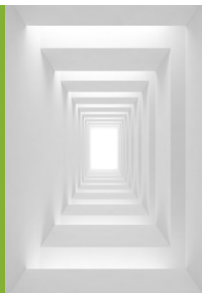
Juniper® Validated Design

Metro Ethernet Business Services

with Updated Platform Recommendations



JVD-METRO-EBS-03-03

Introduction

This Juniper Validated Design testing focused on evaluating the design of Metro Ethernet Business Services, specifically for E-LINE/E-LAN/E-ACCESS metro services based on a next-generation Seamless Segment Routing transport infrastructure, incorporating ACX7024 (DUT), ACX7100-48L (DUT), MX204, ACX5448, and ACX710 as access nodes. The ACX7348 (DUT) and ACX7348 (DUT) platforms support lean edge solutions, offering connectivity options into cloud compute complexes. The MX10004 (DUT) supports multi-service edge (MSE) functionality to facilitate complex connectivity and Internet access. PTX10001-36MR supports core and peering roles.

The solution delivers the integration of traditional metro ring architectures with multi-instance ISIS, Flex-Algo Prefix Metric (FAPM) into NG SR-MPLS metro fabrics leveraging inter-domain transport class and Inter-AS BGP-CT with end-to-end multi-domain service mapping. Connectivity options for port (EPL) and VLAN (EVPL) IEEE 802.1q/QinQ based EVC's supporting end-to-end active-active highly available services including EVPN-VPWS/FXC/EVPN-ELAN and co-existing with traditional VPN services including multi-site VPLS, hot-standby L2Circuit, L2VPN and L3VPN with DIA (Dedicated Internet Access). Legacy static PWs are migrated to an Anycast Floating PW (AFPW) solution, leveraging Anycast-SID for L2 QinQ connectivity. Layer 2 services include E-OAM performance monitoring.

What are the Updated Platforms?

This release of the Metro EBS JVD introduces updated hardware platforms to reflect the continued evolution of metro requirements. The updates provide higher bandwidth, throughput, and scale, while unifying the architecture on a simplified power-optimized platform set. These enhancements align with current customer deployments and prepare the metro for 400G and future service growth.

These updates simplify the platform footprint, ensure feature consistency, and align with modern Cloud Metro use cases.

MX10004 with the **LC9600** line card replaces MX304 in the role of Multiservice Edge (MSE) termination for dense L2/L3 VPN termination, Dedicated Internet Access (DIA), inter-domain communications, policy/QoS, and high scale at the network edge. Key platform features and technical differentiators introduced in this solution include:

- Powered by Juniper Trio 6 custom silicon architecture, LC9600 integrates six Juniper YT ASICs (1.6Tbps each) for 9.6 Tbps per slot.
- System capacity: 38.4Tbps in a compact 7RU chassis when fully populated with LC9600.
- High-density connectivity: 24 × QSFP56-DD (400G/100G), breakout up to 96 × 100G, with integrated MACsec and full PTP timing; ~768K queues per slot enable granular QoS.
- SLA-oriented scale: Hierarchical QoS and deep queuing enable fine-grained shaping/policing per service or customer; timing accuracy supports deterministic, MEF-aligned metro behaviors.
- Operational efficiency and growth: Compact 400G-ready edge reduces space and footprint, while maintaining dense throughput and scale. Trio/Junos continuity simplifies migration and automation across EVPN and traditional VPN services.

ACX7348, part of Juniper Cloud Metro portfolio, replaces ACX7100-32C and ACX7509 in the Metro Edge Gateway (MEG) role, aggregating metro access fabrics, terminating border-leaf VPN services, and providing SLA-grade business service delivery at the metro edge. Key platform features and technical differentiators introduced in this solution include:

- Powered by Broadcom Qumran-2C (Q2C) chipset, part of the Jericho2/DNX generation, delivering deterministic low-latency performance for metro aggregation and services.
- System capacity: 2.4Tbps forwarding in a compact 3RU, 29-cm-deep chassis.
- High-density connectivity: Fixed 48 × 1/10/25GbE (MACsec) and 8 × 100GbE (QSFP28) ports, plus three modular I/O bays (2 × 800 Gb/s, 1 × 400 Gb/s) supporting 100/200/400GbE uplinks.
- Service assurance: Industrial-temperature (-40 °C to +65 °C), precision timing (SyncE, PTP, Class C, GNSS), advanced OAM, and integrated MACsec for SLA-driven metro services.
- Operational efficiency and growth: Fixed-plus-modular design combines resilient base hardware with build-as-you-grow scalability; Junos OS Evolved feature continuity and **MEF 3.0 certification** simplify operations and Carrier Ethernet service assurance.

