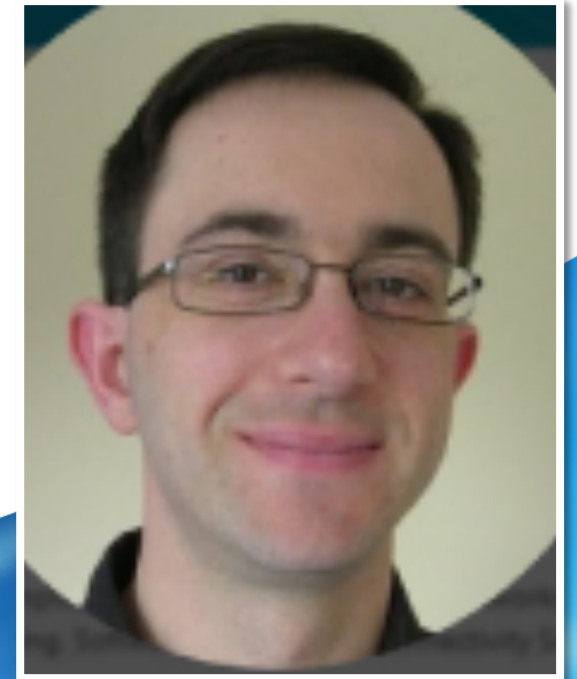MEF19

MEF 3.0 Carrier Ethernet Services

David Ball

LSO Committee Co-Chair, MEF
Principal Engineer, Cisco
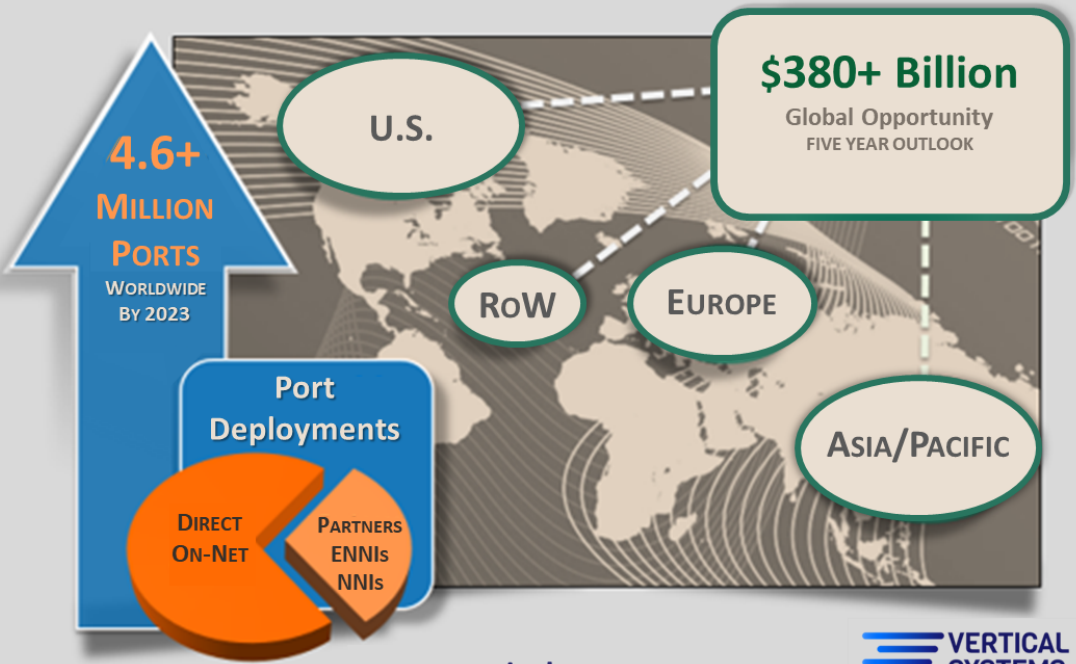
MEF Spearheaded the $85+B Global Carrier Ethernet Market

CE = GLOBAL CONNECTIVITY FABRIC FOR THE DIGITAL ECONOMY

GLOBAL CE SERVICES MARKET

GLOBAL CARRIER ETHERNET SERVICES

4.6+ MILLION PORTS WORLDWIDE BY 2023

U.S.

