Comments #294, 296
Proposed Responses

IEEE P802.3bj
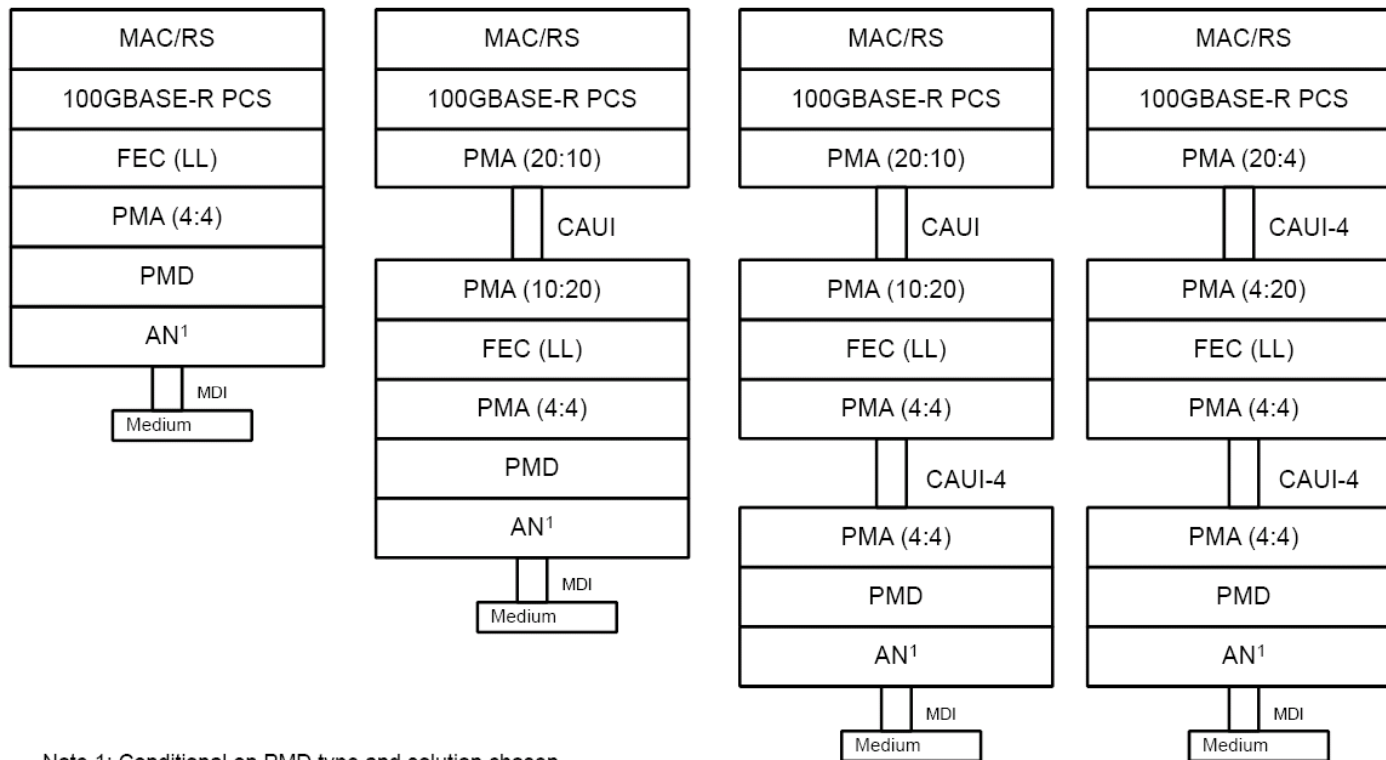## 100 Gb/s Backplane and Copper Cable
Task Force

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San Diego, CA, USA, July 2012

Gustlin_01_0312.pdf

Low Latency FEC Architecture

- The figures below show possible striped (and therefore low latency) FEC architectures

MAC/RS
100GBASE-R PCS
FEC (LL)
PMA (4:4)
PMD
AN[1]

MDI → Medium

MAC/RS
100GBASE-R PCS
PMA (20:10)

CAUI

PMA (10:20)
FEC (LL)
PMA (4:4)
PMD
AN[1]

MDI → Medium

MAC/RS
100GBASE-R PCS
PMA (20:10)

CAUI

PMA (10:20)
FEC (LL)
PMA (4:4)

CAUI-4

PMA (4:4)
PMD
AN[1]

MDI → Medium

MAC/RS
100GBASE-R PCS
PMA (20:4)

CAUI-4

PMA (4:20)
FEC (LL)
PMA (4:4)

CAUI-4

PMA (4:4)
PMD
AN[1]

MDI → Medium

Note 1: Conditional on PMD type and solution chosen

Note: LL = Low Latency   CAUI-4 – assumed new 25G+ interface

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IEEE 802.3 Plenary, July, 2012
San Diego, CA, USA