PTX10001-36MR replaces MX10003 and ACX7509 in the Metro Distribution Router (MDR) role, delivering high-capacity metro aggregation, supporting multiple metro rings, and enabling resilient transport with deterministic performance and fast failover. Key platform features and technical differentiators introduced in this solution include:

- Powered by Juniper Express 4 custom silicon architecture, delivering high-capacity forwarding optimized for transport aggregation, peering, and high-scale metro distribution.
- System capacity: 9.6Tbps non-oversubscribed ultra-compact 1RU chassis.
- High-density connectivity: 24 × 400GE (QSFP56-DD) and 12 × 100GE (QSFP28) ports for dense 400G aggregation with flexible 100G fan-out.
- Transport resilience: Built for high-availability metro fabrics, with TI-LFA, micro-BFD, and advanced fast reroute mechanisms enabling sub-50ms failover across metro rings and inter-domain paths.
- Operational efficiency and growth: Compact 1RU, dense 400G architecture reduces space and power footprint with power-optimized transport; Junos OS Evolved continuity simplifies automation and integration across metro aggregation, DCI, and core transport roles.

Alignment with MEF 3.0 Standards

An important focus of the Metro Ethernet Business Services JVD involves alignment with Mplify (formerly Metro Ethernet Forum) for MEF 3.0 standards. Mplify is an industry consortium dedicated to accelerating the adoption of Carrier Ethernet services and technologies. Its primary purposes and goals revolve around:

- Standardization, interoperability, and innovation within the Ethernet ecosystem
- Development and promotion of standards for Carrier Ethernet services
- Ensuring interoperability between Carrier Ethernet networks and equipment from different vendors
- Fostering innovation by promoting the development of new technologies and services based on Carrier Ethernet
- Educating the market about the benefits and capabilities of Carrier Ethernet services

In this updated design, ACX7348 is MEF 3.0 certified (listed in the Mplify MEF 3.0 Technology Registry), ensuring compliance for supporting MEF-defined business services such as E-Line and E-LAN. This continued alignment ensures service interoperability and compliance across multivendor metro networks.

