The Role of MPLS-TP in Evolved packet transport

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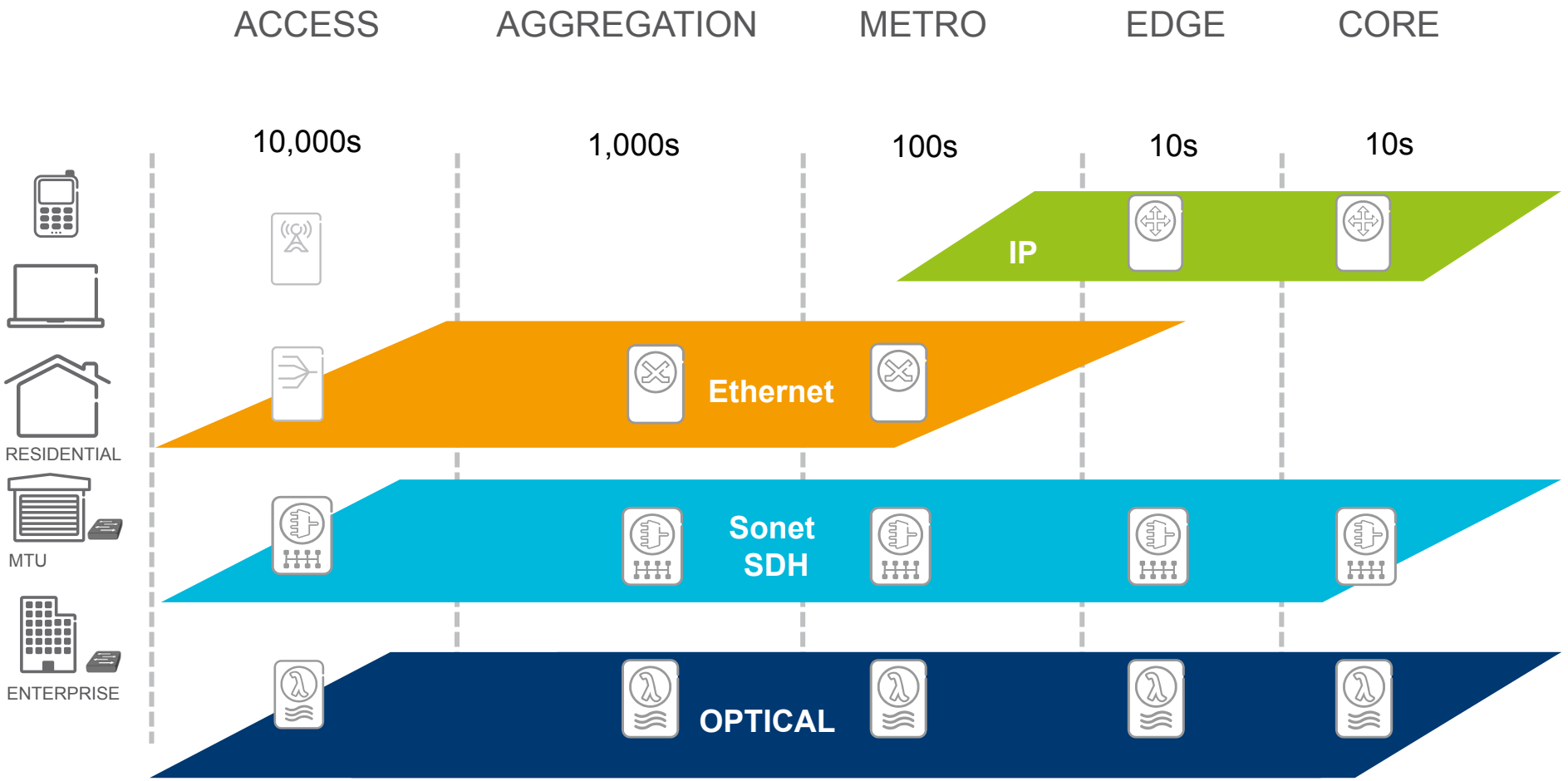
Today's transport architectures
the layered approach