Comment #294

- ## Comment # 294

  Table 94-1 lists the physical layer clauses associated with 100GBASE-KR4 PMD, and states that Clause 83A CAUI is optional. However, CAUI is based on 10 lanes of 10.3125 Gb/s, and therefore would also require two instantiations of the Clause 83 PMA sublayer

- ## Suggested Remedy

  Table 94-1 need to include Clause 83 PMA as optional. Add a note to 83A CAUI line that states if 83A CAUI is present then two instantiations of Clause 83 PMA [(n:10) and (10:n] must be present. It is also assumed that a CAUI would actually reside between two clause 83 PMA sublayers that would reside above the FEC sublayer. This is brought up then, because now we need to define the PMA Sublayer positioning in a fashion similar to what is currently done in 83.1.4. This also would include addresing the MMD addresses for multiple PMA sublayers. also, i believe from prior work it was stated that if the adopted FEC approach were to be used - you could not change the number of lanes until the data link was "de-FEC'd". This means the following two things -
  1. You can't connect a clause 94 PMA to a Clause 83 PMA to do a CAUI
  2. CAUI shall only be used outside of the FEC'd link.

  This needs to be captured in a section similar to the guidelines applying to partioning oPMAs on page 139 of P802d3rev_d3p1.pdf on Page 139.

  It would makie sense to move 94.2 PMA subclauses into

Comment #296

- Comment

  Table 92-1 lists the physical layer clauses associated with 100GBASE-CR4 PMD, and states that Clause 83A CAUI is optional. However, CAUI is based on 10 lanes of 10.3125 Gb/s, and therefore would also require two instantiations of the Clause 83 PMA sublayers. CAUI implementations can not reside inside FEC'd portion of link.

  Also, the PMA sublayer beneath the FEC sublayer SHALL be a [4:4] PMA sublayer, and not the generic PMA sublayer as specified in Clause 83.

  The same problem applies to Clause 93 as well.

- Suggested Remedy

  Add a note to 83A CAUI line that states if 83A CAUI is present then two instantiations of Clause 83 PMA [(n:10) and (10:n] must be present. It is also assumed that a CAUI would actually reside between two clause 83 PMA sublayers that would reside above the FEC sublayer. This is brought up then, because now we need to define the PMA Sublayer positioning in a fashion similar to what is currently done in 83.1.4. This also would include addresing the MMD addresses for multiple PMA sublayers. also, i believe from prior work it was stated that if the adopted FEC approach were to be used - you could not change the number of lanes until the data link was "de-FEC'd". This means the following two things -
  1. You can't connect a clause 94 PMA to a Clause 83 PMA to do a CAUI
  2. CAUI shall only be used outside of the FEC'd link.

  This needs to be captured in a section similar to the guidelines applying to partioning of PMAs on page 139 of P802d3rev_d3p1.pdf on Page 139. Also, this needs to include something that states that the PMA below the FEC sublayer has to be a [4:4] PMA sublayer.

  Possibility of adding PMA related text to Clause 91. However, then we lose the general nature of the FEC for other lane count implementations. THerefore PMA, text needs to be added to Clauses 92 and 93 to cover the issues addressed here.

IEEE P802.3bj 100Gb/s Backplane and Copper Cable Task Force

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San Diego, CA, USA

Comment #294 Overview

Table 94–1—Physical Layer clauses associated with the 100GBASE-KP4 PMD

Associated clause	100GBASE-KP4
81—RS	Required
81—CGMII[a]	Optional
82—PCS for 100GBASE-R	Required
83A—CAUI	Optional
91—FEC	Required
94—PMA	Required
94—PMD	Required
73—Auto-Negotiation	Required
78—Energy-Efficient Ethernet	Optional

[a]The CGMII is an optional interface. However, if the CGMII is not implemented, a conforming implementation must behave functionally as though the RS and CGMII were present.