Test Topology

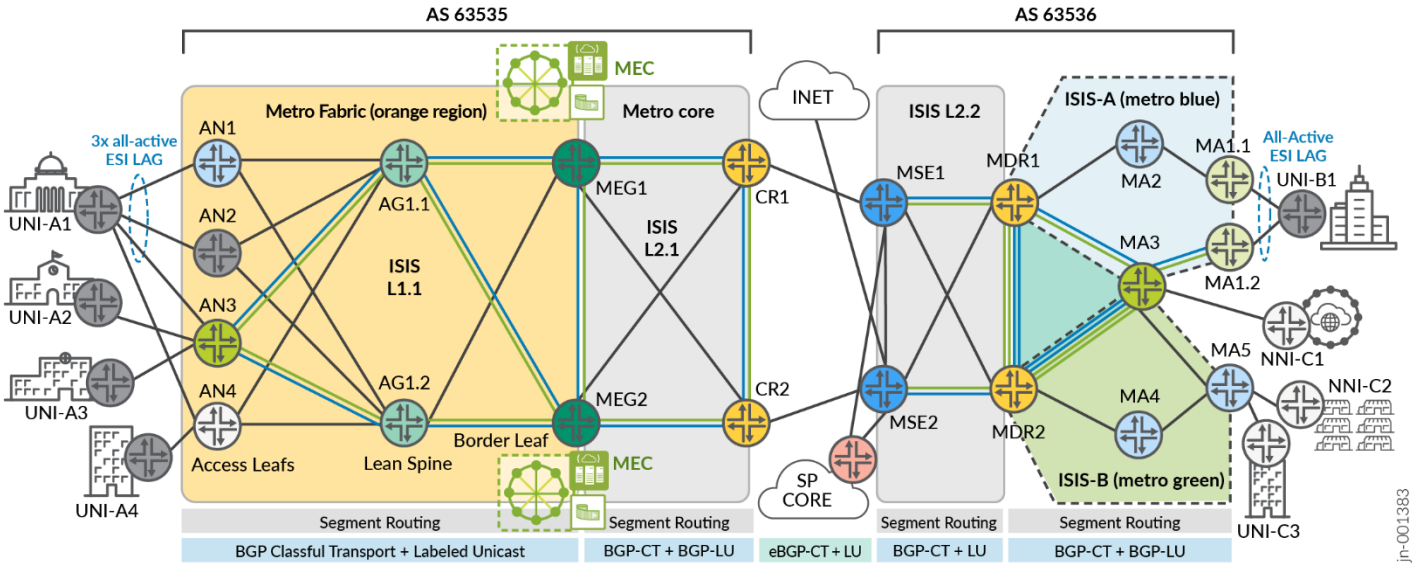


Figure 1: Metro EBS Solution Topology

Platforms Tested

Table 1: Platforms Used

Role	Platform	OS	Line card	RE
Access Node AN1	MX204	Junos OS 24.2R2S1	N/A	N/A
Access Node AN2	ACX5448	Junos OS 24.2R2S1	N/A	N/A
Access Node (DUT) AN3	ACX7100-48L	Junos OS Evolved 24.2R2S1	N/A	N/A
Access Node AN4	ACX710	Junos OS 24.2R2S1	N/A	N/A
Aggregation Node AG1.1	ACX7100-32C	Junos OS Evolved 24.2R2S1	N/A	N/A
Aggregation Node AG1.2	ACX7100-32C	Junos OS Evolved 24.2R2S1	N/A	N/A
Metro Edge Gateway (DUT) MEG1	ACX7348	Junos OS Evolved 24.2R2S1	ACX7348-FPC	ACX7300-RE
Metro Edge Gateway (DUT) MEG2	ACX7348	Junos OS Evolved 24.2R2S1	ACX7348-FPC	ACX7300-RE
Core Router CR1	PTX10001-36MR	Junos OS Evolved 24.2R2S1	N/A	N/A
Core Router CR2	PTX10001-36MR	Junos OS Evolved 24.2R2S1	N/A	N/A
Multiservice Edge (DUT) MSE1	MX10004	Junos OS 24.2R2S1	JNP10K-LC9600	RE X10
Multiservice Edge (DUT) MSE2	MX10004	Junos OS 24.2R2S1	JNP10K-LC9600	RE X10
Metro Distribution Router MDR1	PTX10001-36MR	Junos OS Evolved 24.2R2S1	N/A	N/A
Metro Distribution Router MDR2	PTX10001-36MR	Junos OS 24.2R2S1	N/A	N/A
Metro Access MA2	MX204	Junos OS 24.2R2S1	N/A	N/A
Metro Access MA3	ACX7100-48L	Junos OS Evolved 24.2R2S1	N/A	N/A
Metro Access MA4	MX204	Junos OS 24.2R2S1	N/A	N/A
Metro Access MA5	MX204	Junos OS 24.2R2S1	N/A	N/A
Metro Access (DUT) MA1.1	ACX7024	Junos OS Evolved 24.2R2S1	N/A	N/A
Metro Access (DUT) MA1.2	ACX7024	Junos OS Evolved 24.2R2S1	N/A	N/A
UNI-A1	ACX5448	Junos OS 24.2R2S1	N/A	N/A
UNI-B1	ACX5448	Junos OS 24.2R2S1	N/A	N/A
Switches used for Multi-homing LAG	QFX5110-48s-4c	Junos OS 24.2R2S1	QFX5210-64C	RE-QFX5210-64C
	QFX5110-48s4c	Junos OS 24.2R2S1	QFX5210-64C	RE-QFX5210-64C

Version Qualification History

This JVD has been qualified in Junos OS 24.2R2S1 and Junos OS Evolved 24.2R2S1-EVO.

Scale and Service Details

Table 2: Scale Numbers for the Devices Under Test (DUTs)

Devices Under Test Scale							
Feature	**AN3 ACX7100-48L**	**MEG1 ACX7348**	**MEG2 ACX7348**	**MSE1 MX10004**	**MSE2 MX10004**	**MA1.1 ACX7024**	**MA1.2 ACX7024**
IFD	66	50	48	115	108	35	35
IFL	8581	4249	3945	16333	13776	789	1512
VLANs per-system	6064	3064	3061	7745	5686	600	830
ISIS Adjacency IPv4	4	7	9	4	3	2	2
IBGP v4 Sessions	2	7	7	8	3	4	4
EBGP sessions	200	2	2	2201	2203	-	-
RIB routes	~279k	~155k	~154k	~349k	~1.2M	~31k	~33k
FIB routes	~65k	~12k	~12k	~113k	~966k	~4k	~4k
EVPN-VPWS SH	200	-	-	-	-	-	-
EVPN-FXC SH VLAN-unaware	500	-	-	500	-	-	-
EVPN-FXC SH VLAN-aware	-	-	-	-	-	-	-
EVPN-FXC MH VLAN-aware	0	50	50	-	-	50	50
EVPN-VPWS A/A MH	1400	1000	1000	-	-	400	400
EVPN-ELAN MH VLAN-bundle	200	200	200	-	-	-	-
EVPN-ELAN MH VLAN-based	100	100	100	-	-	100	100
EVPN-ETREE	-	-	-	1000	1000	-	-
EVPN TYPE-5	50	50	50	50	50	-	-
EVPN Anycast IRB	25	25	25	25	25	-	-
EVPN-VPWS EPL	1	-	-	-	-	1	-
EVPN-ELAN EPL	1	-	-	-	-	-	1
EVPN Floating PW	-	-	-	100	100	-	100
L2VPN EPL	1	-	-	-	-	-	-
L2Circuit Hot Standby	1000	1000	1000	-	-	-	-
L2 VPN Sessions	200	-	-	-	-	-	-
L3VPN BGPv4 Instances	100	-	-	1100	1100	-	-
L3VPN BGPv6 Instances	100	-	-	1100	1100	-	-
L3VPN OSPF Instances	100	-	-	1100	1100	-	-
VPLS Instances	300	200	100	-	-	-	200
MAC Scale - VPLS	900	600	300	-	-	-	500
CFM UP MEP	1000	400	200	-	-	-	300
TOTAL VPN SERVICES	4278	2525	2525	4975	4475	551	851

