Motivation for a 100GBE CGMII Extender

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Shawn Nicholl, Xilinx

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Terminology

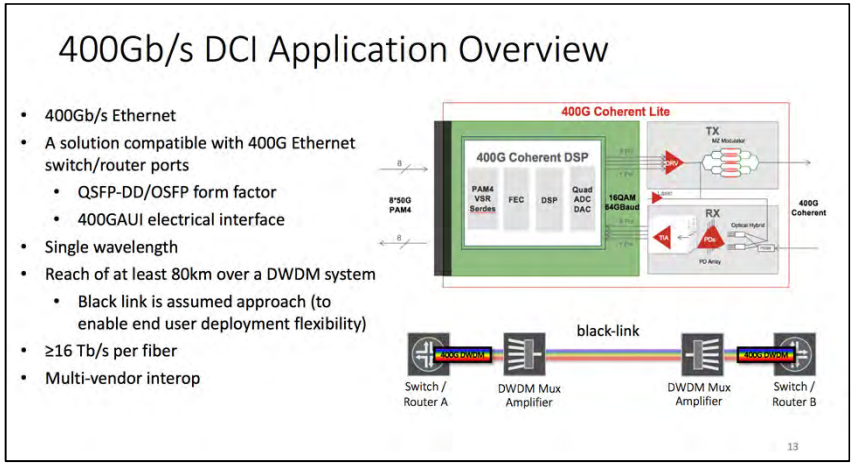
- The terms “400GBASE-ZR” and “100GBASE-ZR” are used throughout this presentation and placed in quotes as the TF has not yet chosen an official name for the 400G and 100G 80km DWDM PHYs respectively.

Outline

- Background and motivation for “100GBASE-ZR”
- Problem statement (architectural challenges in supporting ”100GBASE-ZR”)
- 400GbE Extender recap
- 100GbE Architecture recap
- 100GbE Extender Concept
- 100GbE Extender use cases
  - 802.3cn – “100GBASE-ZR”
  - 802.3ck – “FEC converter”
- Summary

Background

- nowell_b10k_01b_0318 and nicholl_b10k_01a_0518 presented the motivation to add objectives in support of 400GbE and 100GbE operation on a single wavelength capable of at least 80km over a DWDM system
- A key requirement of both proposals was a solution that would be compatible with existing 400GbE and 100GbE switch ports, i.e. connect to 400GAUI-n and CAUI-n/100GAUI-n electrical interfaces