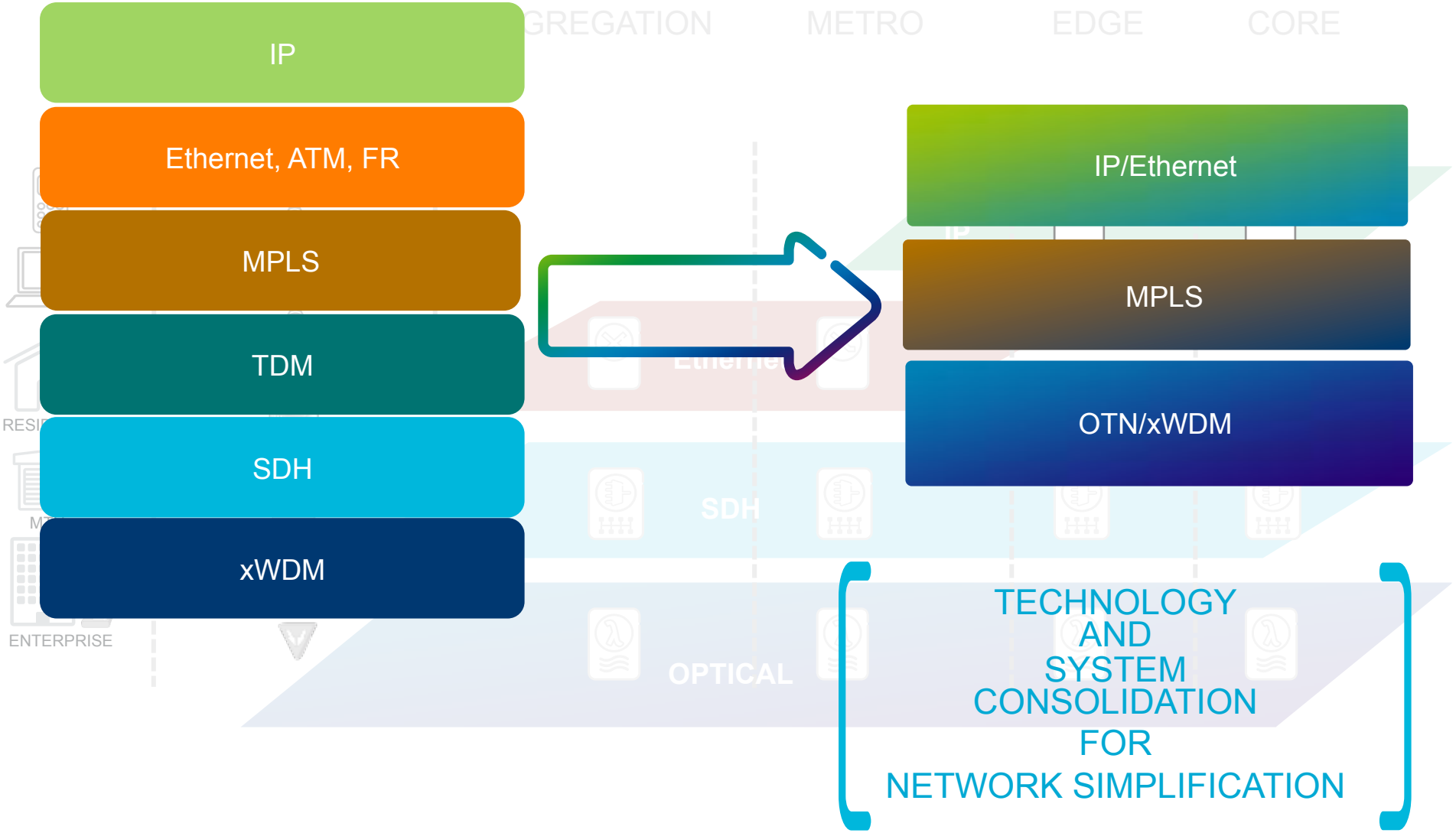


evolved transport network
A prospective view

Transport characteristics

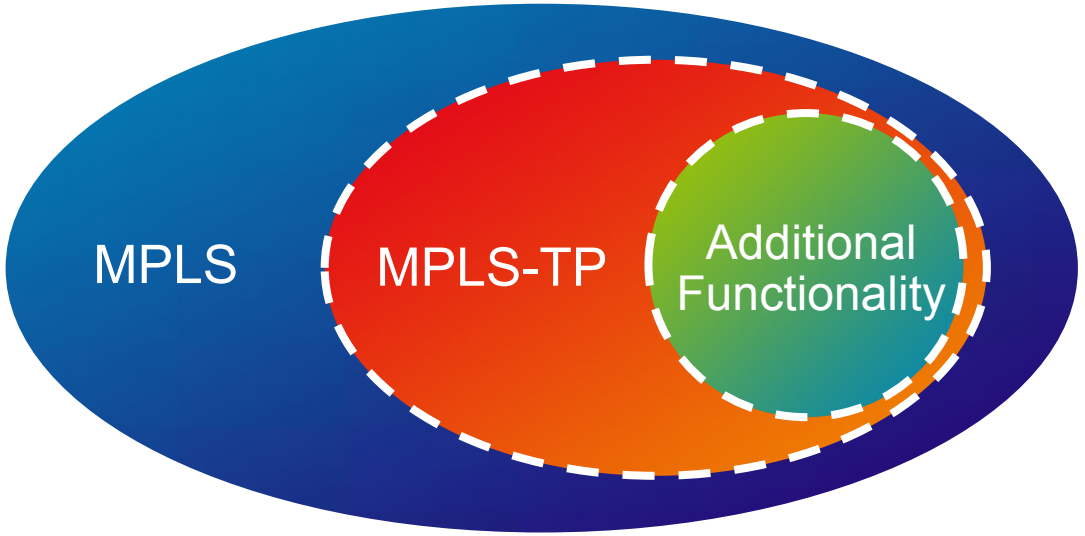
- Long term statically provisioned bi-directional paths
- Support for different transport types, such as packet and TDM
- Pre-determined backup paths (predictability)
- Highly automated operations environment
- Strong reliance on automated OAM and fault management systems

Network LAYER evolution
Technology consolidation



MPLS-TP and the MPLS Architecture

MPLS-TP is a subset of MPLS



- MPLS-TP objectives:
  - Enable MPLS to be deployed in a transport network and *operated in a similar manner* to existing transport technologies (SONET/SDH)
  - Enable MPLS to support packet *transport services with a similar degree of predictability and reliability* to that found in existing transport networks
- MPLS-TP extensions are fully compatible with existing MPLS specifications and newly defined protocols are included in IETF MPLS set

MPLS-TP Additional Functionality

Based on Transport Requirements

Transport-like OAM

- In-band OAM
- Performance monitoring for SLA verification
- Alarms and Fault Notification