Convergence Data

The JVD team validated the reference architecture for Metro Ethernet Business Services, encompassing over twenty service-delivery use cases across multi-domain and inter-AS seamless segment routing infrastructure. The network includes controller-less lite-slicing solutions with flex-algo, transport classes, and service mapping. The validation includes MX10004, ACX7024, ACX7100-48L, ACX7348 and ACX7348 as primary DUTs with helper nodes including PTX10001-36MR, MX204, MX10003, ACX5448, ACX710, QFX5110 platforms. Over 300 test cases are executed successfully in the course of validation on JUNOS and JUNOS Evolved version 24.2R2S1.

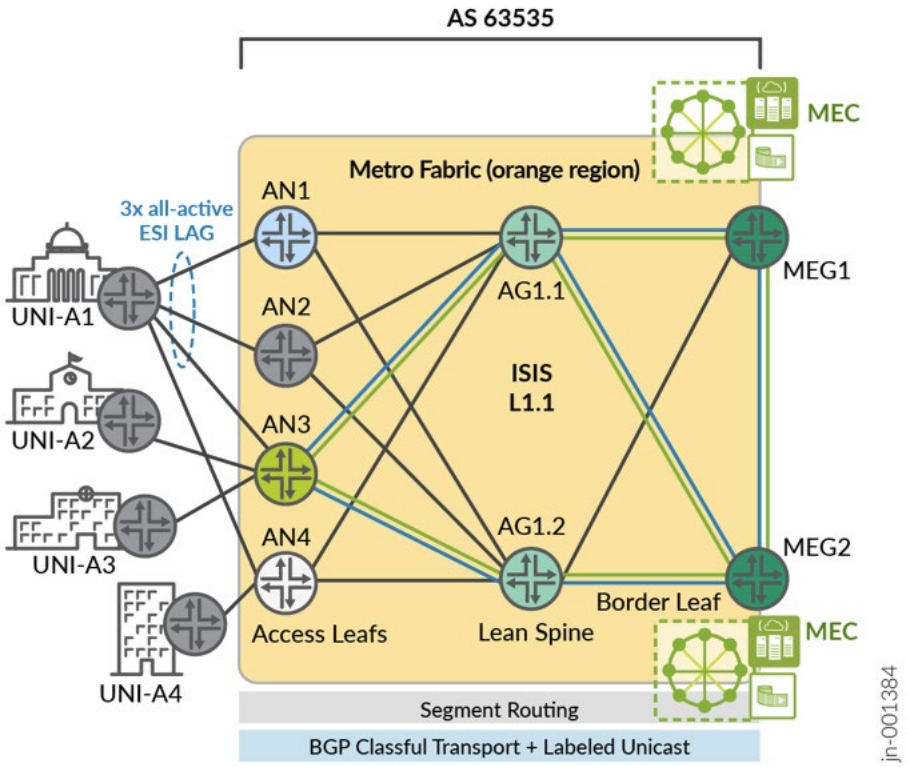


Figure 2: Metro EBS Solution Topology

The next table summarizes convergence times for metro fabric services for the given failure event. The fabric design enables flow optimization for AN-to-AN VPN services. Intra-AS metro fabric services include AN-to-AN (via spine), AN-to-MEG single-homing, and AN-MEG1/MEG2 multi-homing. The Metro Edge Gateway (MEG) supports the connectivity into edge computing services.

Table 3: Convergence Times for Metro Fabric Services

METRO FABRIC INTRA-AS (milliseconds)								
	EVPN-VPWS		EVPN-ELAN		L2CIRCUIT		L3VPN	
EVENT	COLOR AWARE	COLOR AGNOSTIC	COLOR AWARE	COLOR AGNOSTIC	COLOR AWARE	COLOR AGNOSTIC	COLOR AWARE	COLOR AGNOSTIC
AN3-AG1.1 link disable	0	1.2	2.7	1.3	0.025	0.025	0	1.4
AN3-AG1.1 link enable	0.1	0.1	0.1	0.025	0.012	0.025	0	0.1
AN3-AG1.2 link disable	1.6	4	1.1	2.4	4.2	4.2	0	2
AN3-AG1.2 link enable	0	0	0.02	0.01	0.01	0.01	0	0
AG1.2-MEG2 link disable	1.4	1.3	1.3	1.5	2.4	2.4	0	1.2
AG1.2-MEG2 link enable	0.1	0.1	0.02	0.1	0.02	0.01	0	0.1
AG1.1-MEG1 link disable	1.1	1	1	1.2	0.02	0.02	0	1.2
AG1.1-MEG1 link enable	0	0	0.02	0.03	0.01	0.01	0	0
L2CKT Standby Failover	-	-	-	-	3842.3	3140	-	-
L2CKT Standby Revert	-	-	-	-	0.3	0.3	-	-

