Carrier Ethernet Technical Standard Compliance Register: CE 2.0 E-Line and E-LAN Provisioning Standards

TECHNOLOGY OVERVIEW

Carrier Ethernet 2.0 (CE 2.0) represents the definitive evolution of metro and wide-area Ethernet services, standardized by the Metro Ethernet Forum (MEF) to deliver carrier-class transport with deterministic performance, stringent service level agreements (SLAs), and multi-vendor interoperability. This document serves as an authoritative compliance register and technical overview for the CE 2.0 E-Line (point-to-point) and E-LAN (multipoint-to-multipoint) provisioning standards, detailing the architectural principles, service attributes, and hardware-level implementation requirements necessary for deployment in modern carrier-grade networks.

CE 2.0 builds upon the foundational CE 1.0 framework by introducing eight certified service types, advanced Class of Service (CoS) mechanisms, and standardized OAM (Operations, Administration, and Maintenance) capabilities. The E-Line service type provides a dedicated, symmetric, point-to-point Ethernet Virtual Connection (EVC) with guaranteed bandwidth and low latency, ideal for transparent LAN service (TLS), virtual private wire service (VPWS), and high-capacity backhaul. The E-LAN service type delivers a multipoint-to-multipoint EVC, enabling full-mesh connectivity for multi-site

enterprises, cloud access, and distributed data center interconnect scenarios.



SERVICE ARCHITECTURE & EVC FRAMEWORK

At the core of CE 2.0 provisioning lies the Ethernet Virtual Connection (EVC), a logical construct that associates subscriber sites and defines the service topology. The EVC is instantiated across a provider's network via a combination of User-Network Interface (UNI) and Network-Network Interface (NNI) ports, each governed by strict MEF-defined parameters.

For E-Line services, the EVC is a point-to-point association, ensuring that frames ingressing at one UNI are delivered exclusively to a single egress UNI. This architecture guarantees bandwidth symmetry, deterministic jitter control, and strict frame delivery ratios. E-Line services are further classified by MEF as

Ethernet Private Line (EPL), where the UNI is dedicated to a single EVC, and Ethernet Virtual Private Line (EVPL), where multiple EVCs can be multiplexed over a single UNI using VLAN tags.

For E-LAN services, the EVC is a multipoint-to-multipoint association, where frames are delivered to all other UNIs in the same EVC, mimicking a distributed LAN segment. This enables transparent bridging across the provider network, supporting broadcast, unknown unicast, and multicast (BUM) traffic with loop-free topology enforcement via split-horizon forwarding. MEF distinguishes Ethernet Private LAN (EP-LAN) and Ethernet Virtual Private LAN (EVP-LAN) based on UNI dedication and multiplexing capabilities.

The CE 2.0 framework mandates support for the following service attributes across both E-Line and E-LAN: EVC type (P2P or MP2MP), UNI type (dedicated or multiplexed), bandwidth profile (CIR, EIR, CBS, EBS, CM color mode), CoS identifiers (PCP, DSCP, EXP), and service multiplexing. These attributes are enforced at the ingress and egress points using standardized metering, policing, and shaping algorithms.

[IMAGE_1]

PROTOCOL SUPPORT MATRIX & OAM CAPABILITIES

CE 2.0 compliance requires comprehensive support for IEEE 802.1Q, 802.1ad (QinQ), and 802.1ah (PBB) for service encapsulation and scalability. The standard leverages IEEE 802.1ag (Connectivity Fault Management) and ITU-T Y.1731 for fault detection, performance monitoring, and diagnostic functions. MEF-defined OAM attributes include continuity check, loopback, link trace, frame delay, frame delay variation, frame loss ratio, and availability.

Service multiplexing is achieved through VLAN tag stacking, where the provider edge (PE) device maps subscriber traffic to specific EVCs based on outer VLAN (S-VLAN) and inner VLAN (C-VLAN) identifiers. For E-Line and E-LAN services, the CE 2.0 standard specifies that the UNI must support at least 8 CoS per EVC, with strict ingress policing and egress shaping to enforce the bandwidth profile.