nicholl_b10k_01_0518

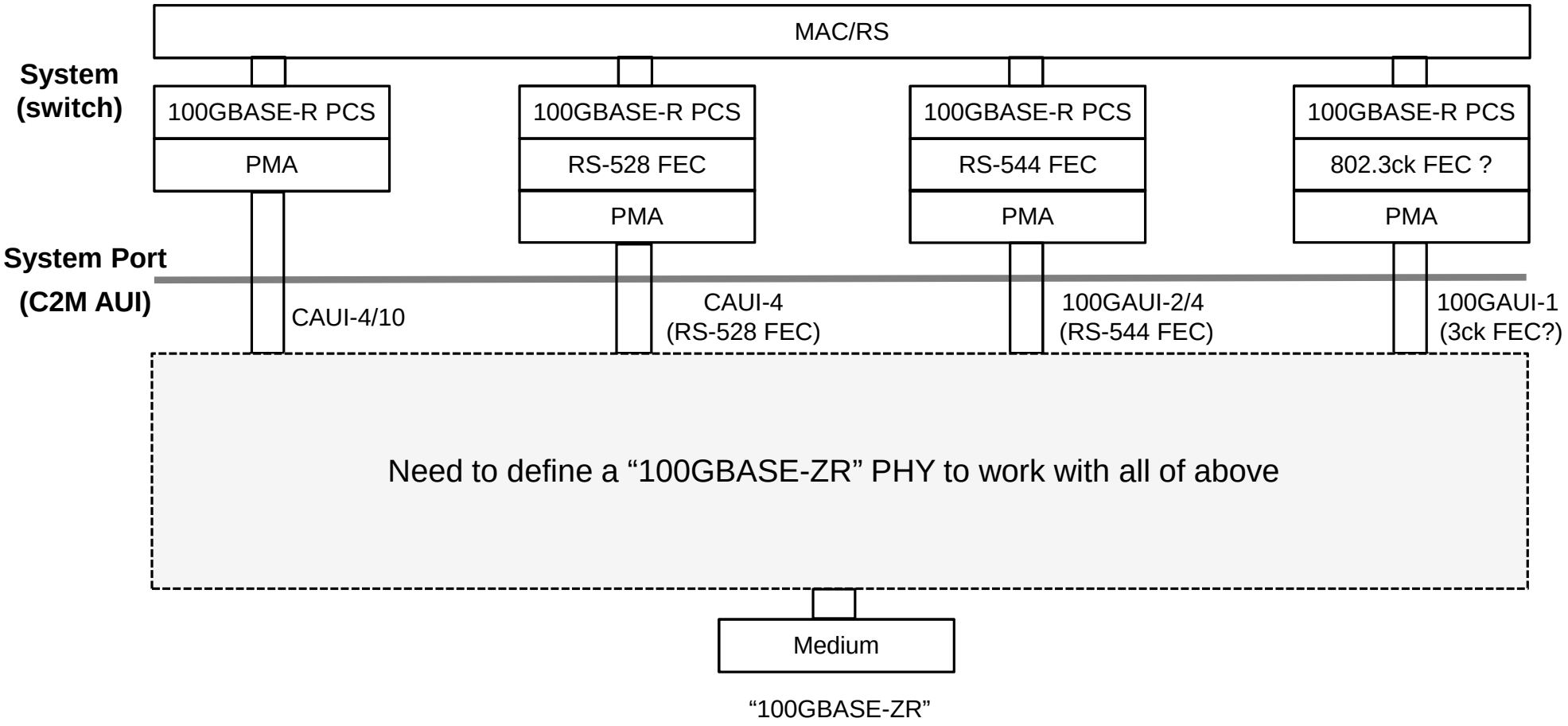
Background

nicholl_b10k_01a_0918 proposed using the existing 400GbE Extender Sublayer (Clause 118) to enable a new "400GBASE-ZR" PHY to interface to a 400GAUI-n and address the 400G 80km DWDM PHY objective.

nicholl_b10k_01a_0918 also pointed out that the situation is somewhat more complex at 100GbE for the following reasons:

- There is no existing 100GMII Extender to leverage
- The PCS and FEC are implemented as separate sub-layers
- There are potentially four different C2M AUIs to connect to:
  - CAUI-4/10 (no FEC)
  - CAUI-4 (RS-528 FEC)
  - 100GAUI-2/4 (RS-544 FEC)
  - 100GAUI-1 (P802.3ck FEC?)

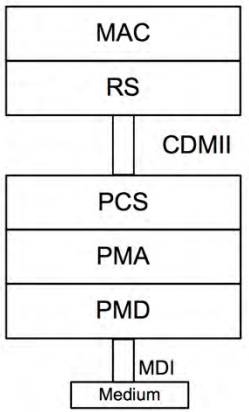
“100GBASE-ZR” PHY Architectural Challenge



400GbE Extender Recap

baseline_3bs_0715.pdf

The 400GbE Basic Layer Diagram



- But…
  - To enable flexibility for future efforts, an extender sublayer for the CDMII is desirable, but there is no physical instantiation of the CDMII.
  - From a standardization perspective, it can leverage a CDAUI, which is a optional physical instantiation of the PMA service interface

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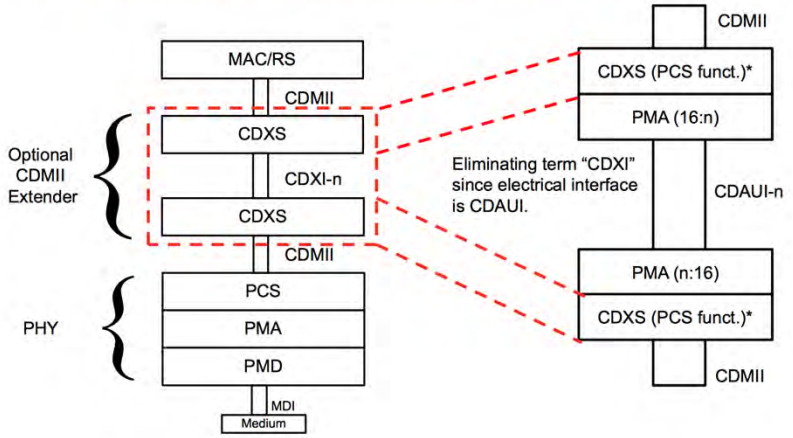
CDMII Extender Functional Concept



Initial Proposal

Updated Proposal

* Note - Same as PCS (including FEC) to be defined.

