



IPv4 IPv6 Only PE Design & ALL SAFI Supported

`draft-ietf-bess-v4-v6-pe-all-safi-03`

IETF 124



Gyan Mishra, Verizon
Jeff Tantsura, Nvidia
Mankamana Mishra, Cisco
Sudha Madhavi, Juniper
Adam Simpson, Nokia
Shuanglong Chen, Huawei
Qing Yang, Arista

Updates on Interoperability testing

- MPLS World Congress March 2025 EANTC testing - Nokia / Juniper ran into issue with testing issue related to RFC 5549/8950 Extended Next Hop Encoding
- Juniper Mx960 upgraded to 24.2R1-S1.10 & successfully completed all Tests 1-12 Interoperability testing between Nokia 7250 IXR-X3 & Juniper Mx960 over MPLS and SRv6 data plane.
- MPLS World Congress 2023 & 2024 Cisco XRD virtual docker container testing over MPLS and SRv6 data plane successfully tested VPN-IPv4 SAFI in all test cases.
- Cisco ASR 9000 & Cisco NCS 5500 interoperability testing with Juniper Mx960 & Nokia 7250 IXR-X3 in progress and plan to complete EOY 2025.
- MPLS World Congress 2026 EANTC testing plan to participate in interop for the draft

IPv6-Only PE Design Testing update / IPv4-Only PE Design Testing Update:

Vendors: Cisco, Juniper, Nokia, Arista, Huawei

Hardware Platforms, Router Code Revision & Testing Updates:

Vendors: Cisco, Juniper, Nokia, Arista, Huawei

Code & Platform chosen for testing platform by Vendor

Cisco: Edge Router- XR ASR 9910 IOS XR 7.4.1, Core Router- NCS 6000

7.2.2, CRS-X 6.7.4, 25.2 ASR 9000 & NCS 5504 **Cisco, Nokia, Juniper Interoperability EOY 2025**

XRd 7.11.2 Virtual Testing completed VPN-IPv4 all test cases

Update: Testing in progress. **Plan to be completed Fall 2025**

Vendor specific knob for forwarding IPv4 packets without IPv4 address configured on interface which is required for IPv6-Only PE design.

Juniper: Edge Router- MX platform MX480, MX960, Core Router- PTX

Platform PTX5000, PTC10K8 (JUNOS and EVO) Release 20.4R2, **24.2R1-S1.10 Interoperability Juniper/Nokia completed**

Update: All unicast testing is completed – **Testing is 100% completed**

Vendor specific knob exists for forwarding IPv4 packets without IPv4 address configured on interface required for IPv4-Only PE design & IPv6-Only PE design.

Nokia: Edge and Core-7750 Service Router, Release R21,

Core-7250 IXR-X3 25.7.R1 Interoperability Juniper/Nokia completed

Update: All unicast testing is completed – **Testing is 100% completed**

Vendor specific knob exists for forwarding IPv4 packets without IPv4 address configured on interface which is required for IPv6-Only PE design.

Huawei: Edge and Core-VRPv8, Release VRP-V800R020C10

Update: Huawei supports RFC 5549 & RFC 8950 and all 12 test cases confirmed supported with R&D team. **Requesting ETA for completion**

Vendor specific knob exists for forwarding IPv4 packets without IPv4 address configured on interface which is required for IPv6-Only PE design.

Typed NLRI Update Section

Below is a list of Typed NLRI SAFI

- MCAST VPN [RFC 6513 / RFC 6514]
- MCAST VPLS [RFC 7117]
- EVPN [RFC 7432]
- BGP-LS [RFC 7752]
- CAR (Color Aware Routing) [draft-ietf-idr-bgp-car-10]

With typed SAFI the data plane is
Instantiated due natively
separate control plane & data plane

IPv4 Only PE ⇔ Single IPv4 peer

IPv6 NLRI over IPv4 NH

Typed NLRI – since data plane independent

Does not need IPv6 data plane forwarding

(IPv4 Only PE Not Applicable)

Non Typed NLR – control plane & data plane
are in-line directly dependent

(IPv4 Only PE Applicable)

IPv6 Only PE ⇔ Single IPv6 peer (RFC 8950)

IPv4 NLRI over IPv6 NH

Typed NLRI – since data plane independent

Does not need IPv4 data plane forwarding

(IPv6 Only PE Not Applicable)

Non Typed NLR – control plane & data plane
are in-line directly dependent

(IPv6 Only PE Applicable)

Typed NLRI have the following format:

MP BGP AFI/SAFI

Route Type

Length

Route Type Specific (NLRI Data Field)

