56. Introduction to Ethernet for subscriber access networks

56.1 Overview

Change the second paragraph in 56.1 (as modified by IEEE Std 802.3ca-2020) as follows:

In addition, a mechanism for network Operations, Administration, and Maintenance (OAM) is included to facilitate network operation and troubleshooting. 100BASE-LX10 extends the reach of 100BASE-X to achieve 10 km over conventional single-mode two-fiber cabling. The relationships between these EFM elements and the ISO/IEC Open System Interconnection (OSI) reference model are shown in Figure 56–1 for point-to-point topologies, Figure 56–2 for 1G-EPON topologies, Figure 56–3 for 10/10G-EPON topologies, Figure 56–4 for 10/1G-EPON topologies, Figure 56–5 for EPoC topologies, ~~and~~ Figure 56–6 for Nx25G-EPON topologies, and Figure 56-7 for Super-PON topologies.

Insert new Figure 56–7 (as shown on the next page) after Figure 56–6. Change the last paragraph in 56.1 as follows:

The EFM architecture is further extended in:

- in Clause 75 and Clause 76 by the addition of 10G–EPON~~;~~;
- Clause 100, Clause 101, and Clause 102 by the addition of EPoC;
- Clause 141, Clause 142, and Clause 143 by the addition of Nx25G-EPON~~.~~; and
- Clause 200 by the addition of Super-PON.

56.1.2 Summary of P2MP sublayers

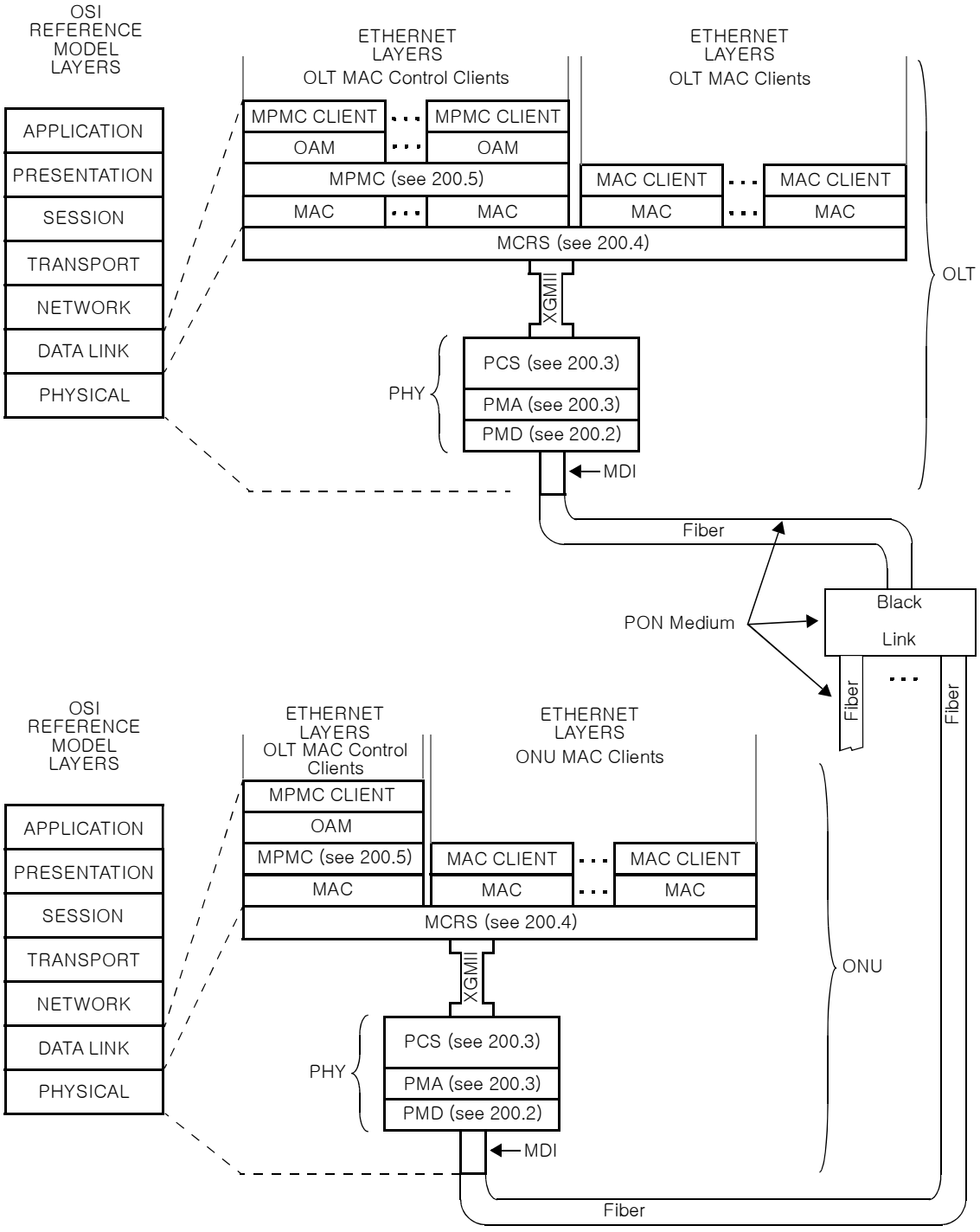
Add a new item to the lettered list in 56.1.2 as follows:

d) Super-PON (i.e., amplified WDM PON) with a nominal MAC data rate of 10 Gb/s in the downstream direction and 10 Gb/s or 2.5 Gb/s in the upstream direction. Super-PON supports an increased optical reach of up to 50 km and an expanded customer coverage of up to 1024 subscribers over a point-to-multipoint passive optical distribution network (ODN) through wavelength division multiplexing (WDM). The Super-PON PMA and PCS sublayers are specified in clause 200.