- For Clauses 94
- CAUI – x10 (802.3ba)
- Generic architecture drawing does not help clarify x10 and x4 PMA / CAUI Implementations
- Clause 83 PMA [m:n] above FEC
- Clause 94 PMA below FEC
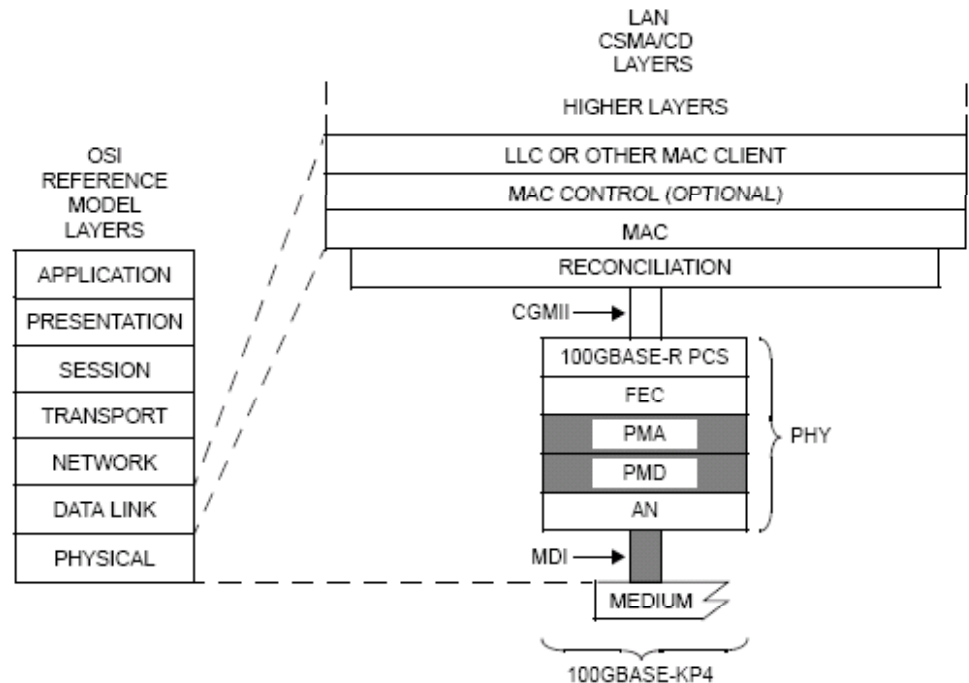
AN = AUTO-NEGOTATION
CGMII = 100 Gb/s MEDIA INDEPENDENT INTERFACE
FEC = FORWARD ERROR CORRECTION
LLC = LOGICAL LINK CONTROL
MAC = MEDIA ACCESS CONTROL

MDI = MEDIUM DEPENDENT INTERFACE
PCS = PHYSICAL CODING SUBLAYER
PHY = PHYSICAL LAYER DEVICE
PMA = PHYSICAL MEDIUM ATTACHMENT
PMD = PHYSICAL MEDIUM DEPENDENT

Figure 94–1—100GBASE-KP4 PMA and PMD relationship to the ISO/IEC Open Systems Interconnection (OSI) reference model and the IEEE 802.3 CSMA/CD LAN model

Comment #296: Problem Overview

Table 92–1—Physical Layer clauses associated with the 100GBASE-CR4 PMD

Associated clause	100GBASE-CR4
81—RS	Required
81—CGMII[a]	Optional
82—PCS for 100GBASE-R	Required
91—FEC	TBD
83—PMA for 100GBASE-R	Required
83A—CAUI	Optional
73—Auto-Negotiation	Required
78—Energy Efficient Ethernet	Optional

[a]The CGMII is an optional interface. However, if the CGMII is not implemented, a conforming implementation must behave functionally as though the RS and CGMII were present.

- For Clauses 92 & 93
- CAUI – x10 (802.3ba)
- Generic architecture drawing does not help clarify x10 and x4 PMA / CAUI Implementations
- Clause 83 PMA [m:n] above FEC
- Clause 83 PMA [4:4] below FEC
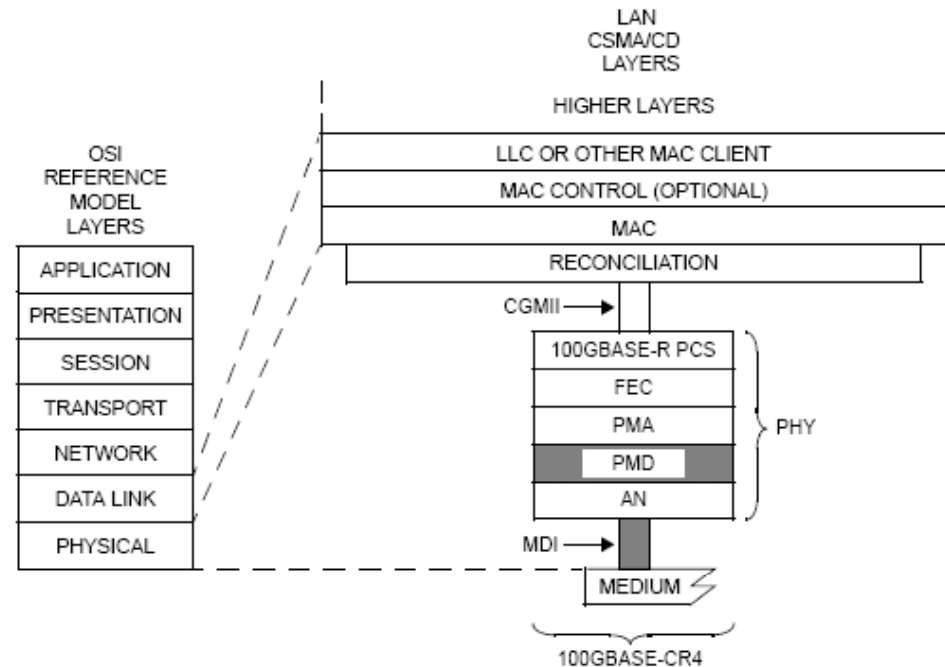
AN = AUTO-NEGOTATION
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PCS = PHYSICAL CODING SUBLAYER
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PMA = PHYSICAL MEDIUM ATTACHMENT
PMD = PHYSICAL MEDIUM DEPENDENT