$380+ Billion
Global Opportunity
FIVE YEAR OUTLOOK

RoW   EUROPE

ASIA/PACIFIC

Port Deployments

DIRECT ON-NET   PARTNERS ENNIs NNIs

www.verticalsystems.com

VERTICAL SYSTEMS GROUP

RESULTS — MEF 3.0   CE 2.0

- **$85+B** annual services & tech market

- **200+** industry member companies

- **25+** MEF 3.0 CE certified organizations
  150+ CE 2.0 certified organizations

- **6575+** certified professionals

MEF

Enhancing Carrier Ethernet
MEF 3.0 CE

MEF

Key MEF 3.0 CE Standards

|	Service Attributes	Service Definitions
Subscriber Services	MEF 10.4	MEF 6.3 +MEF 22.3 (Mobile)
Operator Services	MEF 26.2	MEF 51.1 +MEF 62 (Managed Access)
Special Topics	SOAM MEF 30.1, 35.1 L2CP MEF 45.1	CoS/BWPs MEF 23.2(.1) SAT MEF 48

MEF

MEF 10.4 – Subscriber Ethernet Service Attributes

- **Key Concepts:**
    - Service Provider, Subscriber
    - UNI, EVC, EVC End Point
- **Key Service Attributes**
    - End Point VLAN Map
    - Class of Service Map
    - Service Level Specification
    - Bandwidth Profiles
    - PCP/DEI Preservation

Service Provider

EVC

UNI

EVC End
Point
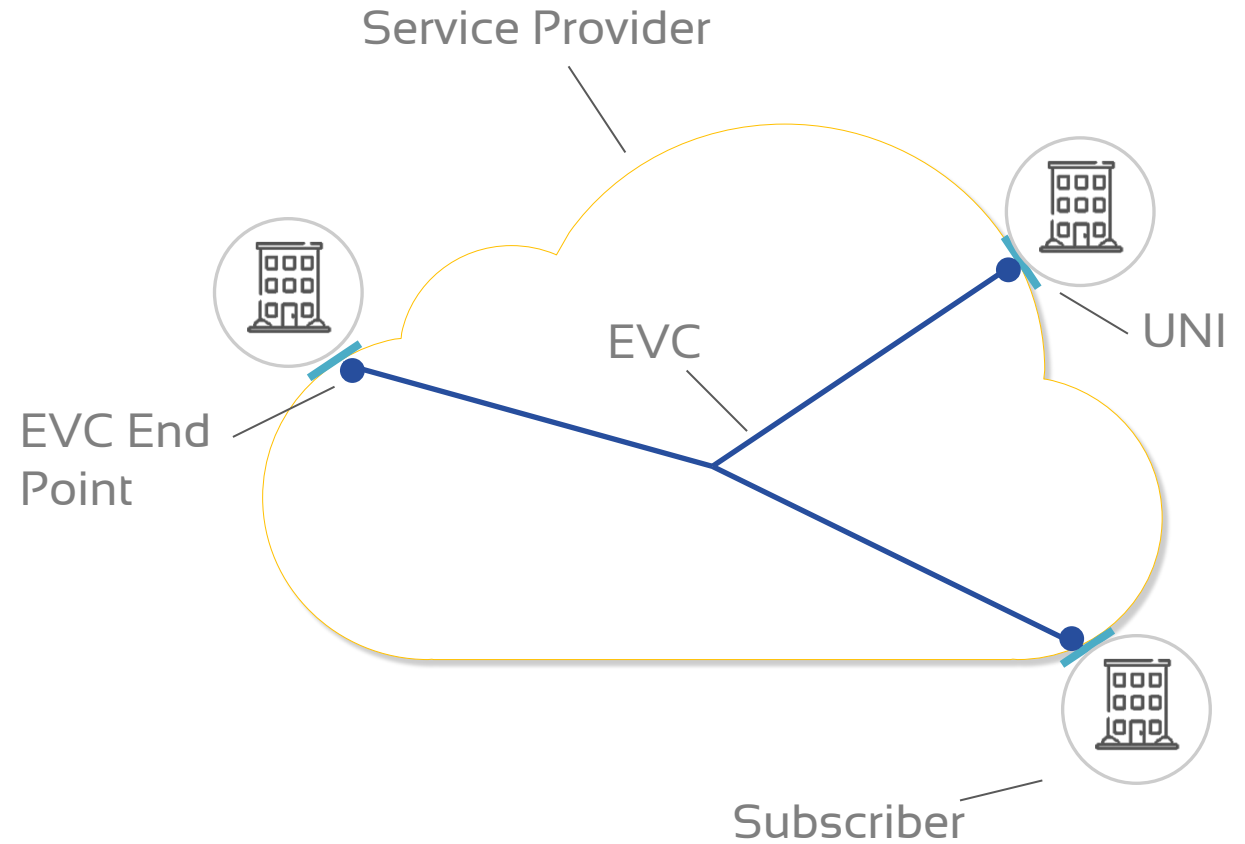
Subscriber

MEF 6.3 – Subscriber Ethernet Service Definitions

- **Three Service Types:**
  - E-Line – point-to-point
  - E-LAN – multipoint
  - E-Tree – rooted multipoint
- **Specific Services – "Port"-based or "VLAN"-based:**
  - E-Line type: EPL and EVPL
  - E-LAN type: EP-LAN and EVP-LAN
  - E-Tree type: EP-Tree and EVP-Tree