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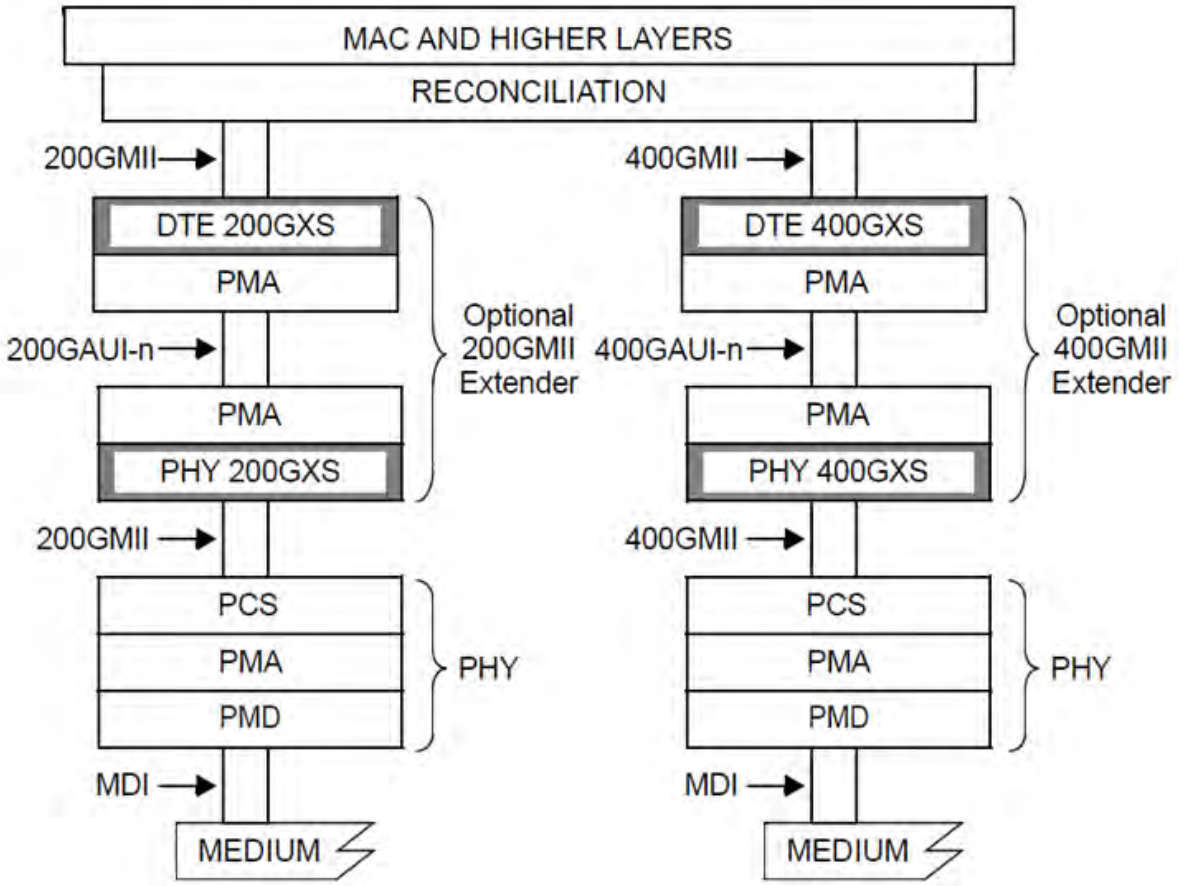
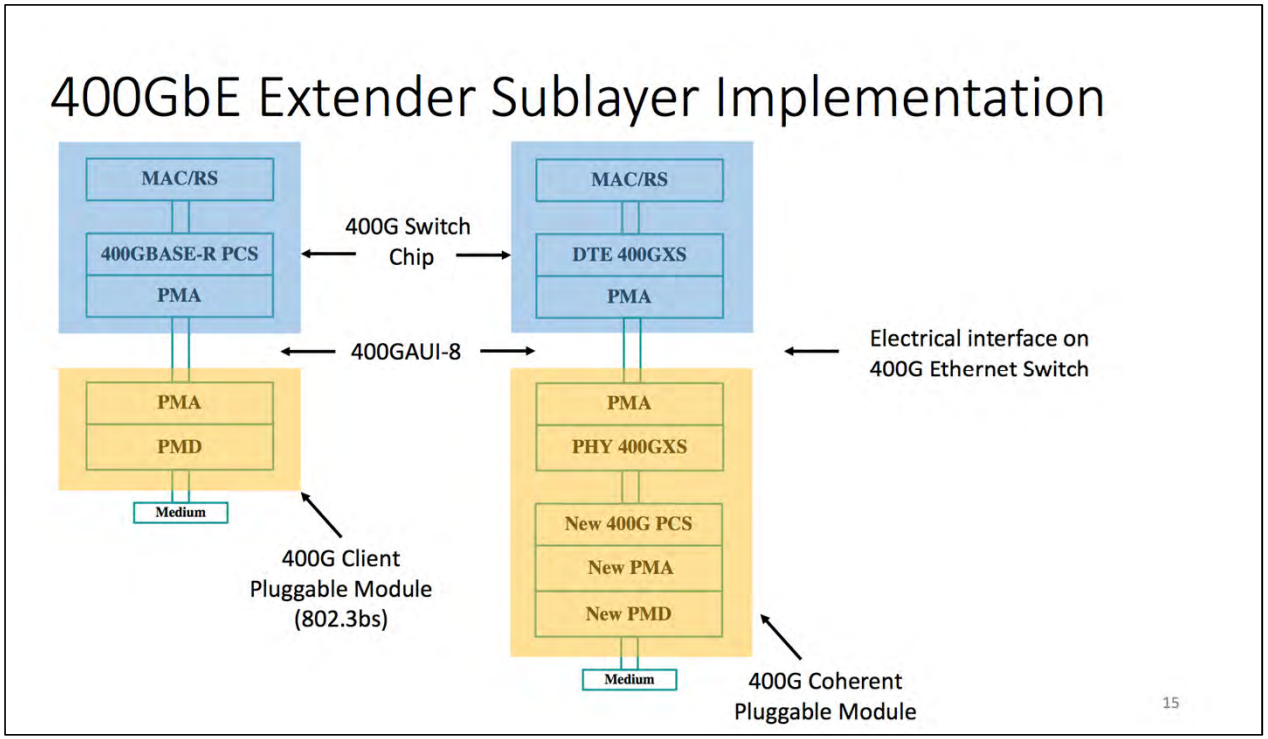
802.3bs introduced the concept of an 400GbE Extender recognizing that future PHYs may require a different FEC, which would require a return to 400GMII (from a standardization perspective)

