Juniper® Validated Design

JVD Test Report Brief: Enterprise Data Center Edge

Introduction

Modern enterprises have business-critical applications running in multiple private and public data centers. They use WANs to connect their data centers and provide access to users in remote campus and branch locations. The enterprise data center uses Ethernet VPN-Virtual Extensible LAN (EVPN-VXLAN) as an overlay protocol and a spine and leaf architecture. Remote campus and branch locations access the data center resources over the WAN using Layer 2 Ethernet VPN Multiprotocol Label Switching (EVPN-MPLS) connections. EVPN-MPLS has become the dominant technology for enabling connectivity between enterprise campus and branch offices. It replaces the legacy virtual private LAN service (VPLS) interconnect model. This validated design focuses on the seamless interconnect of EVPN-VXLAN tunnels running in a data center and MPLS EVPN tunnels running in the WAN. This JVD proposes seamless stitching of two segments without performance impact using an MX router acting as a datacenter gateway. This JVD proposes terminating the VXLAN tunnels on the data center edge/gateway devices.

The advantages of an EVPN-MPLS-based WAN architecture include:

- Multihoming
- Rapid convergence
- Active/active or active/standby attachment points
- BGP-based MAC learning

Test Topology

Figure 1: EVPN-MPLS to EVPN-VXLAN
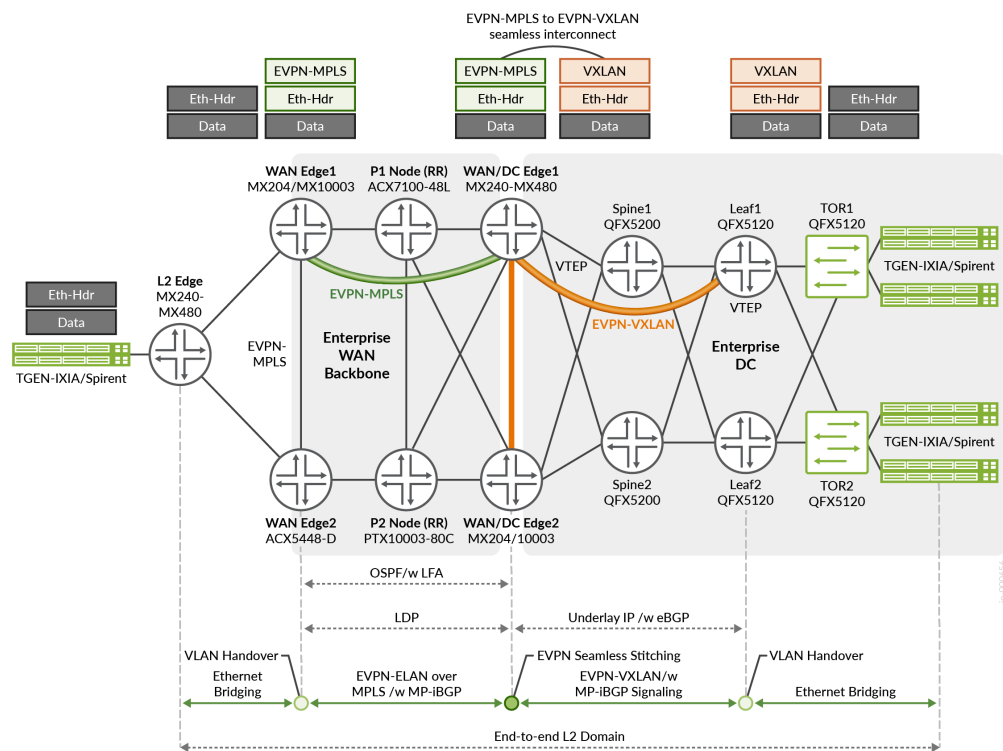
Platforms Tested

Table 1: Platforms Tested

Role	Platform	OS
Data Center Edge	MX480 and MX10003	Junos OS 23.2R2
WAN Edge	MX204 and ACX5448-D	Junos OS 23.2R2
P Router	PTX10003-80C and ACX7100-48L	Junos OS Evolved 23.2R2
Data Center Spine	QFX5200	Junos OS 23.2R2
Data Center Leaf	QFX5120	Junos OS 23.2R2
Data Center Top of Rack	QFX5120	Junos OS 23.2R2

Version Qualification History

This JVD has been qualified in Junos OS Release 23.2R2.