SP

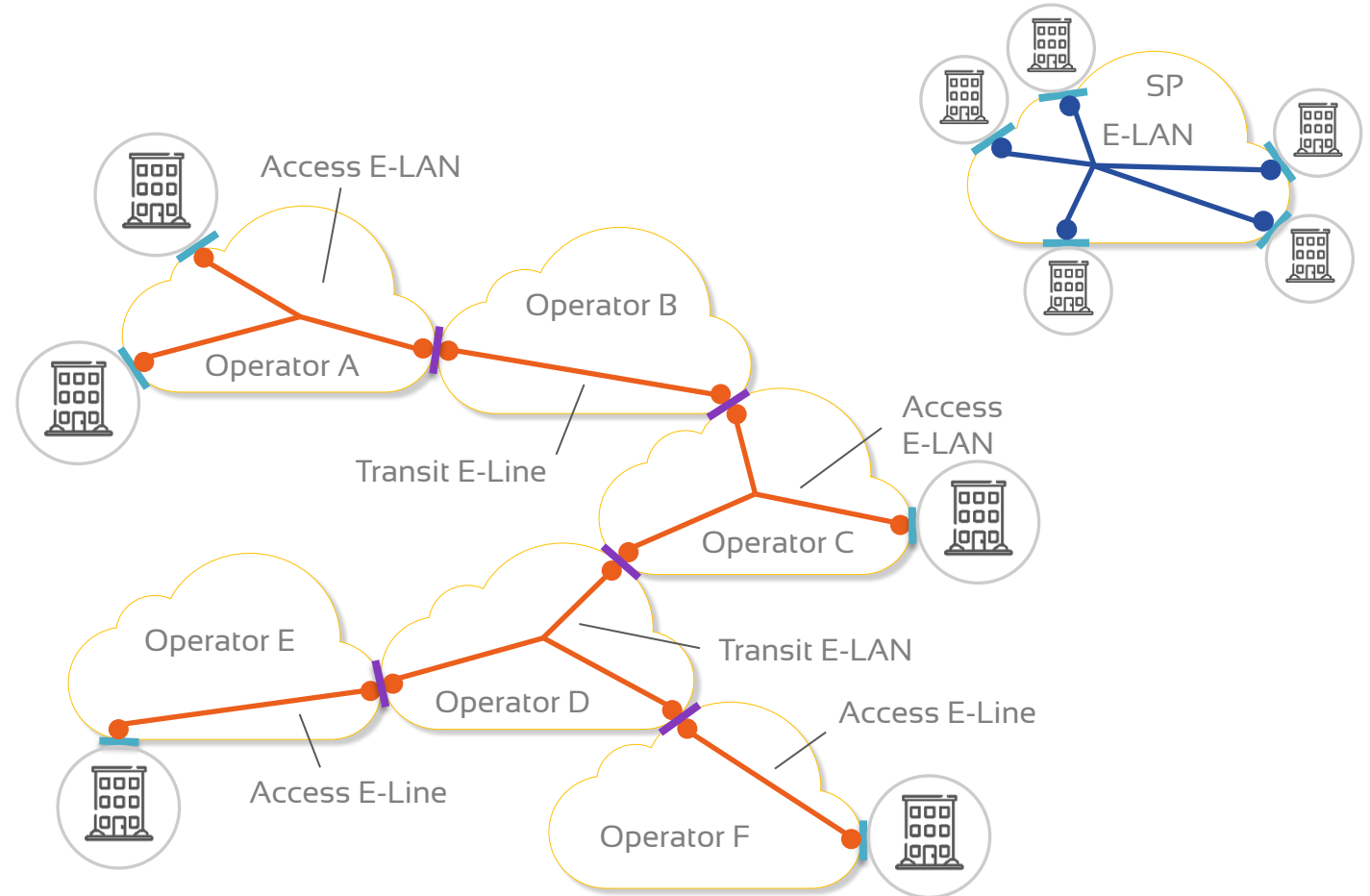E-Line

SP

E-LAN

SP

E-Tree
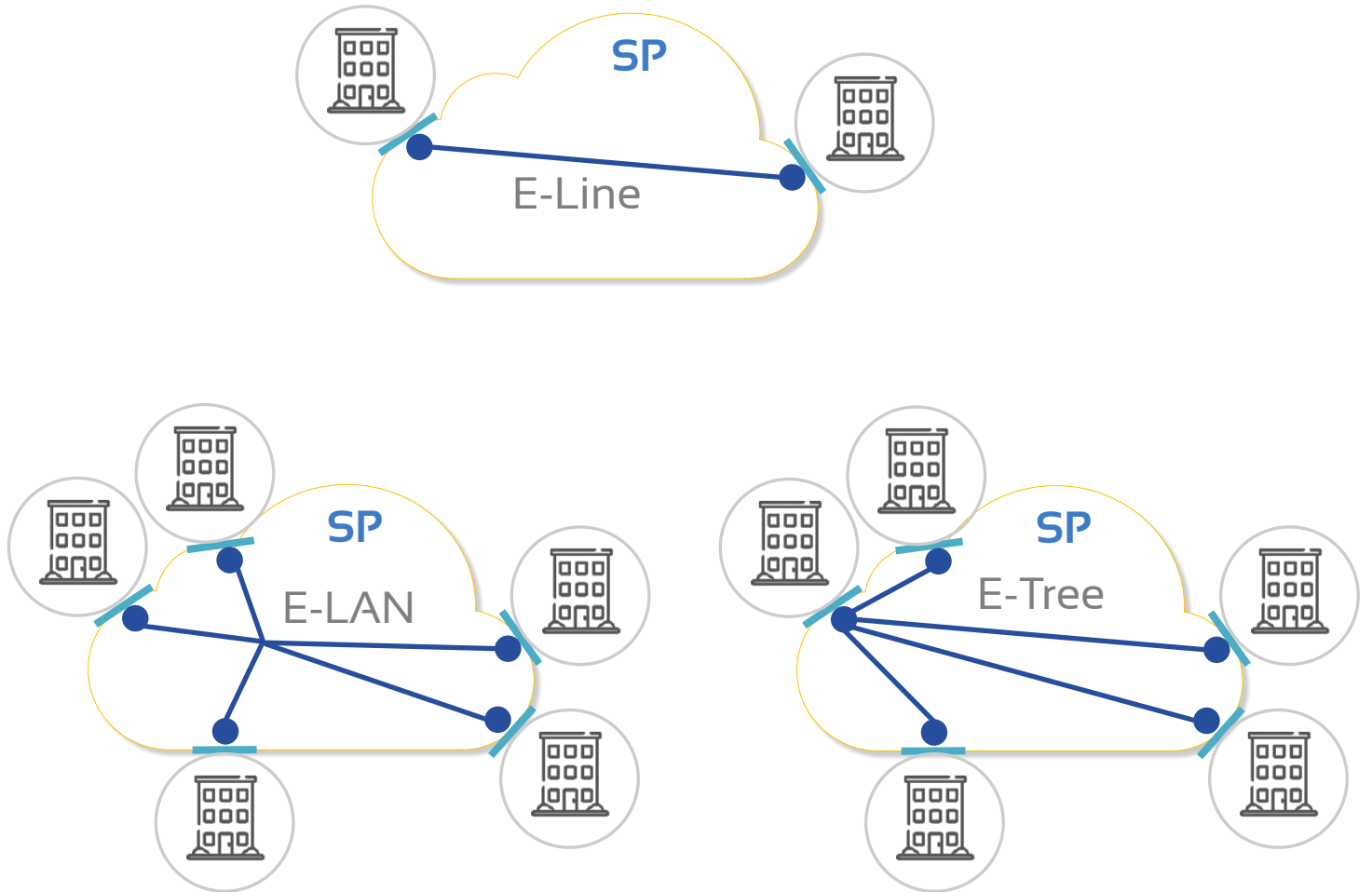
MEF 26.2 – Operator Ethernet Service Attributes

- **Key New Concepts:**
  - Operator, Super-Operator
  - ENNI, OVC, OVC End Point
  - VUNI, Feeder OVC
- **Key Service Attributes:**
  - As for Subscribers, plus:
  - OVC EP VLAN Map
  - OVC EP Egress CoS Map
  - Available MEG Level
  - ENNI S-VLAN ID Control
  - ENNI Common and Multilateral Attributes