400GbE Extender Recap (Clause 118)



Based on (i.e. crop): IEEE 802.3-2018 Figure 118-1

Use of 400GbE Extender to support 400G-ZR Module



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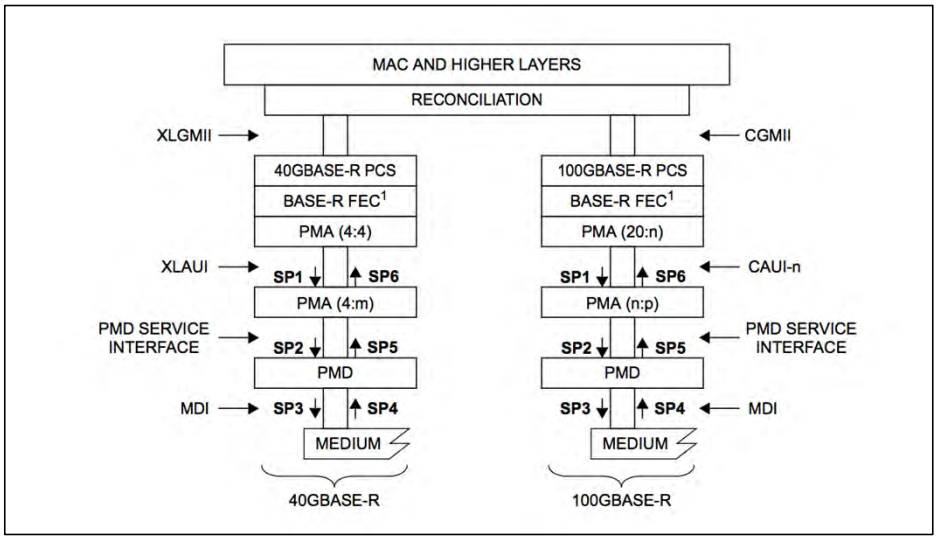
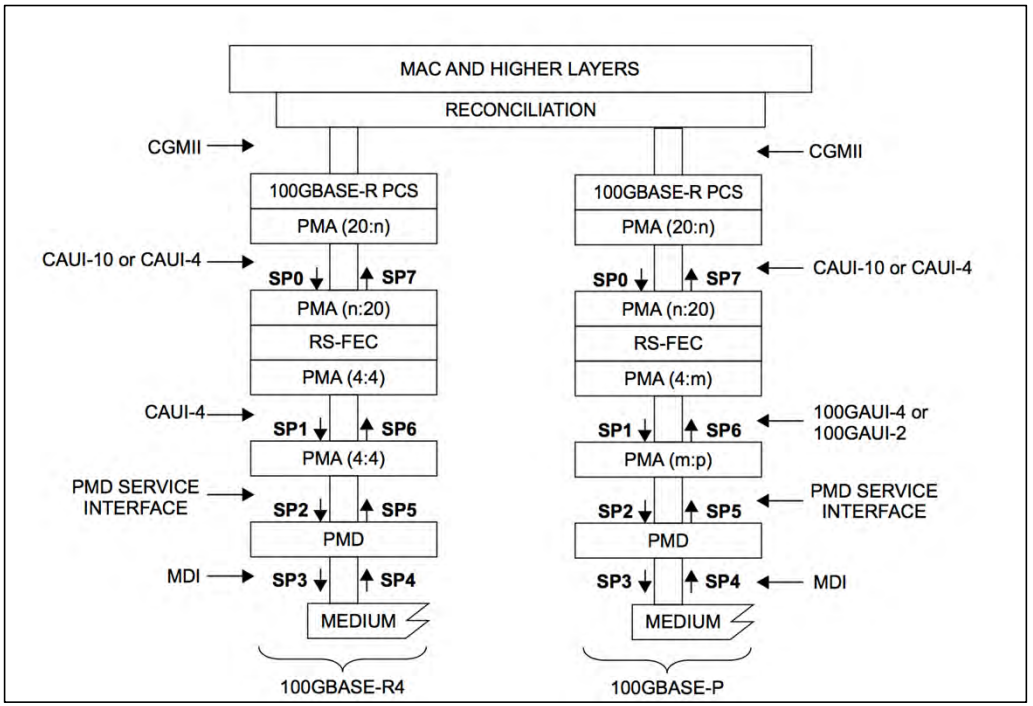
400GbE Extender enables both client and coherent modules to be plugged into the same 400GbE switch port

100GbE Architecture Recap



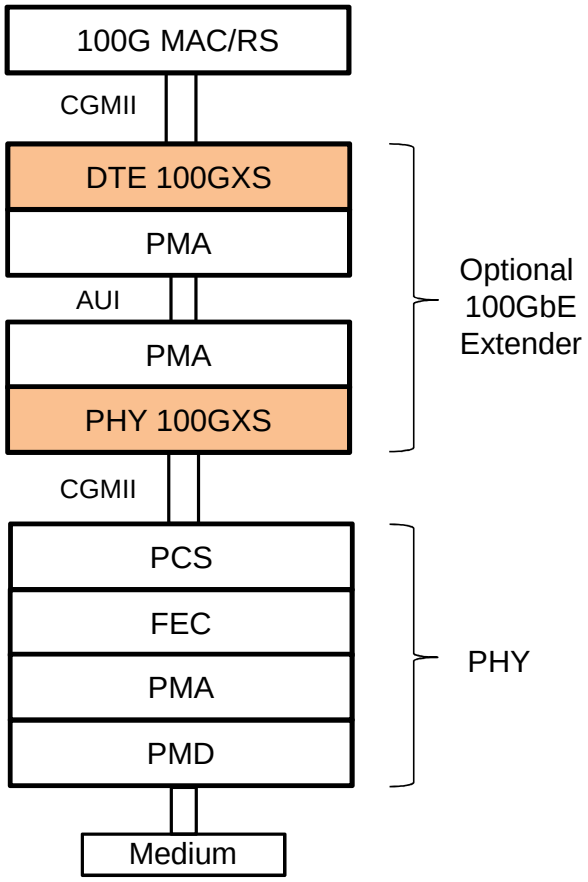
Based on (i.e. crop): IEEE 802.3-2018 Figure 80-6