Typed Data Plane agnostic

IPv4 / IPv6

NLRI can be both carried

in the Data field of the NLRI

Making it - Data Plane Transport

independent

(RFC 8950 still comes into

play for next hop encoding)

Non Typed NLRI have the following format:

(Example: IP VPN RFC 4364)

MP BGP AFI/SAFI

NLRI Data

IPv4 / IPv6

NLRI is carried

directly in NLRI and thus is

Data Plane Transport

dependent

(RFC 8950 comes into play

For next hop encoding)

For Non Typed SAFI the NLRI data is encoded

directly into the NLRI

Non Typed is Data Plane dependent

SRv6 Compression (C-SID Next SID Endpoint Behavior Test cases Section)

SRv6 uSID Test Scenario's:

#1 SRv6 Core – Global Table Inter-AS PE-PE (4PE) - SRv6 Enabled on Inter-AS PE's

Mirror of test #9 IPv6 Core Global Table Inter-AS 4PE but now with SRv6 enabled
Test #9 Global table Option B (4PE) for Unicast

#2 SRv6 Core – Global Table Inter-AS PE-PE (4PE) - SRv6 Disabled on Inter-AS PE's

Mirror of test #9 IPv6 Core Global Table Inter-AS 4PE but now with SRv6 disabled
Test #9 Global table Option B (4PE) for Unicast

#3 SRv6 Core – IP VPN Inter-AS PE-PE - SRv6 Enabled on Inter-AS PE's (eBGP Next Hop Unchanged)

Mirror of test #11 IPv6 IP VPN Inter-AS but now with SRv6 enabled
Test #11 L3 VPN Inter AS Option B (Unicast)

#4 SRv6 Core – IP VPN Inter-AS PE-PE - SRv6 Disabled on Inter-AS PE's (eBGP Next Hop Unchanged)

Mirror of test #11 IPv6 IP VPN Inter-AS but now with SRv6 disabled
Test #11 L3 VPN Inter AS Option B (Unicast)



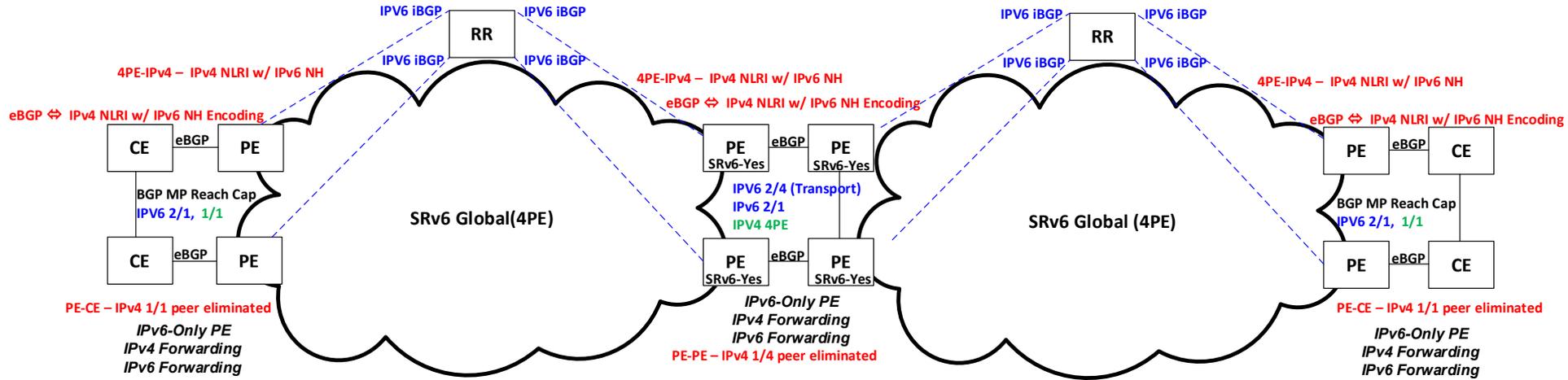
**POC Testing almost finished
Planning for Spring WGLC**

Thank You!