Operator

UNI

OVC
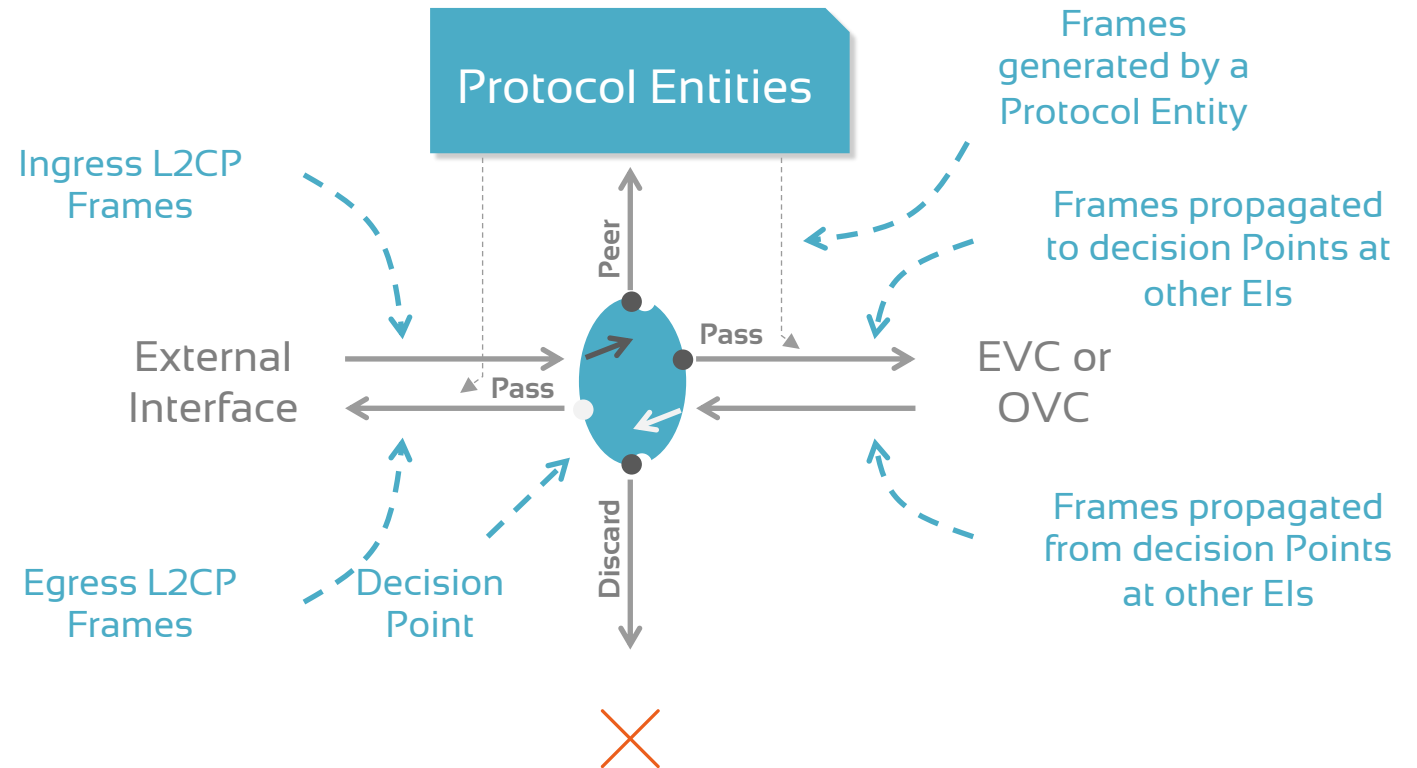
OVC End Point

Peer Operators
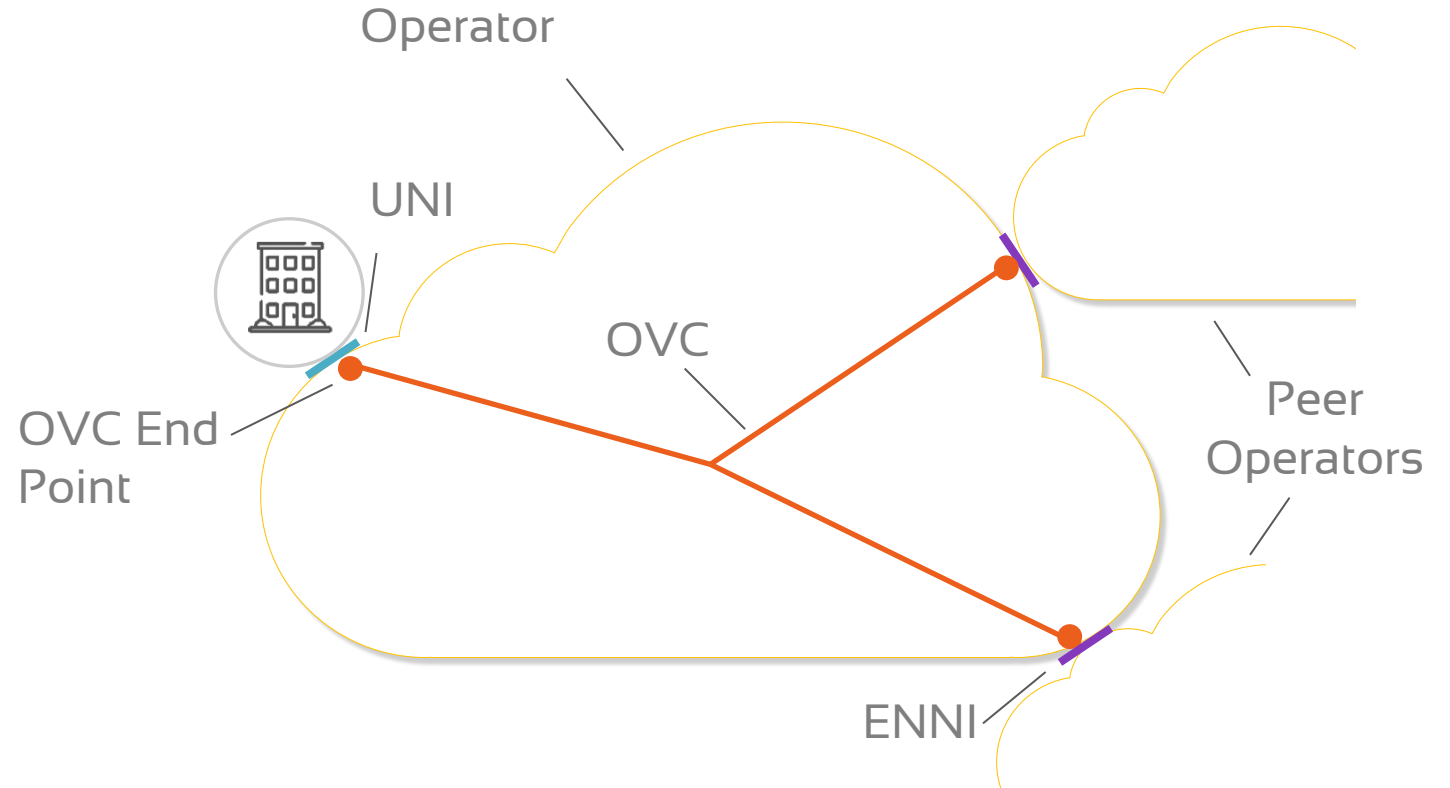
ENNI

MEF 51.1 – Operator Ethernet Service Definitions

- **Three General Services**
  - O-Line (P2P)
  - O-LAN (MP)
  - O-Tree (Rooted MP)
- **Four Specific Services**
  - Access E-Line (P2P, ENNI+UNI)
  - Access E-LAN (MP, ENNI+UNI)
  - Transit E-Line (P2P, ENNI only)
 - Transit E-LAN (MP, ENNI only)