Based on (i.e. crop): 802.3cd D3.5 Figure 80-8

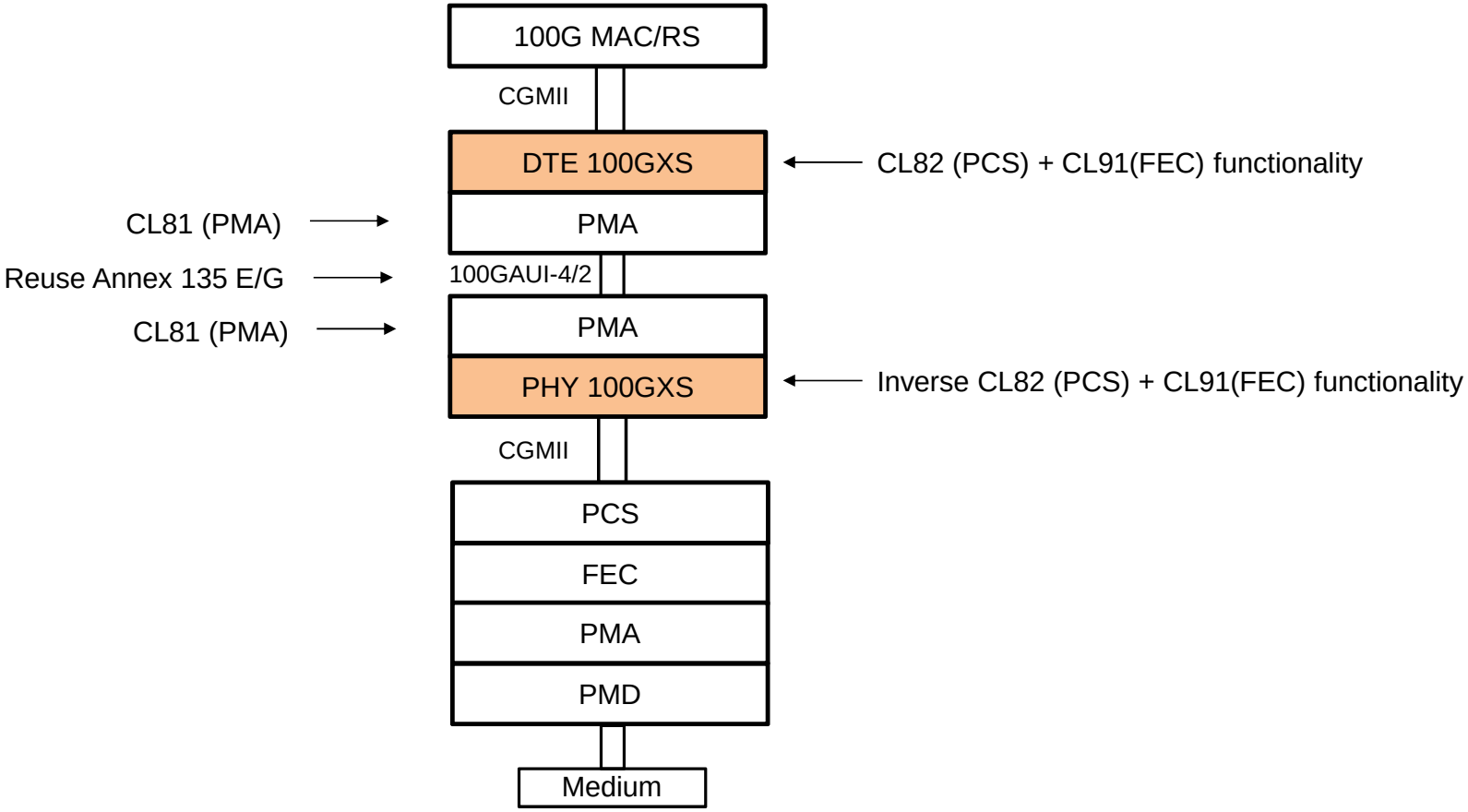
No 100GbE Extender currently defined in architecture.