Transport-like Operations

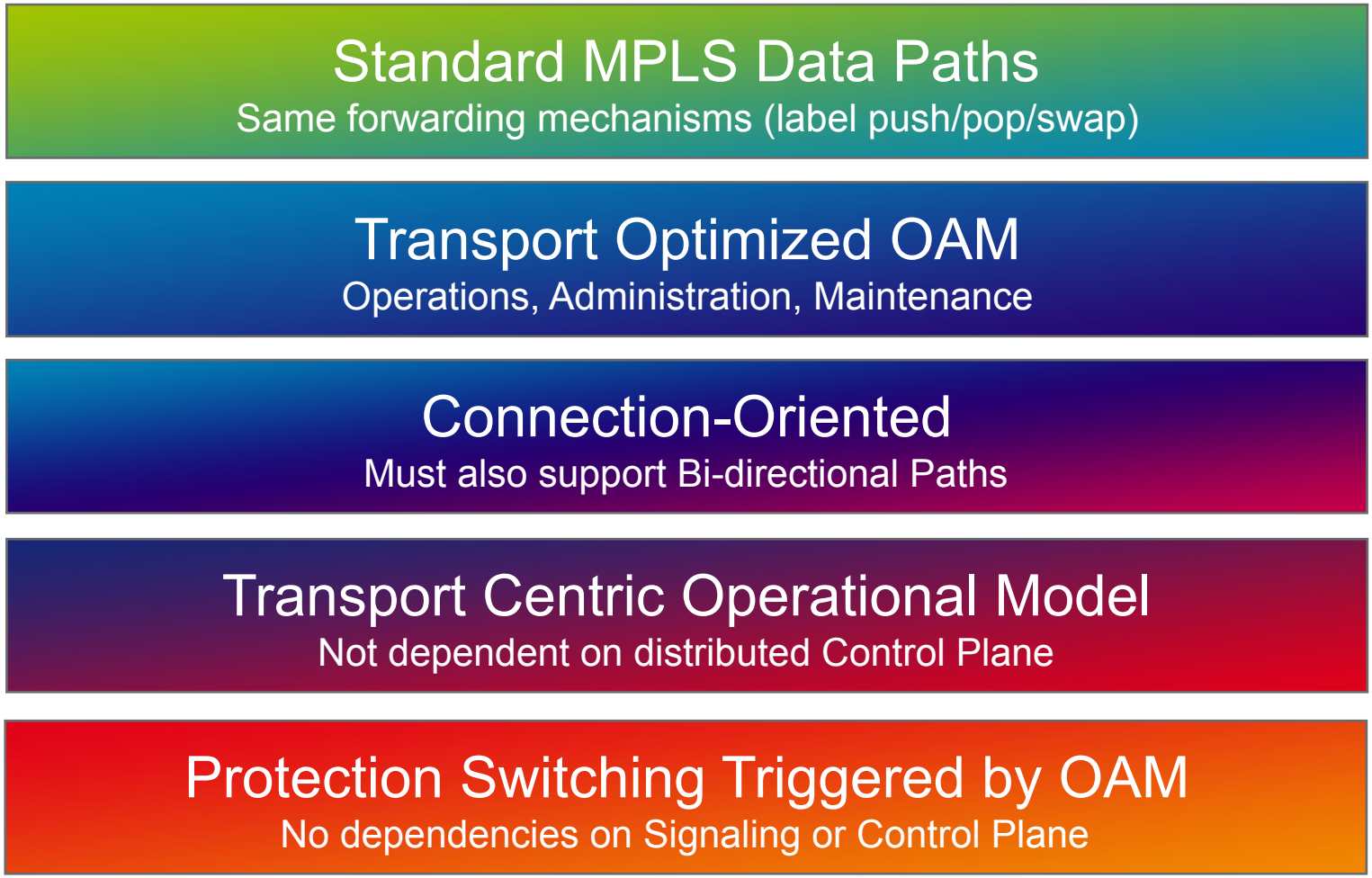
- Static Provisioning
- Operation through NMS
- Bi-directional paths

Transport-like Resilience

- Sub-50 ms OAM driven protection switching
- Linear protection (1+1, 1:1, 1:N)
- Ring protection