MEF 45.1 – Ethernet Layer 2 Control Protocols

- **"One stop shop" for L2CP**

  - Behavioral model

  - Service Attributes

  - L2CP Processing Requirements

  - Application to specific services

    - E-Line, E-LAN, E-Tree

    - Access E-Line/E-LAN

    - Transit E-Line/E-LAN

Protocol Entities

Frames generated by a Protocol Entity

Frames propagated to decision Points at other EIs

Ingress L2CP Frames

Peer

Pass

Pass

External Interface

EVC or OVC

Discard

Egress L2CP Frames

Decision Point

Frames propagated from decision Points at other EIs

MEF 62 – Managed Access E-Line

- **Special Case of MEF 51 Access E-Line Service**

  – Avoid need for SP to deploy NID at Subscriber Premises

- **Standard CoS and OAM capabilities**

  – Single Class of Service for all traffic

  – Specific requirements for SOAM FM, SOAM PM, and Latching Loopback

SP

MAEL Operator

No SP NID!
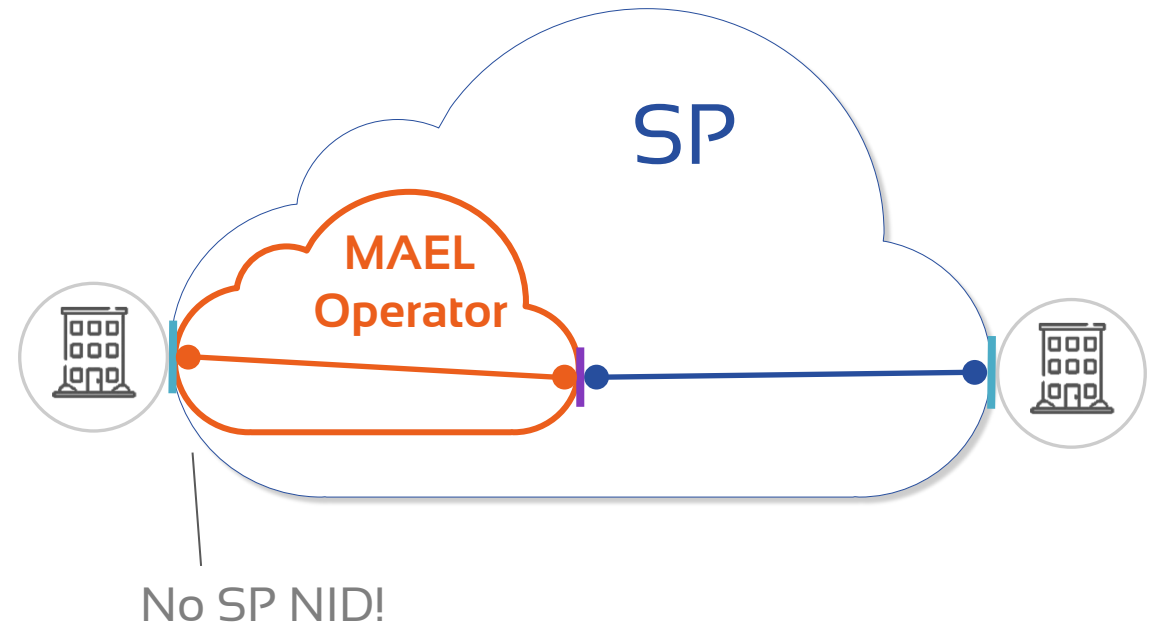
Reduced Cost
Simplified Ordering
Simplified Delivery

Active Carrier Ethernet Projects

UPDATED: Transport for Mobile Networks (5G) [MEF 22.3.1]
UPDATED: Ethernet Services for Cloud Connectivity [MEF 47.1]
NEW: Simplified Transit E-Line [MEF 65]

Service Definitions

Service Attributes

Special Topics
(e.g. SOAM, SAT, CoS, etc.)
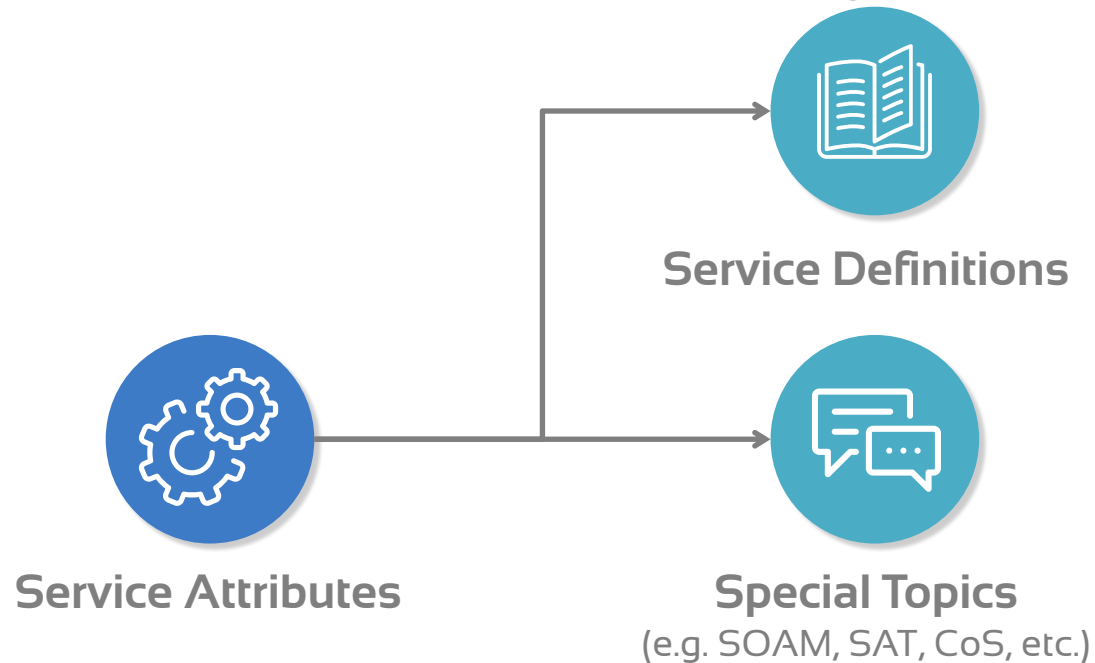
UPDATED: Service Activation Testing [MEF 48.1]
UPDATED: Token Bucket Algorithm Clarifications [MEF 41.0.1]