100GbE Extender Concept

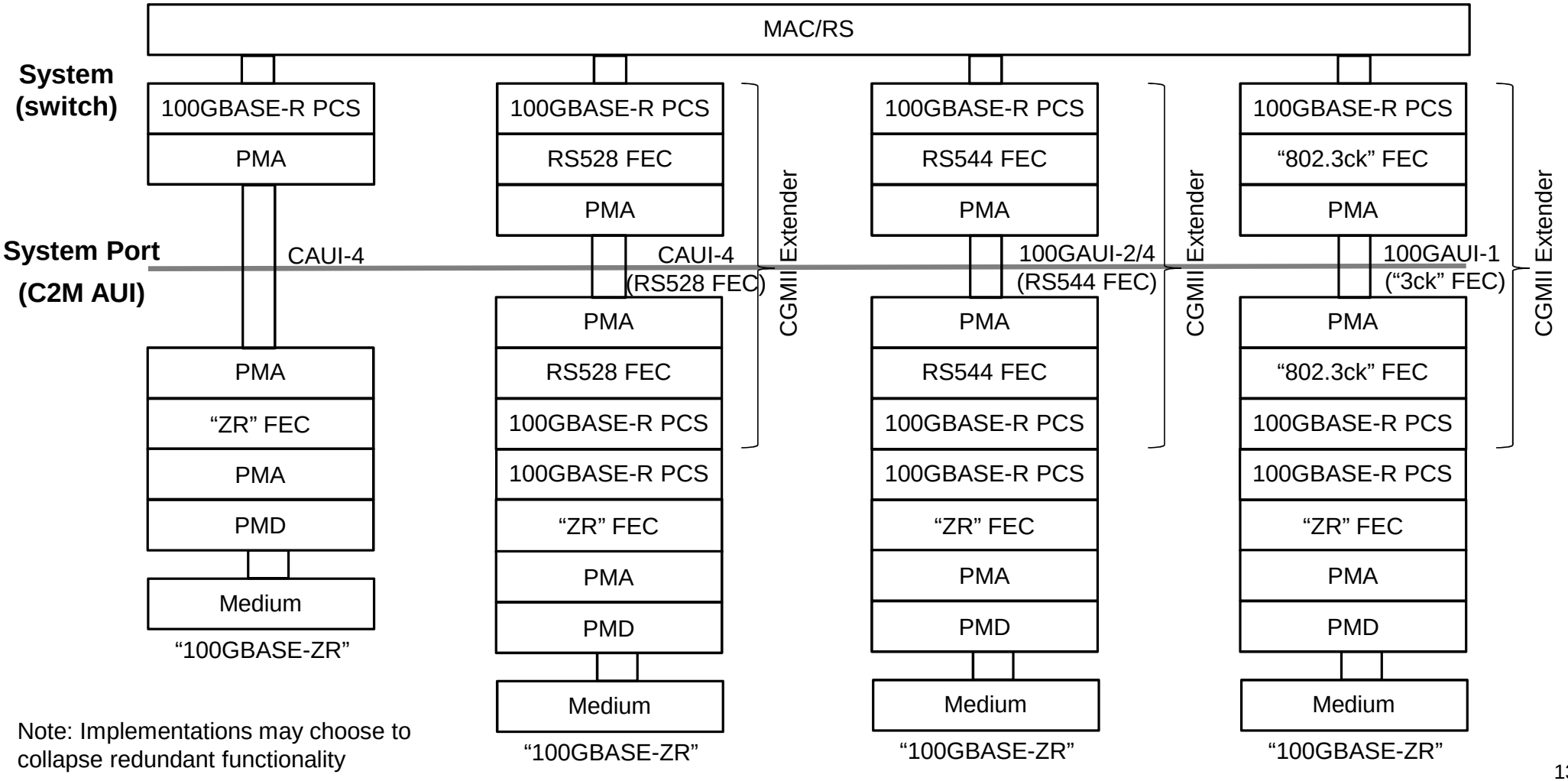


- The 100GbE Extender Sublayer (100GXS) is used to extend the CGMII across a physically instantiated AUI
- This allows support for new PCS/FEC/PMA functionality below the extended CGMII, if needed.
- The 100GXS is a combination of the functionality of the 100G PCS sublayer and the FEC sublayer associated with a specific AUI interface
- Identical in concept to the 400GbE Extender and 400GbE Extender Sublayer