MPLS-TP Fundamentals

› *RFC 5654* specifies the general MPLS-TP fundamentals

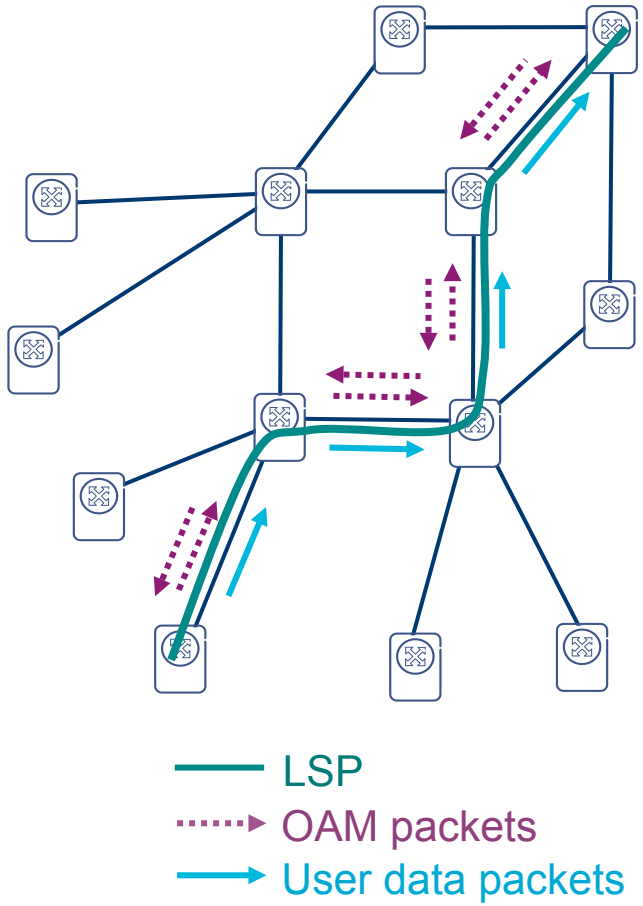


Transport-Like OAM

Transport Optimized OAM
Definition of a comprehensive set of in-band OAM tools

1. To monitor and manage the *transport network itself*
2. To monitor the *services delivered to customers*

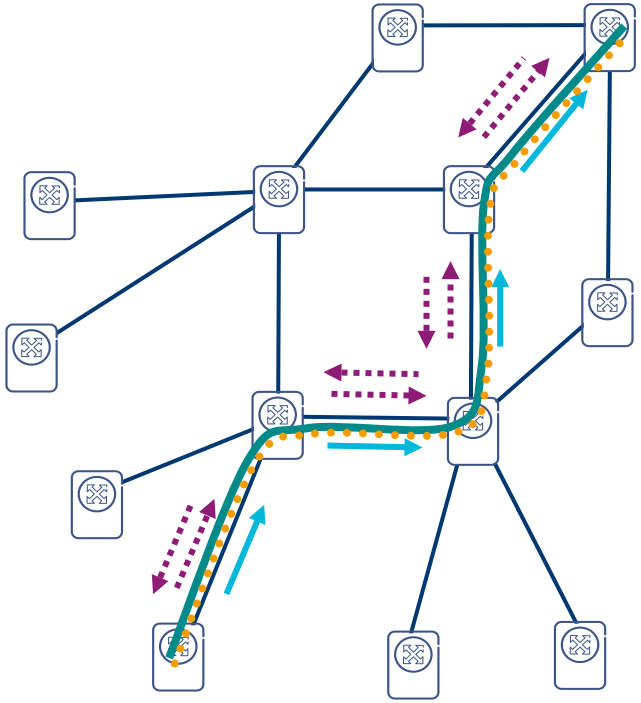
› All OAM functionality needs to be in-band
  – OAM packets are sent over the data plane
    › Takes same path as the user payload
  – No out-band signaling component
  – OAM functionality must not depend on IP forwarding



Transporting OAM Packets

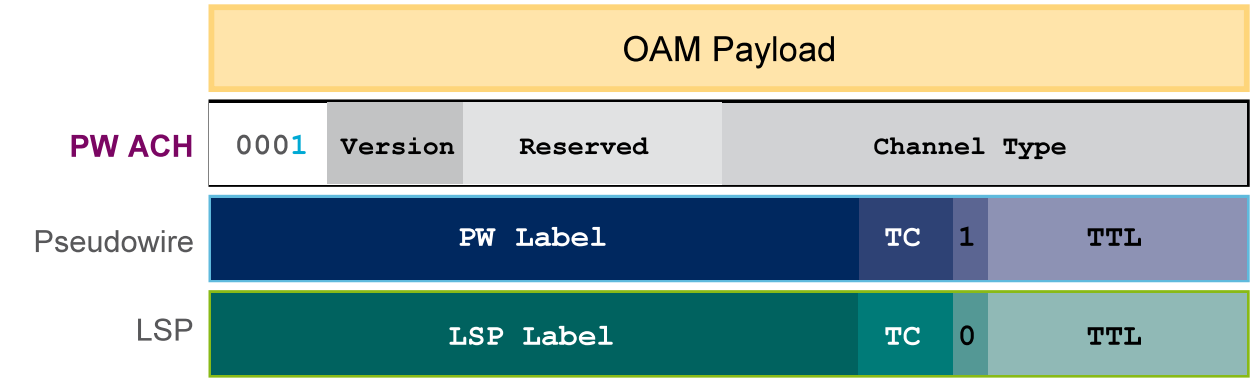
- A dedicated channel *associated with the data path* is created for the OAM packets
  - Known as an Associated Channel (ACh)

- ACh is used for OAM on all levels
  - Using the PW-ACh for Pseudowires
    - *RFC 4385*
  - Using a Generic ACh (G-ACh) for LSPs
    - *RFC 5586*



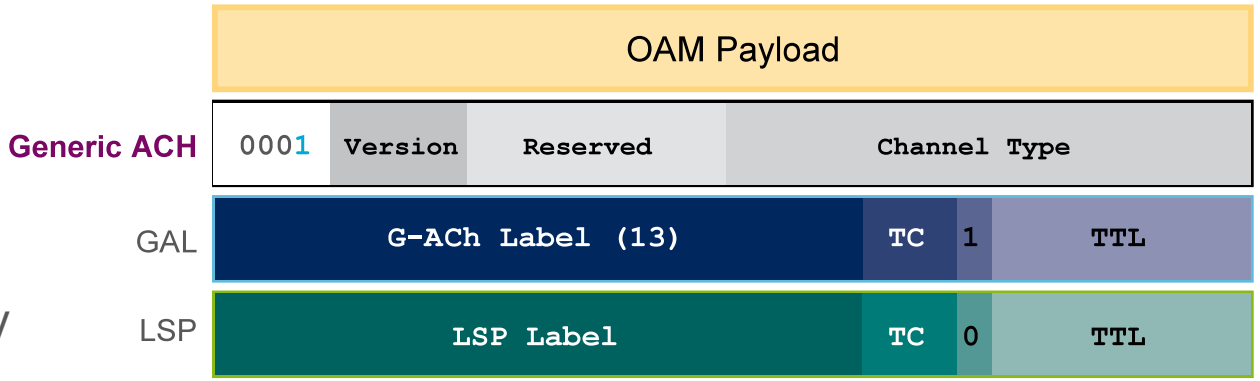
PW Ach & Generic ACh

- PW ACH
  - Between PW Label and OAM payload
  - Channel Type indicates type of OAM packets