Figure 92–1—100GBASE-CR4 PMD relationship to the ISO/IEC Open Systems Interconnection (OSI) reference model and the IEEE 802.3 CSMA/CD LAN model

Proposed Changes to Clause 83

- 83.3 (P802.3/D3.1, Page 140, L48)

  Change "If the PMA client is the PCS or an FEC sublayer,"
  to

  "If the PMA client is the PCS or an BASE-R FEC sublayer (see Clause 74), the PMA (or PMA client) continuously sends four (for 40GBASE-R) or twenty (for 100GBASE-R) parallel bit streams to the PMA client (or PMA), each at the nominal signaling rate of the PCSL. If the PMA client is the 100GBASE-R FEC sublayer (see Clause 91), the PMA continuously sends four parallel bit streams to the PMA client (or PMA), each at 25.78125 GBd."

Proposed Changes to Clause 91

- Add a subclause with the heading "PMA compatibility" that specifies the Clause 91 FEC sublayer is a client of either a Clause 83 PMA with four upstream lanes and four downstream lanes or a Clause 94 PMA.

Proposed Changes to Clause 92

- Add after 1st paragraph in 92.1
  - When forming a complete 100GBASE-CR4 Physical Layer, the following guidelines apply:
    - (a) If FEC is implemented, the PMA specified in Clause 83 shall connect with the FEC through the PMA service interface specified in 83.3, with p=4 input lanes.
    - (b) When connected to the Clause 91 FEC, the PMD specified in Clause 92 shall connect with the PMA specified in Clause 83 through the PMD service interface specified in 92.2.
    - (c) If one or more CAUI interfaces are implemented between the FEC and the RS, each CAUI interface shall include a pair of PMA sub-layers, as specified in Clause 83. Refer to 83.1.4 for additional guidance.

Proposed Changes to Clause 93

- Add after 1st paragraph in 93.1
  - When forming a complete 100GBASE-CR4 Physical Layer, the following guidelines apply:
    - (a) If FEC is implemented, the PMA specified in Clause 83 shall connect with the FEC through the PMA service interface specified in 83.3, with p=4 input lanes.
    - (b) When connected to the Clause 91 FEC, the PMD specified in Clause 92 shall connect with the PMA specified in Clause 83 through the PMD service interface specified in 93.2.
    - (c) If one or more CAUI interfaces are implemented between the FEC and the RS, each CAUI interface shall include a pair of PMA sub-layers, as specified in Clause 83. Refer to 83.1.4 for additional guidance.

Proposed Changes to Clause 94

- ## Modify 94.1 to

  This clause specifies the Physical Medium Attachment (PMA) sublayers, Physical Medium Dependent (PMD) sublayer, and medium for the 100GBASE-KP4 PHY. A 100GBASE-KP4 physical shall include the required sub-layers and may include the optional sub-layers specified in Table 94-1.

  When forming a complete 100GBASE-KP4 Physical Layer, the following guidelines apply:

    (a) The 100GBASE-KP4 PMA specified in 94.2 shall connect with the FEC through the PMA service interface specified in 94.2.1.

    (b) The 100GBASE-KP4 PMD specified in 94.3 shall connect with the 100GBASE-KP4 PMA through the PMD service interface specified in 94.3.1.

    (c) If one or more CAUI interfaces are implemented between the FEC and the RS, each CAUI interface shall include a pair of PMA sub-layers, as specified in Clause 83.. Refer to 83.1.4 for additional guidance.

- ## Add entry to Table 94.1

  - 83 PMA – Optional

- ## Modify 94.2.12 to

  "Clause 45 specifies the optional MDIO capability that describes several variables that provide control and status information for and about the PMA. 45.2.1 describes the Management Data Input/Output (MDIO) Manageable Device (MMD) addresses".

Proposed Changes to Annex 83C

- Note all current figures in Annex 83C use Clause 83 PMA and Clause 74 FEC

- Add sub-clause / partition example illustrating 100GBASE-nR4 with CAUI and Clause 91 RSFEC

- Add sub-clause / partition example illustrating 100GBASE-KP4 with CAUI and Clause 94 RSFEC