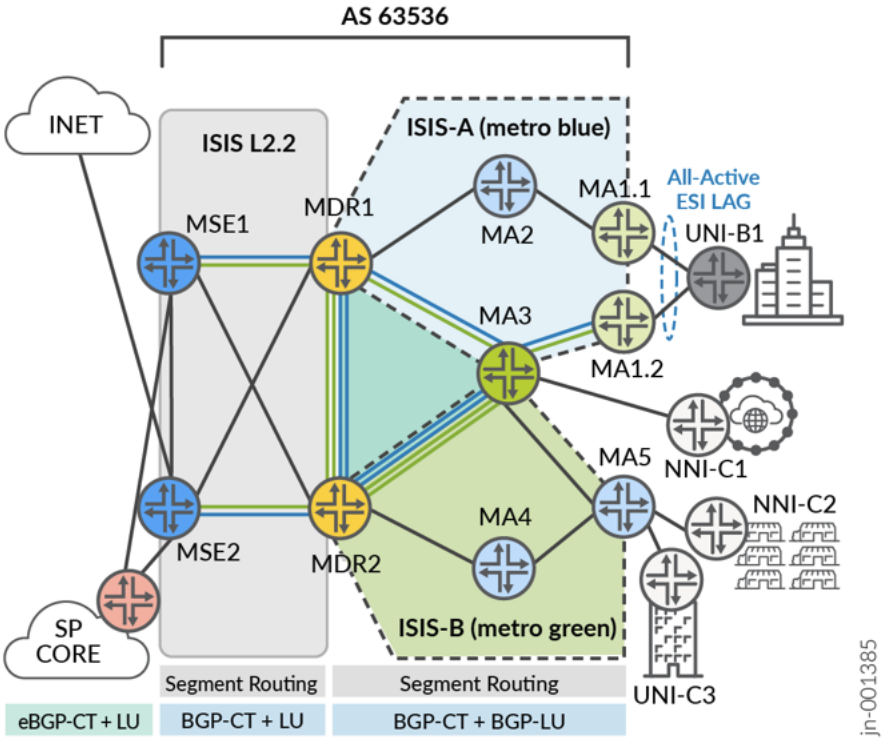


Figure 3: Metro Multi-Ring Topology

The next table summarizes convergence times for metro multi-ring services for the given failure event. The multi-ring design enables flow optimization for MA-to-MA VPN services by leveraging MDR1/MDR2 as the point of prefix leaking between ring domains (ISIS instances). Intra-AS metro multi-ring services include MA-to-MA, MA-to-MSE single-homing, and MA-MSE1/MSE2 multi-homing. The Multiservices Edge (MSE) routers support Internet-VRF and SP core connectivity, which allows services to be stitched into additional network domains.

Table 4: Convergence Times for Metro Multi-Ring Services

METRO MULTI-RING INTRA-AS (milliseconds)								
	BGP-VPLS		EVPN-TREE		FLOATING PW		L3VPN	
EVENT	COLOR AWARE	COLOR AGNOSTIC	COLOR AWARE	COLOR AGNOSTIC	COLOR AWARE	COLOR AGNOSTIC	COLOR AWARE	COLOR AGNOSTIC
MDR1-MA2 link disable	0.06	0.1	0	0	0.07	0.07	0.1	0.1
MDR1-MA2 link enable	14.7	3	0.1	0.1	0.07	0.07	0.1	0.1
MDR1-MA3 link disable[2]	0.06	0.06	0.1	1.6	1.1	0.2	0	0.1
MDR1-MA3 link enable[2]	0.06	0.1	0	0.8	1	0.2	0.1	0.1
MDR2-MA3 link disable[2]	0.06	0.06	0.1	0.1	1.3	0.05	0.1	0.1
MDR2-MA3 link enable[2]	0.06	0	0	0	2.7	0.07	0.1	0.1
MDR2-MA4 link disable	2	1.1	3.4	14.9	0.08	0.07	3	4
MDR2-MA4 link enable	0	0	0.1	14.3	0	0	0.1	0
MA1.2-MA3 link disable	22.5	69.1	0.1	0.1	24.5	8.1	1	1
MA1.2-MA3 link enable	7.4	7.4	0	0.7	3	0.06	0	0
SP Core to MSE2 link disable[1]	-	-	226.2	305.1	16.7	5.3	-	-
SP Core to MSE2 link enable[1]	-	-	269.1	263.2	611.8	322	-	-

[1] SP Core represents a Q-in-Q segment handoff.

[2]Both MDR-MA3 results with a notation that this failure is performed on the sub-interface to ensure only one ring is impacted at a time.