PW-ACh according to *RFC 4385*

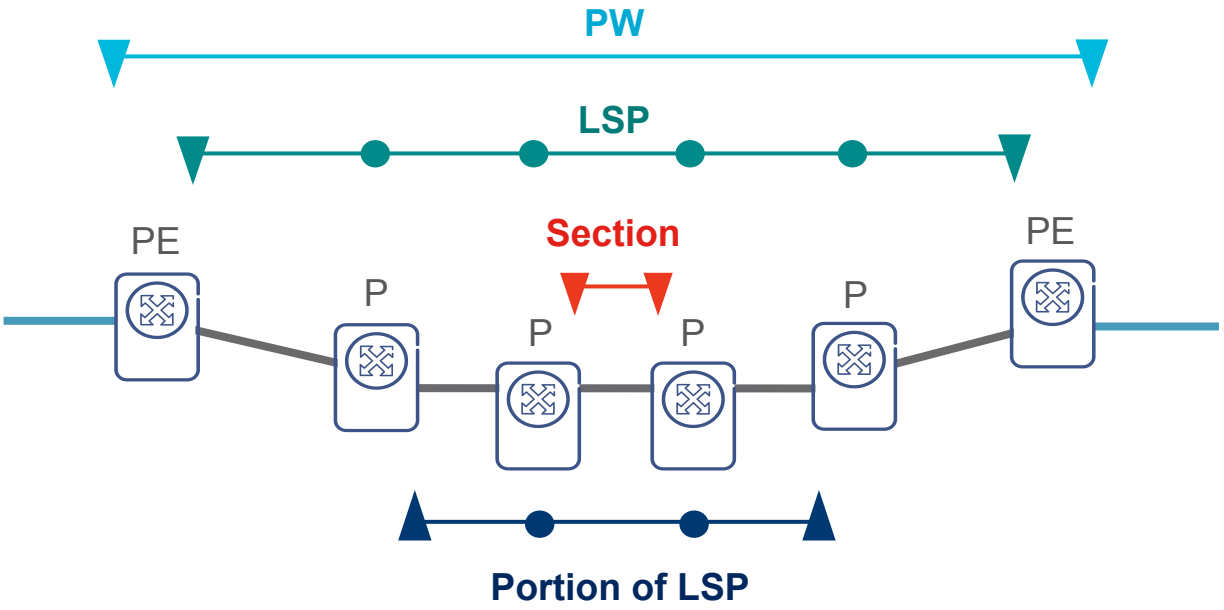
- Generic ACH
  - Reusing structure from PW ACH
  - G-ACh Label (GAL) provides alert based mechanism to identify presence of the ACH



G-ACh according to *RFC 5586*

Similar OAM Features on all Levels

- Pseudowires
- Paths (LSPs)
- Sections
- Portion of LSP



› OAM Features
  - Continuity Check (CC)
    - › Proactive liveliness monitoring
  - Connectivity Verification (CV)
    - › Verifying end-point
  - Delay and Loss Measurements
  - Fault Notification, Fault Isolation and Diagnostics

Secure Connection-Oriented Paths

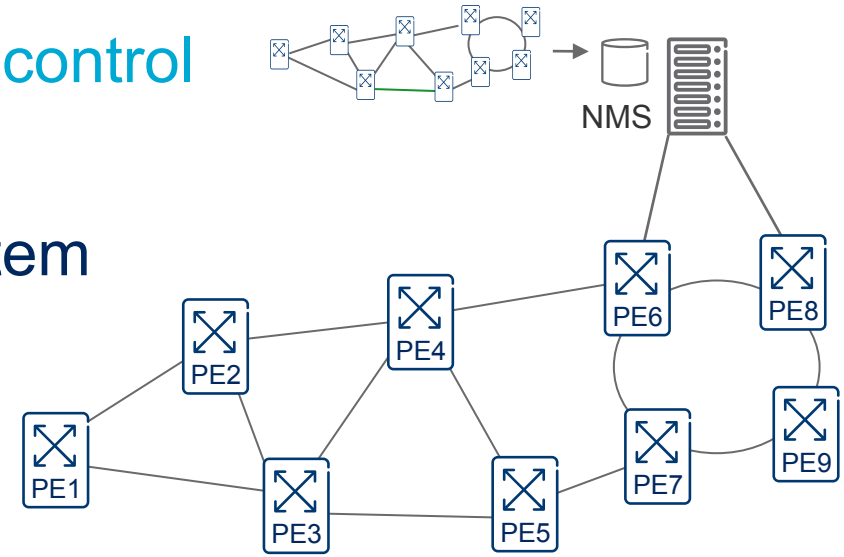
Connection-Oriented
Must also support bi-directional paths

- MPLS-TP excludes some MPLS options to ensure connection-oriented paths and consistent OAM operation
  - Equal Cost Multi Path (ECMP) – excluded
  - MultiPoint to Point (MP2P) LSPs – excluded
  - Penultimate Hop Popping (PHP) – disabled by default
- MPLS-TP supports the following LSP types:
  - Uni-directional Point-to-Point (P2P)
  - Uni-directional Point-to-Multipoint (P2MP)
  - Bi-directional P2P
    - Associated and co-routed