56.1.2.1 Multipoint MAC Control Protocol (MPCP)

Change the first two paragraphs in 56.1.2.1 as follows:

The Multipoint MAC Control Protocol (MPCP) for 1G-EPON uses messages, state diagrams, and timers, as defined in Clause 64, to control access to a P2MP topology; Clause 77 defines the messages, state diagrams, and timers required to control access to a P2MP ODN topology in 10G-EPON; ~~and~~ Clause 144 defines the messages, state diagrams, and timers required to control access to a P2MP ODN topology in Nx25G-EPON, and Clause 200 defines the messages, state diagrams, and timers required to control access to a P2MP ODN topology in Super-PON. The issues related to coexistence of 1G-EPON and 10G-EPON on the same fiber plant are described in 77.4.



XGMII= 10 GIGABIT MEDIA INDEPENDENT INTERFACE
MDI = MEDIUM DEPENDENT INTERFACE
OAM = OPERATIONS, ADMINISTRATION & MAINTENANCE
OLT = OPTICAL LINE TERMINAL
MCRS= MULTI-CHANNEL RECONCILIATION SUBLAYER
MPMC= MULTI-POINT MAC CONTROL
ONU = OPTICAL NETWORK UNIT
PCS = PHYSICAL CODING SUBLAYER
PHY = PHYSICAL LAYER DEVICE
PMA = PHYSICAL MEDIUM ATTACHMENT
PMD = PHYSICAL MEDIUM DEPENDENT

Figure 56–7—Architectural positioning of EFM: P2MP Super-PON Architecture

Every P2MP ODN topology consists of one Optical Line Terminal (OLT) and one or more ONUs, as shown in Figure 56–2, Figure 56–3, Figure 56–4, ~~and~~ Figure 56–6, and Figure 56-7 for 1G-EPON, 10/10G-EPON, 10/1G-EPON, ~~and~~ Nx25G-EPON, and Super-PON, respectively. One of several instances of the MPCP in the OLT communicates with the instance of the MPCP in the ONU. A pair of MPCPs that communicate between the OLT and ONU are a distinct and associated pair.

56.1.2.2 Reconciliation Sublayer (RS) and media independent interfaces

Change the first and fourth paragraphs 56.1.2.2 as follows:

The Clause 22 RS and MII, Clause 35 RS and GMII, and Clause 46 RS and XGMII are all employed for the same purpose in EFM, that being the interconnection between the MAC sublayer and the PHY sublayers. Extensions to the Clause 35 RS for P2MP topologies are described in Clause 65, the RS for 10G-EPON P2MP topologies is described in Clause 76, the RS for Nx25G-EPON P2MP topologies is described in Clause 143, the RS for Super-PON P2MP topologies is described in Clause 200, and the RS for EPoC P2MP topologies is described in Clause 101.

This is described in Clause 65 for EPON, in Clause 76 for 10G-EPON, in Clause 143 for Nx25G-EPON, in Clause 200 for Super-PON, and in Clause 101 for EPoC. EFM Copper links use the MII of Clause 22 operating at 100 Mb/s. This is described in 61.1.4.1.2.

56.1.3 Physical Layer signaling systems

Insert a new paragraph in 56.1.3 after the paragraph:

"Additionally, EFM introduces a family of Physical Layer signaling systems that are derived from 25GBASE–R, but which include RS, PCS and PMA sublayers adapted for Nx25G-EPON, along with a mandatory FEC function, as defined in Clause 142. All these systems employ PMDs defined in Clause 141."

as follows:

Additionally, EFM introduces a family of Physical Layer signaling systems for Super-PON, as defined in Clause 200.

Insert new rows at the end of Table 56–1 (below the 50GBASE-PQX-U3 row), as follows (unchanged rows and footnotes not shown):

Table 56–1— Summary of EFM Physical Layer signaling systems

Name	Location	Rate	Nominal reach (km)	Medium	Clause
…					
10GBASE-SP1-D	OLT	10 Gb/s (tx) 10 Gb/s (rx)	50	Two single-mode fibers	200
10GBASE-SP1-U	ONU			One single-mode fiber	
10/2.5GBASE-SP1-D	OLT	10 Gb/s (tx) 2.5 Gb/s (rx)	50	Two single-mode fibers	200
10/2.5GBASE-SP1-D	ONU	2.5 Gb/s (tx) 10 Gb/s (rx)		One single-mode fiber	

Insert new rows at the end (below the 50GBASE-PQG-D3 row) and a new column at the right of Table 56–3 , as follows (unchanged rows and footnotes not shown):

Table 56–3— Nomenclature and clause correlation for optical P2MP systems

Nomenclature	Clause		
	57	**…**	**200**
	OAM	**…**	**Super-PON PMD, PMA, PCS, RS, MPCP**
…			
10GBASE-SP1-D	O		M
10GBASE-SP1-U	O		M
10/2.5GBASE-SP1-D	O		M
10/2.5UBASE-SP1-D	O		M