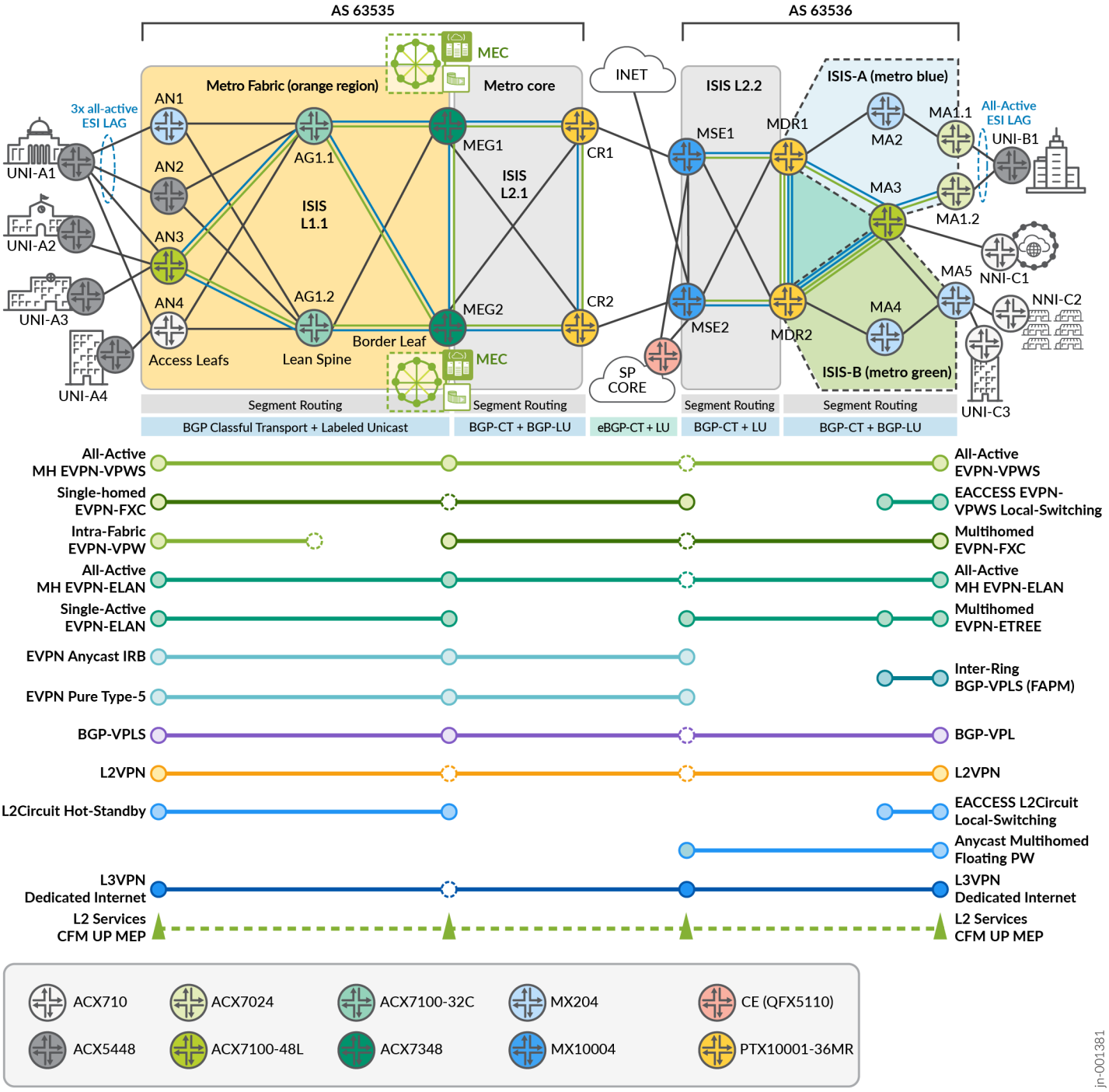


Figure 4: Metro Fabric to Multi-Ring Inter-AS Topology

The next convergence table includes the end-to-end inter-AS services.