Transport-Like Operations

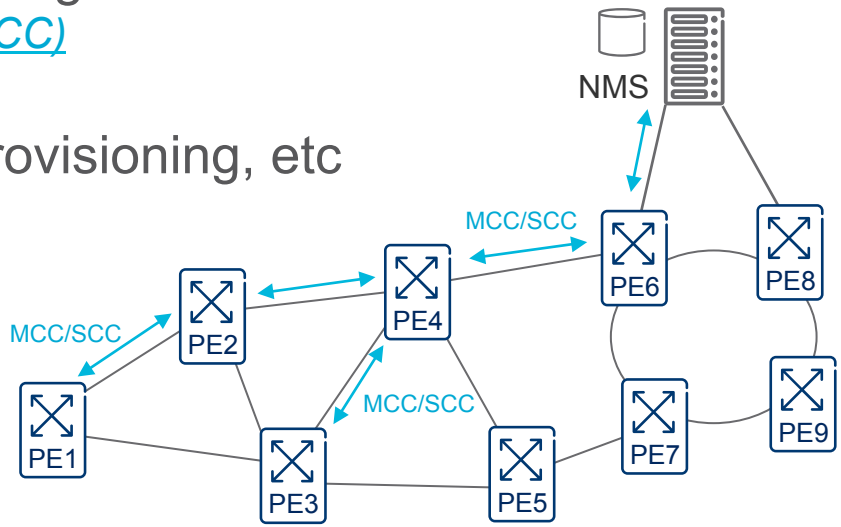
Transport Centric Operational Model
Not dependent on distributed Control Plane

- Possibility to use a centralized control plane
- Provisioning through NMS system
  - Topology discovery
  - Path computation
  - Static assignment of labels
  - Static service provisioning
- No need for distributed control plane
  - Node layer simplification

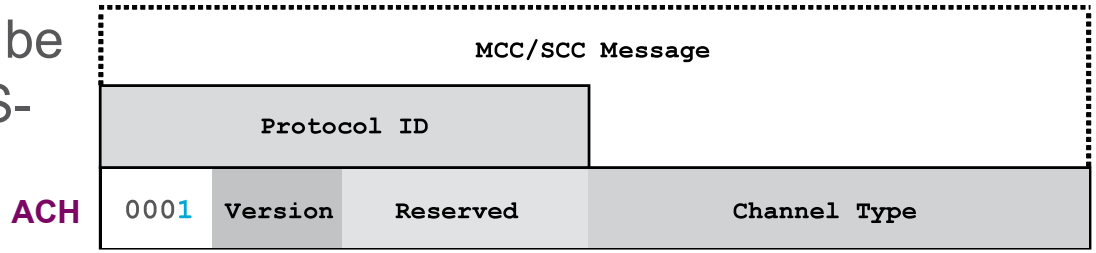


Communication on the DCN

- DCN can be out-of-band or in-band
- For in-band communication the following is defined
  - *Management Communication Channel (MCC)*
  - *Signaling Communication Channel (SCC)*
- To be used for topology discovery, provisioning, etc



- MCC/SCC is using the G-ACh structure defined in *RFC 5586*
  - Channel type is set to MCC/SCC
  - In addition a protocol ID field is used
- No restriction on protocol to be used for managing an MPLS-TP network



Transport-Like Resilience

Protection Switching Triggered by OAM
No dependencies on Signaling or Control Plane

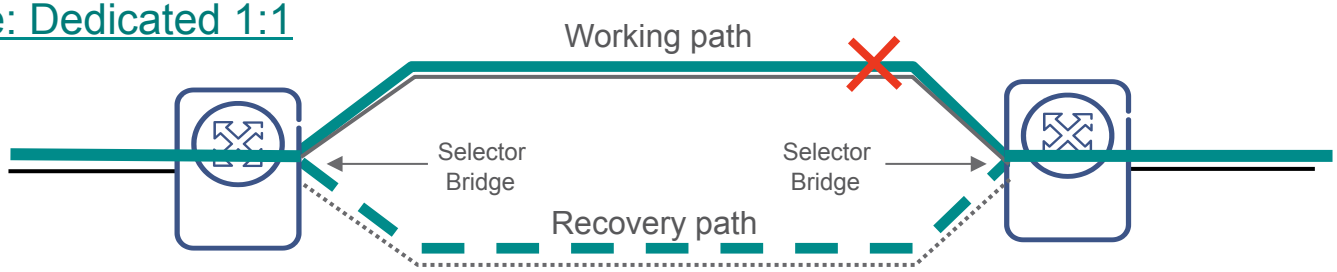
- Comprehensive set of recovery mechanisms
  - OAM triggered protection mechanisms are standardized within MPLS-TP
  - Existing MPLS & GMPLS mechanisms may also be used
- Similar functionality across PWs, LSPs, SPMEs, and sections

Protection

Protection Switching Triggered by OAM
No dependencies on Signaling or Control Plane

