

## 69. Introduction to Ethernet operation over electrical backplanes

### 69.1.1 Scope

*Change the second paragraph of 69.1.1 as shown:*

Backplane Ethernet supports the IEEE 802.3 MAC operating at 1000 Mb/s, 10 Gb/s, ~~or~~ 40 Gb/s, or 100 Gb/s. For 1000 Mb/s operation, the family of 1000BASE-X Physical Layer signaling systems is extended to include 1000BASE-KX. For 10 Gb/s operation, two Physical Layer signaling systems are defined. For operation over four logical lanes, the 10GBASE-X family is extended to include 10GBASE-KX4. For serial operation, the 10GBASE-R family is extended to include 10GBASE-KR. For 40 Gb/s operation, there is 40GBASE-KR4 that operates over four lanes. For 100 Gb/s operation, the 100GBASE-R family is extended to include 100GBASE-KR4 and 100GBASE-KP4.

### 69.1.2 Objectives

**Editor's note (to be removed prior to final publication):**

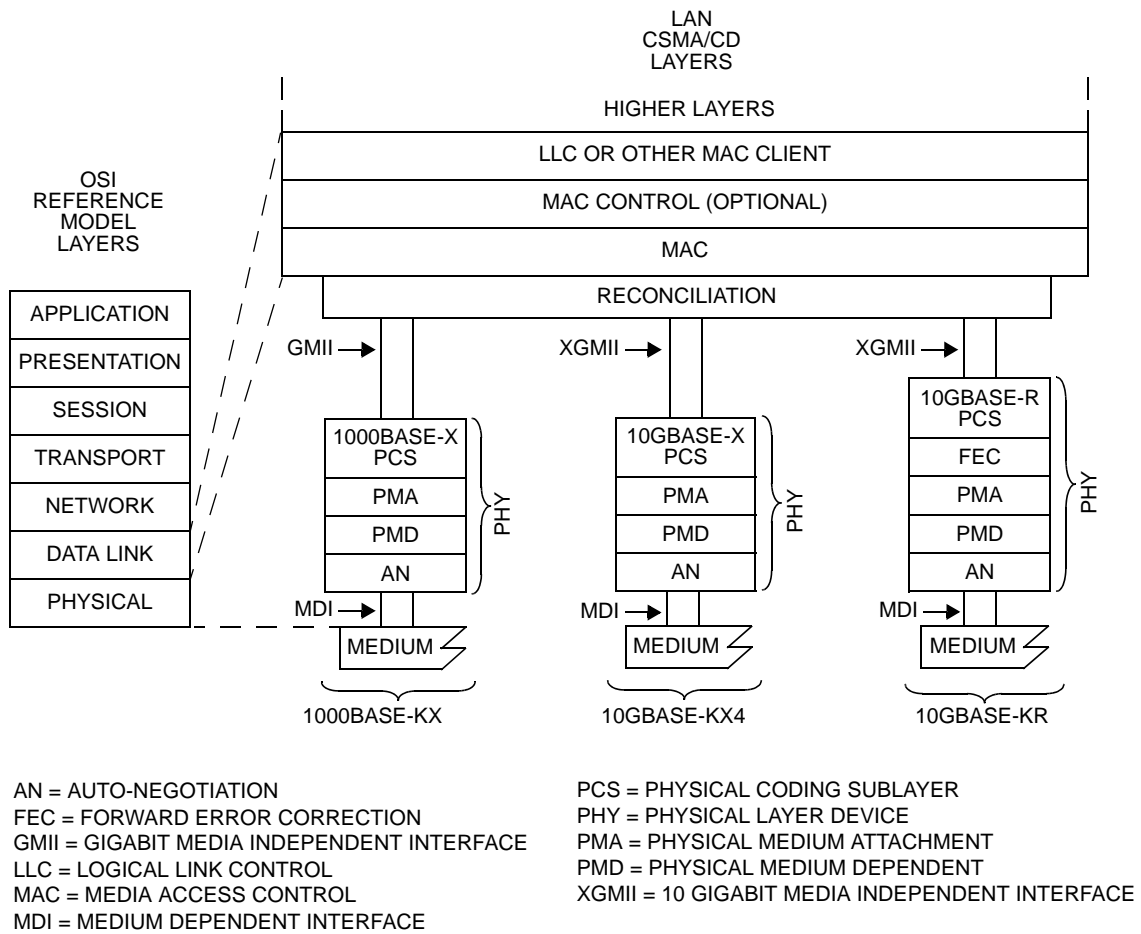
There has been some discussion related to the merits of amending lists of objectives such as this as new Physical Layers are defined. This will be discussed in the context of the comment #20 against Clause 80 during the IEEE P802.3bj D1.0 1st Task Force review. It is suggested that this is handled in the same way the comparable list in Clause 80 is handled.