Scale and Performance Data

This document might contain key performance indexes (KPIs) used in solution validation. Validated KPIs are multi-dimensional and reflect our observations in customer networks or reasonably represent solution capabilities. These numbers do not indicate the maximum scale and performance of individual tested devices. For uni-dimensional data on individual SKUs, contact your Juniper Networks representatives.

The Juniper JVD team continuously strives to enhance solution capabilities. Consequently, solution KPIs might change without prior notice. Always refer to the latest JVD test report for up-to-date solution KPIs. For the latest comprehensive test report, contact your Juniper Networks representative.

Scale Summary on WAN Edge		
Feature	ACX5448-D	MX204
VLANS	3453	2152
MAC 41900 34000	41900	34000
Bridge Domains	757	1460
IGP(OSPF)	50K	50K
BFD	5@100 ms	5@100 ms
VLANS	3453	2152

Scale Summary on DC Edge		
Feature	DC Edge MX10003/MX480	Leaf QFX5120
VLANS	3503	3503
MAC	41000	34000
ARP	40900	900
Switching Instance	1500	1500
Bridge Domains	2217	2217
VNI	2217	2217
VTEP	4503	1506
ESI	48	48
IRB (CRB Model)	2153	NA
IRB (ERB Model)	50	50
IGP(OSPF)	50K	50K
BFD	3@100 ms	4@100 ms

Traffic Profiles

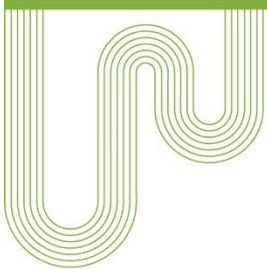| Scale Summary on WAN Edge		
Bidirectional Traffic Stream details	**Packet Size**	**Port Rate**
EVPN_VLAN_Based_WANEdge1_to_Leaf1 / Leaf2	512	200 Mbps
EVPN_VLAN_Based_Leaf1 / Leaf2_to_WANEdge1	512	200 Mbps
EVPN VLAN_Bundle_WANEdge1_to_Leaf1 / Leaf2	512	200 Mbps
EVPN_VLAN_Bundle Leaf1 / Leaf2_to_WANEdge1	512	200 Mbps
EVPN_VLAN_Aware_WANEdge1_to_Leaf1 / Leaf2	512	200 Mbps
EVPN_VLAN_Aware_Leaf1 / Leaf2_to_WANEdge1	512	200 Mbps
EVPN_VLAN_Based_WANEdge2_to_Leaf1 / Leaf2	512	200 Mbps
EVPN_VLAN_Based_Leaf1 / Leaf2_to_WANEdge2	512	200 Mbps
EVPN_VLAN_Bundle_WANEdge2_to_Leaf1 / Leaf2	512	200 Mbps
EVPN_VLAN_Bundle_Leaf1 / Leaf2_to_WANEdge2	512	200 Mbps

Convergence Scenarios	**Convergence Time**
EVPN-MPLS traffic convergence with WANEdge1 to P1-Node Link failure	~71
EVPN-MPLS traffic convergence with WANEdge1-Node to P1-Node Link failure	~71
EVPN-MPLS traffic convergence with MPLS CORE P1 node failure	44
EVPN-MPLS traffic convergence with P1-Node to DC1 Link failure	14
EVPN-MPLS traffic convergence with P1-Node to DC1 Link failure	44
EVPN-MPLS traffic convergence with WANEdge1 to P1-Node Link failure	~71

High Level Features Tested

- Enterprise Data Center running eBGP underlay and iBGP overlay protocol.
- EVPN-VXLAN Layer 2 connectivity to deliver application traffic to end users.
- Enterprise WAN backbone running OSPF as IGP with LFA for link and node protection.
- LDP for label distribution and iBGP for EVPN signalling.
- Seamless interconnect of EVPN-VXLAN to EVPN-MPLS without logical tunnel interfaces.
- Active multihoming within the data center.
- Single-homed WAN Edge.
- BFD for rapid failure detection and convergence.
- Three EVPN-MPLS/EVPN-VXLAN service models:
  - VLAN-based
  - VLAN bundle
  - VLAN-aware bundle

Event Testing

- Restart of critical Junos OS processes.

- Device reboot.

- Interface up/down.

- Deletion or configuration of various configuration stanzas.

- Clearing protocol sessions.