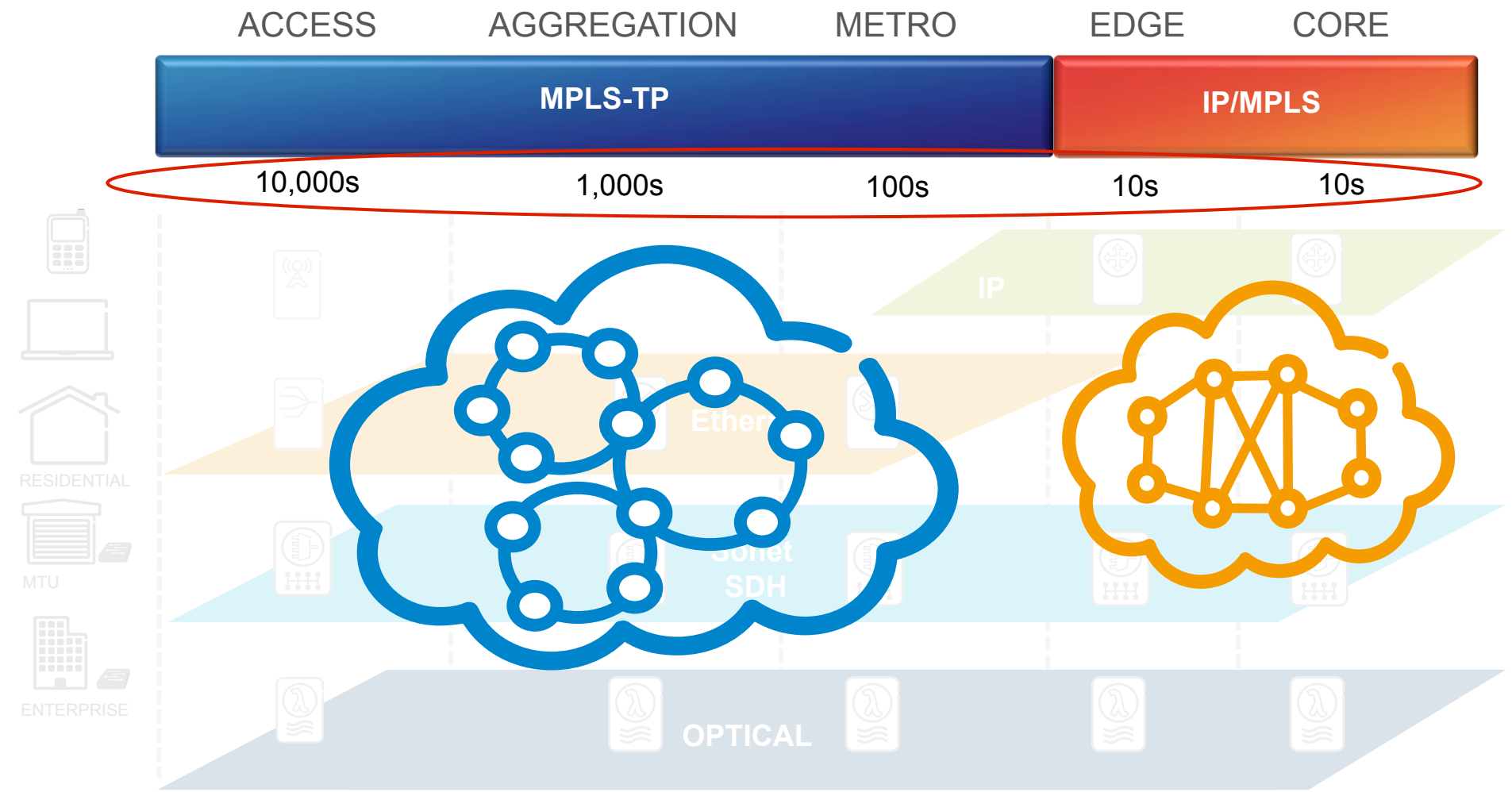
- Protection triggered by data plane OAM
  - Linear protection
    - Dedicated 1+1 (2 concurrent traffic paths)
    - Dedicated 1:1 (one active and one standby path)
    - Shared 1:N (many active paths share one standby)
  - Additional Ring Protection mechanisms