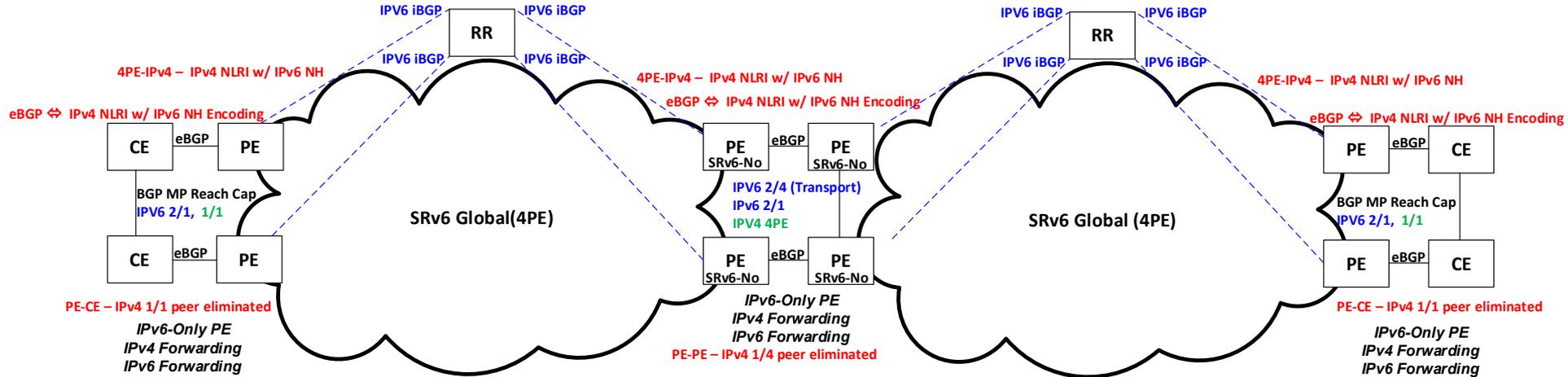
Test #1 SRv6 uSID Global Table w/ SRv6 Aware Inter-AS PE

SRv6 Global w/ IPv6 Only PE (4PE) (Inter-AS PE is SRv6 Aware) IPv6-Only PE Design "IPv6-Only Core" – Inter-AS Option B – 4PE (Test #9)



Test #2 SRv6 uSID Global Table w/ SRv6 Unaware Inter-AS PE

SRv6 Global w/ IPv6 Only PE (4PE) (Inter-AS PE is SRv6 Unaware) IPv6-Only PE Design "IPv6-Only Core" – Inter-AS Option B – 4PE (Test #9)



Test #3 SRv6 uSID IP VPN w/ SRv6 Aware Inter-AS PE

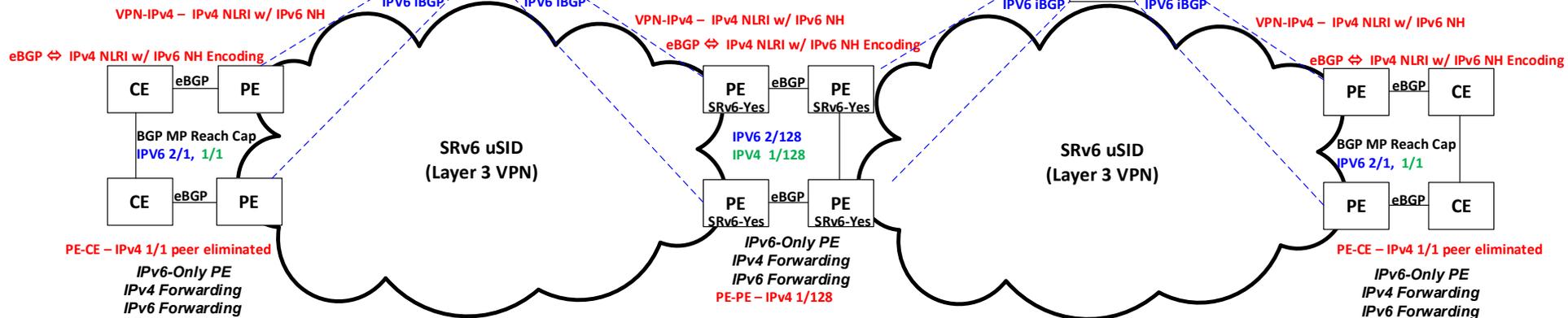
SRv6-VPN w/ IPv6 Only PE (Inter-AS PE is SRv6 Aware) IPv6-Only PE Design "IPv6-Only Core" – Inter-AS Option B (Test #11)

AFI/SAFI tested:

SAFI = 1 -Unicast

SAFI = 128 -VPN

BGP MP Reach Cap
VPN-IPv4 1/128
VPN-IPv6 2/128,



Test #4 SRv6 uSID IP VPN w/ SRv6 Unaware Inter-AS PE

SRv6-VPN w/ IPv6 Only PE (Inter-AS PE is SRv6 Aware) IPv6-Only PE Design "IPv6-Only Core" – Inter-AS Option B (Test #11)

AFI/SAFI tested:
SAFI = 1 -Unicast
SAFI = 128 -VPN

BGP MP Reach Cap
VPN-IPv4 1/128
VPN-IPv6 2/128,