Table 5: Convergence Times for End-to-End Inter-AS Services

METRO MULTI-RING INTER-AS (milliseconds)										
	EVPN-VPWS		EVPN-ELAN		L2VPN		VPLS		L3VPN	
EVENT	COLOR AWARE	COLOR AGNOSTIC	COLOR AWARE	COLOR AGNOSTIC	COLOR AWARE	COLOR AGNOSTIC	COLOR AWARE	COLOR AGNOSTIC	COLOR AWARE	COLOR AGNOSTIC
AN3-AG1.1 link disable	0.1	0.1	0.5	0.1	0.1	0.1	2.8	2.8	1	1
AN3-AG1.1 link enable	0.1	0.2	0.06	0.1	0.2	0.2	0.06	0.06	0.1	0.1
AN3-AG1.2 link disable	0.1	4.3	1.2	4.3	2.4	4.4	2.6	4.3	4.3	4.3
AN3-AG1.2 link enable	0.05	0.1	0.06	0.1	0.1	0.1	0.12	0.12	0.1	0.1
AG1.2-MEG2 link disable	0.1	2.4	1.6	2.6	1.5	2.6	1.5	2.4	2.4	2.6
AG1.2-MEG2 link enable	0.1	0.1	0.12	0.1	0.2	0.1	0.1	0.06	0.1	0.1
AG1.1-MEG1 link disable	2.4	0.6	0.9	0.7	1	0.1	0.9	0.1	2	0.1
AG1.1-MEG1 link enable	0.1	0.1	0.08	0.1	0.1	0.1	0.06	0.06	0	0.1
MDR1-MA2 link disable	0.05	2.3	0.1	1.1	0.1	0.1	0.06	0.06	0.1	0.1
MDR1-MA2 link enable	2.4	0.2	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1
MDR1-MA3 link disable[2]	2.4	2.4	0.1	0.1	0.1	0.1	1.1	1	0.1	0.1
MDR1-MA3 link enable[2]	0.04	0.1	0.1	0.1	0.1	0.1	1.3	1.2	0.1	0.1
MDR2-MA3 link disable[2]	0.1	0.1	0.1	0.1	0.1	0.1	1.5	1	0.1	0.1
MDR2-MA3 link enable[2]	0.06	1.5	0	0.1	0.1	0.1	2.5	2.5	0.1	0.1
MDR2-MA4 link disable	0.1	0.1	0.06	0.2	0.7	3.2	1.2	1.9	0.1	0.1
MDR2-MA4 link enable	0.1	0.1	0.12	0.12	0	0.1	0.06	0.12	0	0.1
MA1.2-MA3 link disable	14.8	7.4	-	8	0.1	0.1	10.4	10.4	1	1
MA1.2-MA3 link enable	9.9	0.1	1.9	7.6	0.1	0.1	8.7	1.2	0.1	0

METRO MULTI-RING INTER-AS (milliseconds)										
AN3 ESI LAG disable	0.2	110	713	1125[1]	-	-	-	-	-	-
AN3 ESI LAG enable	-	1	53.6	53.6	-	-	-	-	-	-
MEG-MEC link disable	750.5[1]	1077.4[1]	839[1]	1589[1]	-	-	-	-	-	0
MEG-MEC link enable	450[1]	376[1]	0[1]	0.1[1]	-	-	-	-	-	81.5

[1] Current result show global repair. For fast fail over, the Dynamic-List NextHop (DLNH) feature is required. It is scheduled for JUNOS-EVO 24.4.

[2] MDR-MA3 failures are performed on the sub-interface to ensure only one ring is impacted at a time.

Traffic Profiles

Table 6: Custom IMIX definition

Custom IMIX Table	
Size	**Weight**
64	3
128	16
256	6

Table 7: Traffic Load Distribution

Traffic Load Distribution		
Feature	**Aggregate FPS**	**Packet Sizes Tested**
L2Circuit-HSB	322983	Custom IMIX
L2Circuit-HSB	2400	512
Floating-PW	322982	Custom IMIX
Floating-PW	1600	512
EVPN-VPWS-SH	11000	Custom IMIX
EVPN-VPWS-SH	1200	512
EVPN-FXC-SH-unaware	432984	Custom IMIX
EVPN-FXC-SH-unaware	2400	512
EVPN-FXC-MH-aware	21395.5	Custom IMIX
EVPN-FXC-MH-aware	4800	512
EVPN-ETREE	64596	Custom IMIX
EVPN-ETREE	12000	512
VPLS	446023	Custom IMIX
VPLS	14400	512
L2VPN	40000	Custom IMIX
L2VPN	1200	512
EVPN-ELAN-MH-VLAN-bundle	322983.5	Custom IMIX
L3VPN-OSPF	88000	Custom IMIX
L3VPN-BGPv4	88000	Custom IMIX
L3VPN-BGP-v6	8000	Custom IMIX
EVPN-ELAN-MH-VLAN-based	1078952	Custom IMIX
EVPN-ELAN-MH-VLAN-based	3600	512
EVPN-TYPE-5	140000	Custom IMIX
L3VPN-BGPv4-INTERNET	40000	Custom IMIX
EVPN-VPWS-MH	60000	Custom IMIX
EVPN-VPWS-MH	5400	512
EVPN-VPWS-LSW	20000	Custom IMIX
EVPN-VPWS-LSW	1200	512
L2Circuit-LSW	16149	Custom IMIX
L2Circuit-LSW	3000	512
EVPN-VPWS-EPL	60000	Custom IMIX
L2VPN-EPL	60000	Custom IMIX

Traffic Load Distribution		
Feature	**Aggregate FPS**	**Packet Sizes Tested**
EVPN-ELAN-EPL	60000	Custom IMIX
L3VPN-BGP-INTERNET	20000	Custom IMIX
L3VPN-BGP-v6_INTERNET	60000	Custom IMIX
EVPN - Anycast IRB	100000	Custom IMIX
EVPN-TYPE-5-INTERNET	20000	Custom IMIX