### 69.1.3 Relationship of Backplane Ethernet to the ISO OSI reference model

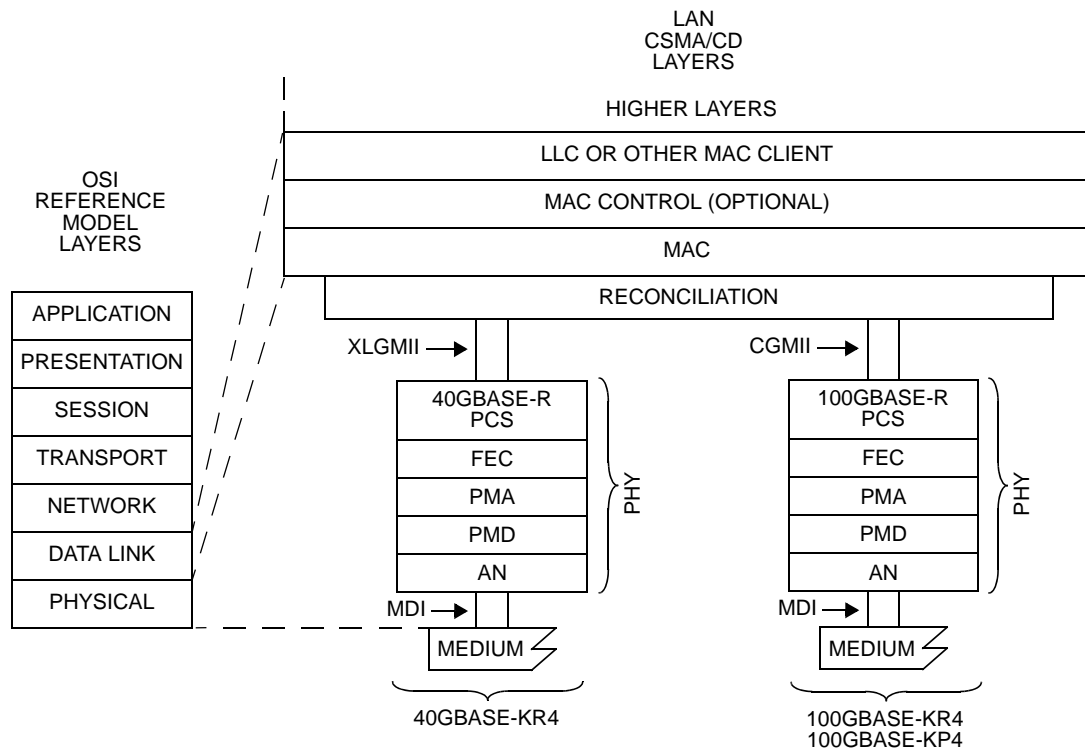
*Change the first paragraph as shown:*

Backplane Ethernet couples the IEEE 802.3 (CSMA/CD) MAC to a family of Physical Layers defined for operation over electrical backplanes. The relationships among Backplane Ethernet, the IEEE 802.3 MAC, and the ISO Open System Interconnection (OSI) reference model are shown in Figure 69-1 and Figure 69-1a.

*Change Figure 69-1 and insert Figure 69-1a as shown:*



**Figure 69–1—Architectural positioning of 1 Gb/s and 10 Gb/s Backplane Ethernet**



AN = AUTO-NEGOTIATION  
 CGMII = 100 GIGABIT MEDIA INDEPENDENT INTERFACE  
 FEC = FORWARD ERROR CORRECTION  
 LLC = LOGICAL LINK CONTROL  
 MAC = MEDIA ACCESS CONTROL  
 MDI = MEDIUM DEPENDENT INTERFACE

PCS = PHYSICAL CODING SUBLAYER  
 PHY = PHYSICAL LAYER DEVICE  
 PMA = PHYSICAL MEDIUM ATTACHMENT  
 PMD = PHYSICAL MEDIUM DEPENDENT  
 XLGMII = 40 GIGABIT MEDIA INDEPENDENT INTERFACE

**Figure 69-1a—Architectural positioning of 40 Gb/s and 100 Gb/s Backplane Ethernet**

*Change the item f) as shown:*

- f) The MDI as specified in Clause 70 for 1000BASE-KX, Clause 71 for 10GBASE-KX4, Clause 72 for 10GBASE-KR, ~~or~~ Clause 84 for 40GBASE-KR4, Clause 93 for 100GBASE-KR4, or Clause 94 for 100GBASE-KP4.