Simplified Transit E-Line

London

Los Angeles

SP

Operator

ENNI
SP NID
UNI

STEL Service

Rome
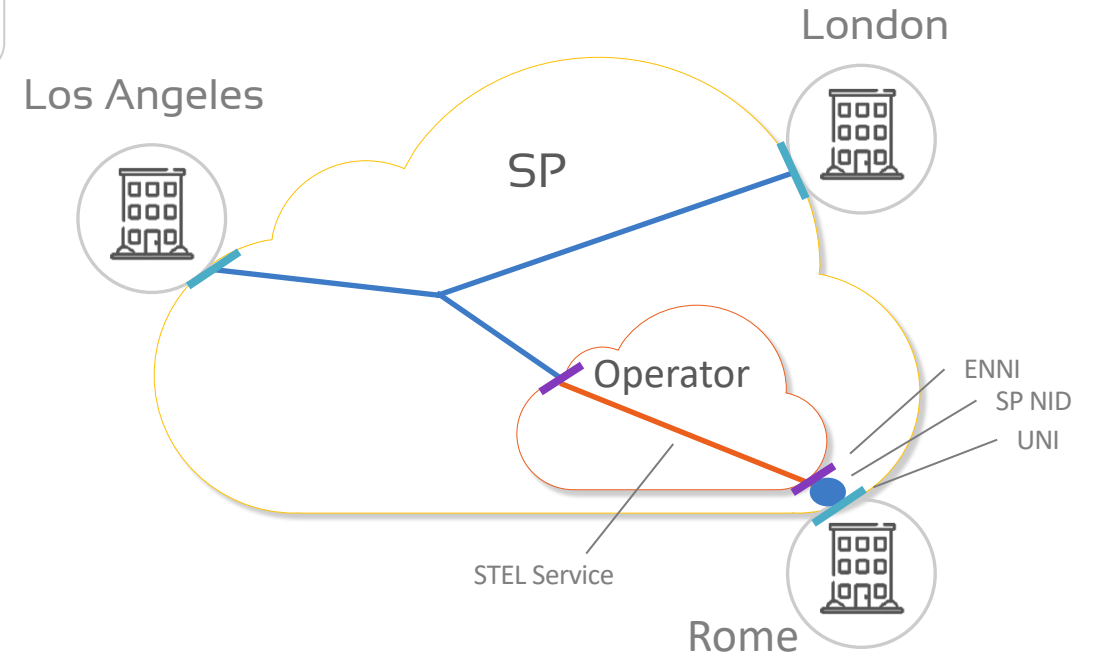
- **Special Case of MEF 51.1 Transit E-Line Service**

  – Simplified ENNI/OVC
  – Inverse of MAEL [MEF 62]

MEF 3.0 CE services provide the highest level of performance, assurance, and agility available in the industry.

	CE 2.0	MEF 3.0 CE
Retail Services		
E-Line	✓	✓
E-LAN	✓	✓
E-Tree	✓	✓
Wholesale Services		
E-Access	✓	✗
Access E-Line, E-LAN (51.1)	✗	✓
Transit E-Line, E-LAN (51.1)	✗	✓
Managed Access E-Line (62)	✗	✓

Access E-Line services supersede CE 2.0 E-Access services.

MEF 3.0 CE includes enhanced attributes for agility & assurance.

CE 2.0		MEF 3.0 CE	
Agility			
Orchestration Ready ✕	▶	✔	(10.4)
Improved utilization of bandwidth ✔	▶	Token sharing bandwidth profile models ✔	(23.2.1)
Layer 2 control protocol for retail services ✔	▶	Fully augmented for wholesale services ✔	(45.1)
Subscriber UNI attributes ✔	▶	UNI Virtual Instantiation for use with VMs ✔	(10.4)
Service attributes ✔	▶	Simplification of attributes (qty & complexity) ✔	(10.4)
Assurance			
Service OAM ✔	▶	Enhanced for OVC management ✔	(26.2, 30.1, 51.1)
Performance objectives for p2p services ✔	▶	Upgraded for mp2mp services ✔	(23.2)
	▶	Added performance tiers for data centers ✔	(23.2)
Link aggregation with active/standby ✔	▶	Strengthened to support 'all-active' links ✔	(10.4)