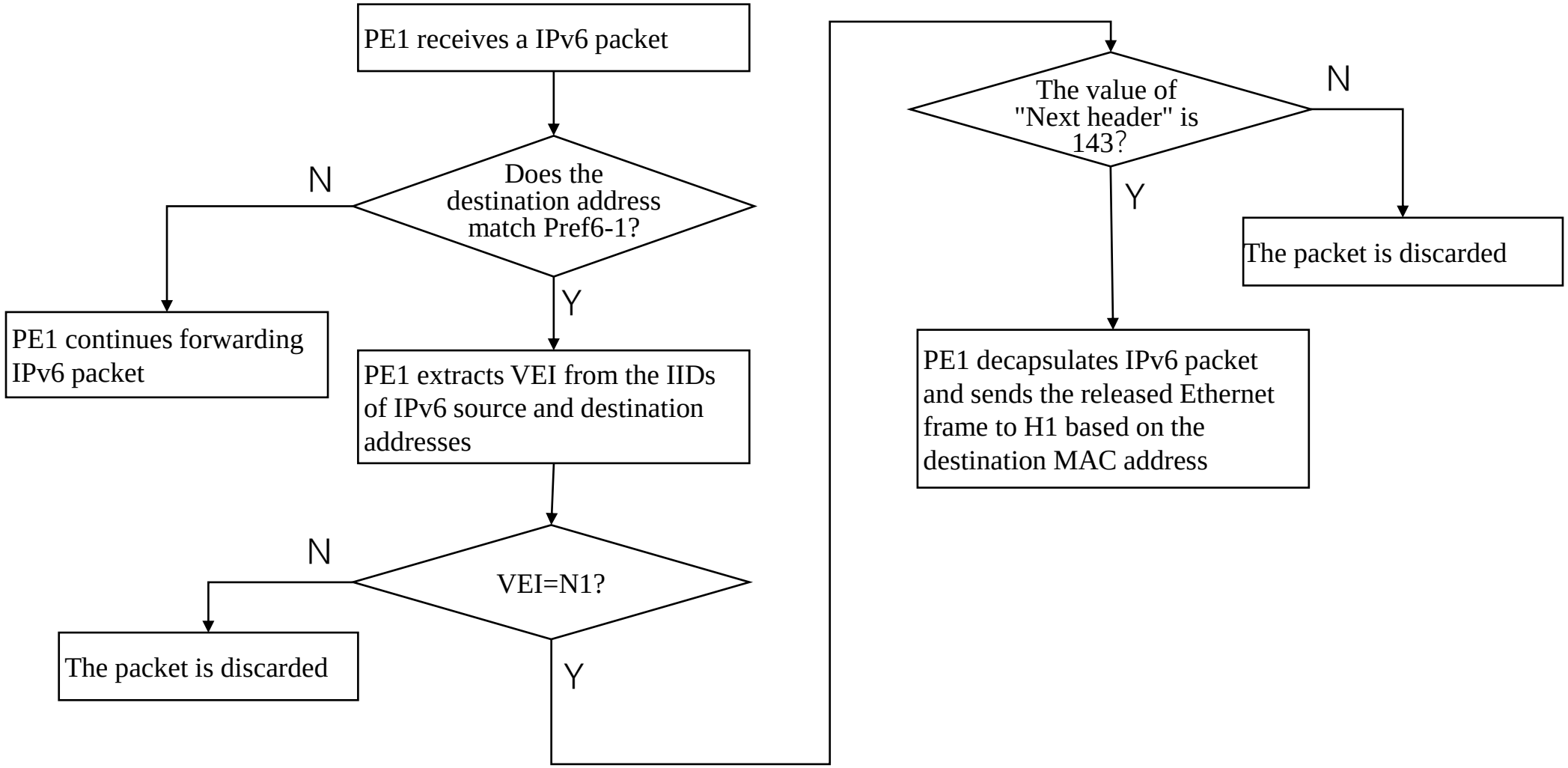
IPv6 Source Address

IPv6 Destination Address

MAC-VRF and Control Layer

- The data in MAC-VRF should be available before encapsulation of Ethernet frame, so the sites needs to pre-send MAC/Pref6 mapping of each hosts to other sites.
- The exchange of MAC/Pref6 mapping can be implemented at the existing control layer. This has been out of the scope of this document.

Packet Decapsulation and Ethernet Frame Restoration



Characteristics

- Forward efficiency
  - L2 frame is encapsulated into IPv6 packet without extra encapsulation headers, encapsulation and processing cost can be reduced.
- Delivery flexibility
  - Service can be provisioned as long as access to lPv6 Internet is available. There is no constraint from the underlying network.
- Interworking between ISPs
  - There is no specific requirement to the interworking interface of ISPs.
- Secure
  - As there is no pre-configured static tunnel endpoint address, the risk of DDOS attack can be reduced.
- Traffic load-balancing(ECMP)
  - Load balancing can be implemented based on the source IPv6 addresses, different host within the same site has different IPv6 addresses.

Next Steps

- System implementation and field trial.
- Comments and suggestions are welcome, and make further refinement to improve the document.
- Authors would like to ask for WG adoption of this document.

Thank you！
Q&A