### 69.2.1 Reconciliation sublayer and media independent interfaces

*Change the first paragraph as shown:*

The Clause 35 RS and GMII, the Clause 46 RS and XGMII, and the Clause 81 RS ~~and~~, XLGMII, and CGMII are employed for the same purpose in Backplane Ethernet, that being the interconnection between the MAC sublayer and the PHY.

### 69.2.4 Physical Layer signaling systems

*Insert the following two paragraphs after the fourth paragraph:*

Backplane Ethernet also specifies 100GBASE-KR4 for 100 Gb/s operation using 2-level pulse amplitude modulation (PAM) over four differential signal pairs in each direction for a total of eight pairs where the insertion loss of each pair does not exceed 35 dB at 12.9 GHz. The embodiment of 100GBASE-KR4

employs the PCS defined in Clause 82, the PMA defined in Clause 83, the PMD defined in Clause 93, and may optionally include the FEC defined in Clause 91.

**Editor’s note (to be removed prior to final publication):**

**This paragraph describes Clause 91 FEC as optional for 100GBASE-KR4 but this will be updated if it is determined to be mandatory. See also Table 69–1a.**

Backplane Ethernet also specifies 100GBASE-KP4 for 100 Gb/s operation using 4-level PAM over four differential signal pairs in each direction for a total of eight pairs where the insertion loss of each pair does not exceed 33 dB at 7.0 GHz. The embodiment of 100GBASE-KP4 employs the PCS defined in Clause 82, the FEC defined in Clause 91, and the PMA and PMD defined in Clause 94.

*Change the last paragraph as shown:*

Table 69–1 and Table 69–1a specifies the correlation between nomenclature and clauses. A complete implementation conforming to one or more nomenclatures meets the requirements of the corresponding clauses.

*Change Table 69–1 and insert Table 69–1a as shown:*

**Table 69–1—Nomenclature and clause correlation for 1 Gb/s and 10 Gb/s Backplane Ethernet Physical Layers**

Nomenclature	Clause													
	35		36	46		48	49	51	70	71	72	73	74	78
	RS	GMII	1000BASE-X PCS/PMA	RS	XGMII	10GBASE-X PCS/PMA	10GBASE-R PCS	Serial PMA	1000BASE-KX PMD	10GBASE-KX4 PMD	10GBASE-KR PMD	Auto-Negotiation	BASE-R FEC	Energy-Efficient Ethernet (EEE)
1000BASE-KX	M <sup>a</sup>	O <sup>a</sup>	M						M			M		O
10GBASE-KX4				M	O	M				M		M		O
10GBASE-KR				M	O		M	M			M	M	O	O

<sup>a</sup>O = Optional, M = Mandatory

**Table 69–1a—Nomenclature and clause correlation for 40 Gb/s and 100 Gb/s Backplane Ethernet Physical Layers**

Nomenclature	Clause															
	73	74	78	81			82		83		83A		84	91	93	94
	Auto-Negotiation	BASE-R FEC	Energy-Efficient Ethernet (EEE)	RS	XLGMII	CGMII	40GBASE-R PCS	100GBASE-R PCS	40GBASE-R PMA	100GBASE-R PMA	XLAUI	CAUI	40GBASE-KR4 PMD	100GBASE-R FEC	100GBASE-KR4 PMD	100GBASE-KP4 PMA/PMD
40GBASE-KR4	M <sup>a</sup>	O <sup>a</sup>	O	M	O		M		M		O		M			
100GBASE-KR4	M		O	M		O		M		M		O		O	M	
100GBASE-KP4	M		O	M		O		M				O		M		M

<sup>a</sup>O = Optional, M = Mandatory

### 69.2.6 Low-Power Idle

*Change the first sentence as shown:*

**Editor’s note (to be removed prior to final publication):**

**This change assumes the scope of the project will be increased to include 40GBASE-KR4. If not, the text will be modified to cite 1 Gb/s, 10 Gb/s, or 100 Gb/s accordingly.**

With the optional EEE feature, described in Clause 78, Backplane Ethernet PHYs ~~for 10Gb/s or lower~~ can achieve lower power consumption during periods of low link utilization.

### 69.3 Delay constraints

*Insert the following two paragraphs after the last paragraph:*

For 100GBASE-KR4, normative delay specifications may be found in 81.1.4, 82.5, 83.5.4, 91.3, and 93.4 and also referenced in 80.4.

For 100GBASE-KP4, normative delay specifications may be found in 81.1.4, 82.5, 93.4, and 94.3.3 and also referenced in 80.4.

### 69.5 Protocol implementation conformance statement (PICS) proforma

*Change the first paragraph as shown:*

The supplier of a protocol implementation that is claimed to conform to any part of IEEE Std 802.3;  
~~Clause 70 through Clause 74~~, demonstrates compliance by completing a protocol implementation confor-  
mance statement (PICS) proforma.

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