KEY FEATURES

- E-Line Service Type: Point-to-point EVC with dedicated or multiplexed UNI, supporting EPL and EVPL variants for transparent LAN and virtual private wire services.
- E-LAN Service Type: Multipoint-to-multipoint EVC with full-mesh connectivity, supporting EP-LAN and EVP-LAN variants for distributed enterprise and cloud access.
- Bandwidth Profile Enforcement: Standardized CIR, EIR, CBS, EBS, and

color-mode metering per MEF 10.3, ensuring deterministic SLA adherence.

- Class of Service (CoS): Eight priority levels per EVC, mapped via PCP, DSCP, or EXP fields, with strict queueing and scheduling disciplines.

- OAM & Performance Monitoring: IEEE 802.1ag and ITU-T Y.1731 support for fault management and performance metrics, including frame delay, jitter, and loss ratio.

- Multi-Vendor Interoperability: MEF CE 2.0 certification ensures seamless interworking across disparate vendor platforms and network domains.

- Scalability & Multiplexing: VLAN tag stacking (QinQ), PBB, and EVC multiplexing for high-density service provisioning.

COMPLIANCE & STANDARDS

This platform is designed to meet or exceed the following standards and certifications:

- MEF 6.2: EVC Ethernet Service Definitions

- MEF 7.2: EMS-NMS Information Model

- MEF 10.3: Ethernet Services Attributes Phase 3

- MEF 11: User Network Interface (UNI) Requirements

- MEF 26.1: External Network Network Interface (ENNI)

- MEF 33: Ethernet Access Services

- MEF 35: Service OAM Performance Monitoring

- IEEE 802.1Q: Virtual LANs

- IEEE 802.1ad: Provider Bridging

- IEEE 802.1ah: Provider Backbone Bridging

- IEEE 802.1ag: Connectivity Fault Management

- ITU-T Y.1731: OAM Functions and Mechanisms for Ethernet

- ITU-T G.8032: Ethernet Ring Protection Switching

TECHNICAL SPECIFICATIONS

Parameter	**Specification**
Service Types	E-Line (EPL, EVPL), E-LAN (EP-LAN, EVP-LAN)
EVC Topology	Point-to-Point (E-Line), Multipoint-to-Multipoint (E-LAN)
UNI Types	Dedicated (Private), Multiplexed (Virtual Private)
Bandwidth Profile	CIR, EIR, CBS, EBS, CM (Color Mode) per MEF 10.3
Class of Service (CoS)	8 priority levels per EVC; PCP, DSCP, EXP mapping
VLAN Support	IEEE 802.1Q, 802.1ad (QinQ), 802.1ah

	(PBB)
OAM Protocols	IEEE 802.1ag, ITU-T Y.1731, MEF 35 Performance Monitoring
Protection Switching	ITU-T G.8032 Ethernet Ring Protection (ERP), <50ms
Multicast Support	IGMP Snooping, PIM-SM, MLD Snooping for E-LAN BUM traffic
MTU	Up to 9216 bytes (Jumbo Frames)
Latency	Sub-10ms for E-Line; Sub-50ms for E-LAN (typical)
Frame Loss Ratio	<0.001% for E-Line; <0.01% for E-LAN (SLA-dependent)
Service Multiplexing	Up to 4094 S-VLANs per UNI; 8 CoS per EVC
Management	SNMPv3, NETCONF/YANG, CLI, Syslog, MEF EMS-NMS Model
Certifications	MEF CE 2.0, NEBS Level 3, FCC, CE, UL, RoHS

REGULATORY COMPLIANCE

This equipment complies with the following regulatory directives and safety standards:

- EMC: FCC Part 15 Subpart B Class A, EN 55032 Class A, EN 55024
- Safety: UL 60950-1, IEC 60950-1, EN 60950-1
- Environmental: RoHS 2.0 (2011/65/EU), WEEE (2012/19/EU), REACH
- Telecom: NEBS Level 3 (GR-1089-CORE, GR-63-CORE), ETSI EN 300 019
- MEF: CE 2.0 Certified (E-Line, E-LAN, E-Tree, E-Access)