Example: Dedicated 1:1

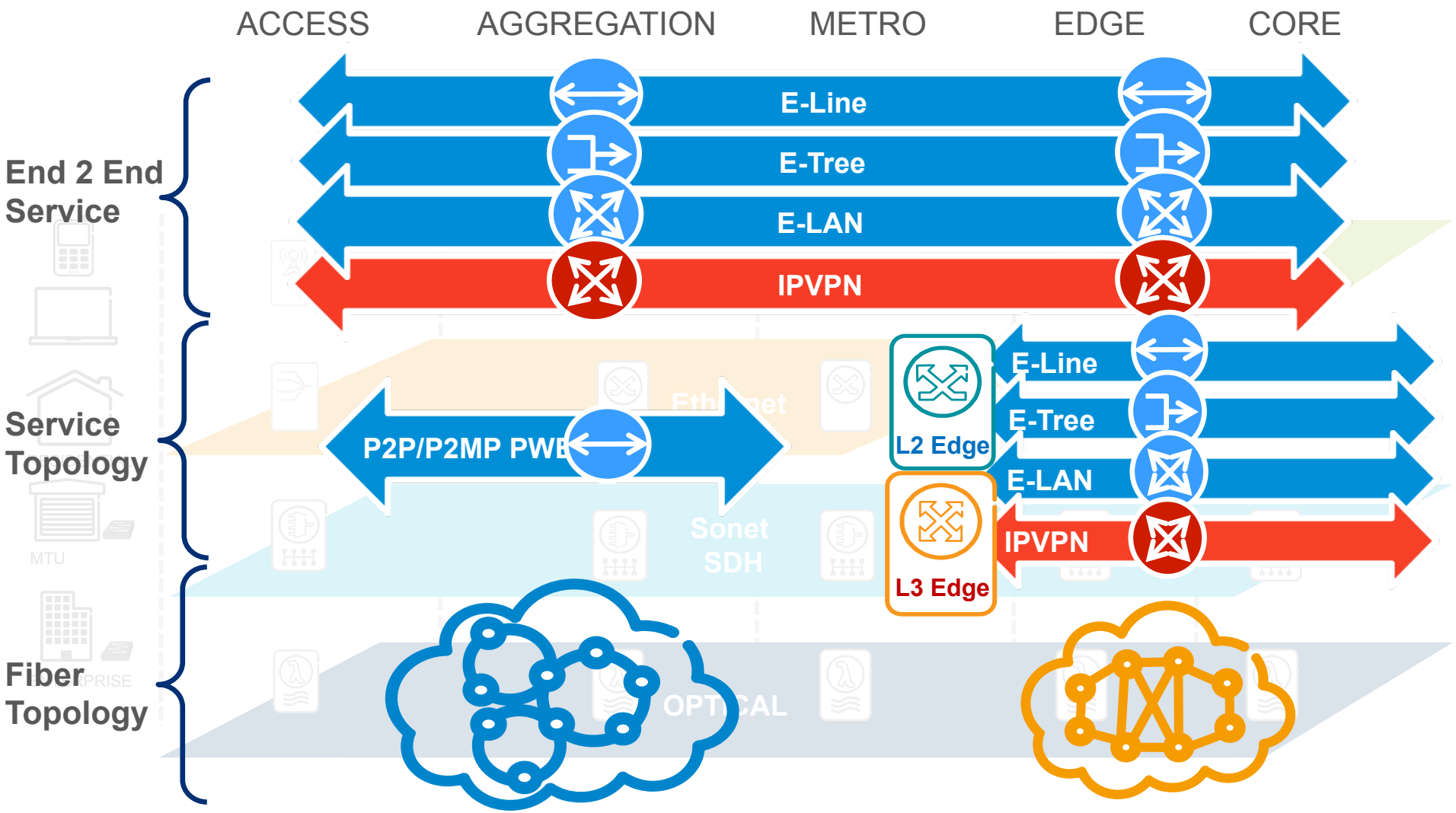


- Protection State Coordination (PSC) to sync the nodes

Evolved Transport Network
Technology Fit

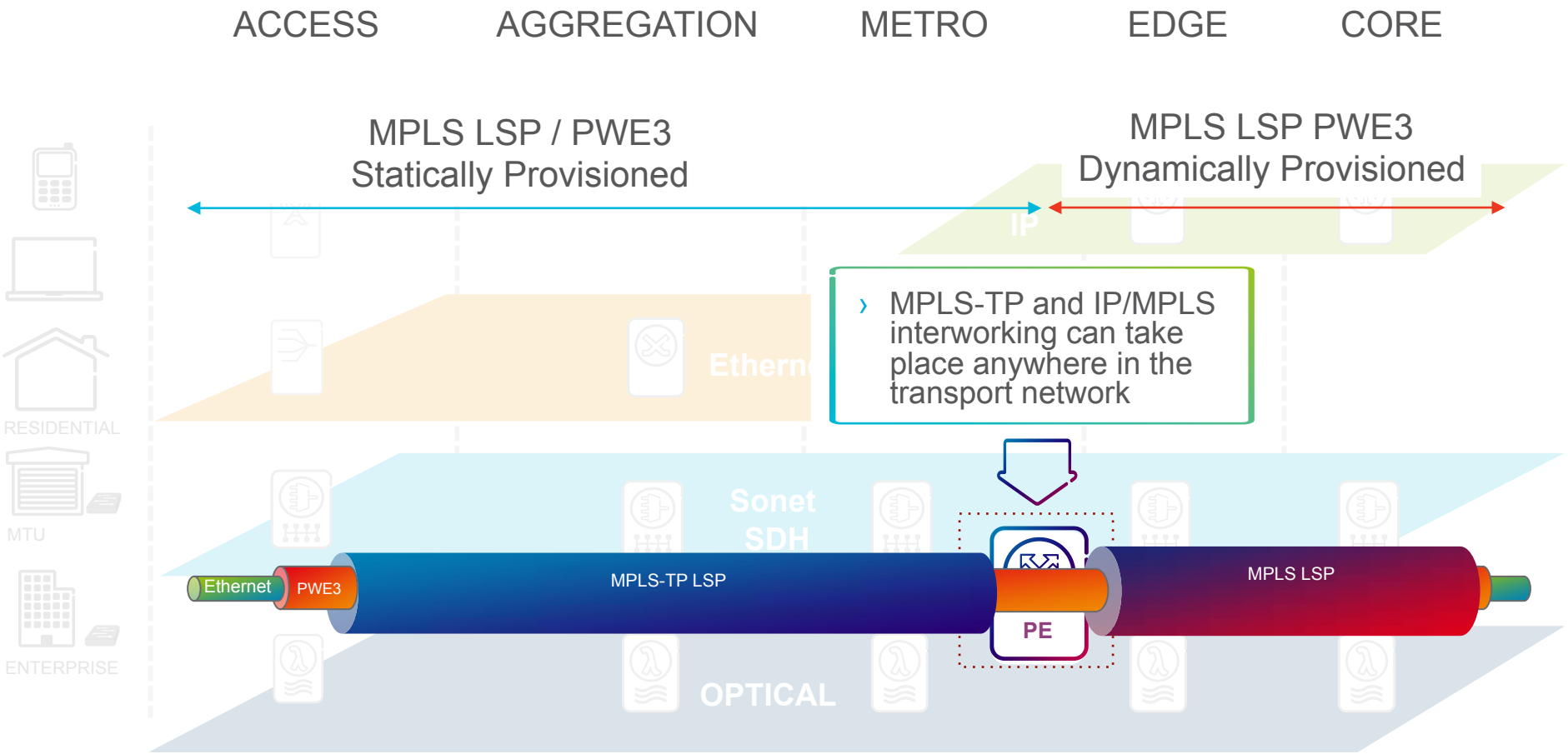


Evolved Transport Network
Service Segmentation



MPLS-TP and IP/MPLS

Interworking



› End-to-End Pseudo-wire can provides end-to-end OAM across different domains

Evolved packet transport
summary