High Level Features Tested

The high level features that are tested are as follows:

Common Features:

- Seamless SR-MPLS with TI-LFA
- Flexible Algorithm Application Specific Link Attribute (ASLA)
- Co-Existence of Seamless SR-MPLS BGP-LU & BGP-CT Inter-AS solutions
- End-to-End color-aware Traffic Steering (Network “Lite-Slicing”)
- Intra-domain Transport Class tunnelling with Service Mapping
- Inter-domain color awareness with BGP Classful Transport
- All services include color-aware & color-agnostic path selection
- Intent-based routing with Color Mapping based on Delay & TE metrics
- Color agnostic services take IGP metric paths (inet.3)
- Strict Resolution Scheme (no fallback) and Cascade Fallback

Metro Fabric Features:

- Lean Edge services aggregation
- Metro Edge Gateway with Multi-access Edge Compute Interconnectivity
- Optimized forwarding paths over 2-stage MPLS fabric
- EVPN-FXC (aware + unaware), EVPN-VPWS, EVPN-ELAN
- L2Circuit, L2VPN, BGP-VPLS
- Dedicated Internet Access (DIA): L3VPN, EVPN Type-5
- All-Active ESI LAG load-shared x3 PEs
- Active-Active and Hot-Standby Services
- Policer scale

Metro Rings Features:

- Multi-Instance ISIS (blue & green rings)

- Flex-Algo Prefix Metrics (FAPM) Leaking across ISIS Multi-Instances to optimize inter-ring forwarding paths
- Intra-domain Transport Class Service Mapping
- Floating PW with Anycast-SID (migrating from legacy L2CKT)
- EVPN-ETREE (MX-only), EVPN-FXC, EVPN-VPWS, EVPN-ELAN, L2Circuit, L2VPN, BGP-VPLS
- Local Switching (LSW) EVPN-VPWS & L2Circuit
- L3VPN

Known Limitations

The known limitations are as follows

- The solutions and services proposed by the JVD can be considered complete and supported with the following distinctions. Note that any target JUNOS/EVO feature delivery references are not guaranteed and are subject to delay or cancellation without notice. Please consult with your Juniper account representative for status.
- Juniper recommends three additional optimization options for improving EVPN performance and reducing convergence time. For EVPN active-active multi-homing, the ESI route by default points to two next hops. A link failure event between PE and CE causes a new next-hop entry to be created, triggering mass MAC route withdrawals and additions. Juniper recommends Dynamic List Next Hop (DLNH) to enable the silent removal of the affected next-hop entry without causing mass MAC withdrawals. EVPN Egress Link Protection https://www.juniper.net/documentation/us/en/software/junos/evpn-vxlan/topics/concept/convergence-mh-evpn-mpls.html creates backup next hops on multi-homed PEs to support fast reroute (FRR). These features are currently supported on MX platforms. ACX7000 platforms support these features from 24.4R1-EVO, therefore not included with 24.2R2-EVO covered by this JVD.
- The ACX7000 family does not support these features in 24.2R2-EVO but support is planned for 24.4R1-EVO.
- To avoid certain BGP-LU & BGP-CT inter-domain global repair events, Juniper recommends BGP-PIC machinery. In the presented solution, the functionality requires the preserve-nexthop-hierarchy knob, which is supported by MX platforms and included in the JVD. PNH is supported for the ACX7000 family starting with 24.2R1-EVO, with additional support for L2 VPN services coming in 24.4R1-EVO and later. Please consult with your Juniper account representative for details. BGP-PIC for Seamless SR (BGP-LU & BGP-CT) is not included in the JVD for unsupported devices.
- The ACX7000 family supports simultaneous ECMP + FRR mechanisms starting from 24.2R1-EVO. In general, TI-LFA fast reroute will provide optimal restoration, and these are the results reported in the JVD. Simultaneous ECMP + FRR mechanisms are not tested in 24.2R2-EVO.
- In EVPN-MPLS scenarios, where the underlay resolves using a recursive route (like SR-TE or BGP-LU scenarios), underlay changes can result in service route next hop changes. If there is a quick underlay flap and the original service route next hop to a remote-PE/BD is reused, the remote-PE may be missing from the flood-next hop list of the corresponding BD. This limitation is resolved with the introduction of the `preserve-nexthop-hierarchy` with `multipath-resolve` configuration options.

Event Testing

The events that are tested are as follows:

- Restart and kill of critical Junos OS or Junos EVO processes and assess the impact.
- Device reboot to evaluate the impact on the network.
- Interface flap events to evaluate the impact on the traffic.

- Deletion or configuration of various configuration stanzas to evaluate the impact of node and network stability.
- Clearing protocol sessions to simulate protocol session flaps and assess the impact on services and traffic.

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