100GbE Extender Example for 100GAUI-4/2



“100GBASE-ZR” Use Cases – Functional Stack up



Note: Implementations may choose to collapse redundant functionality

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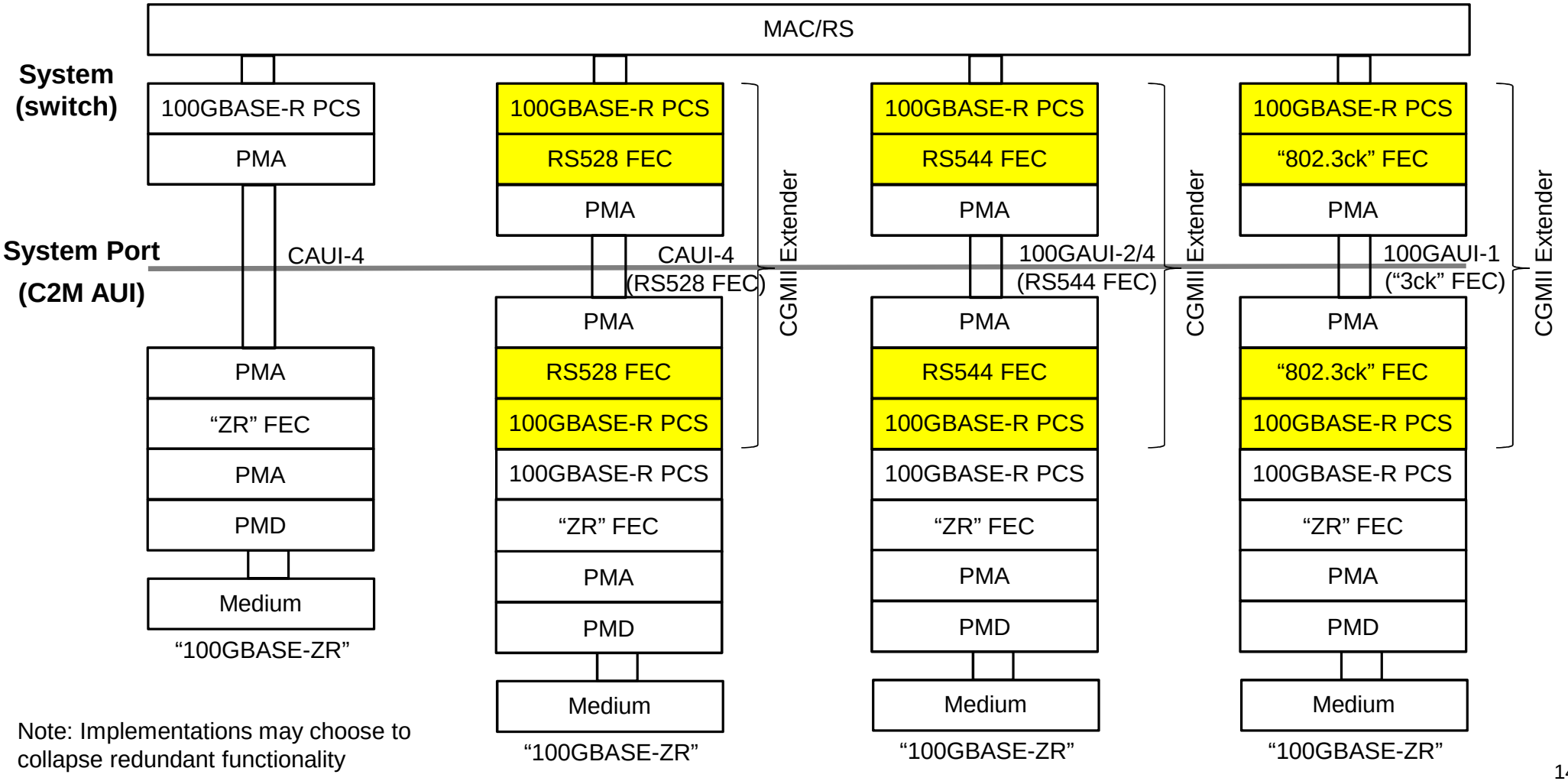

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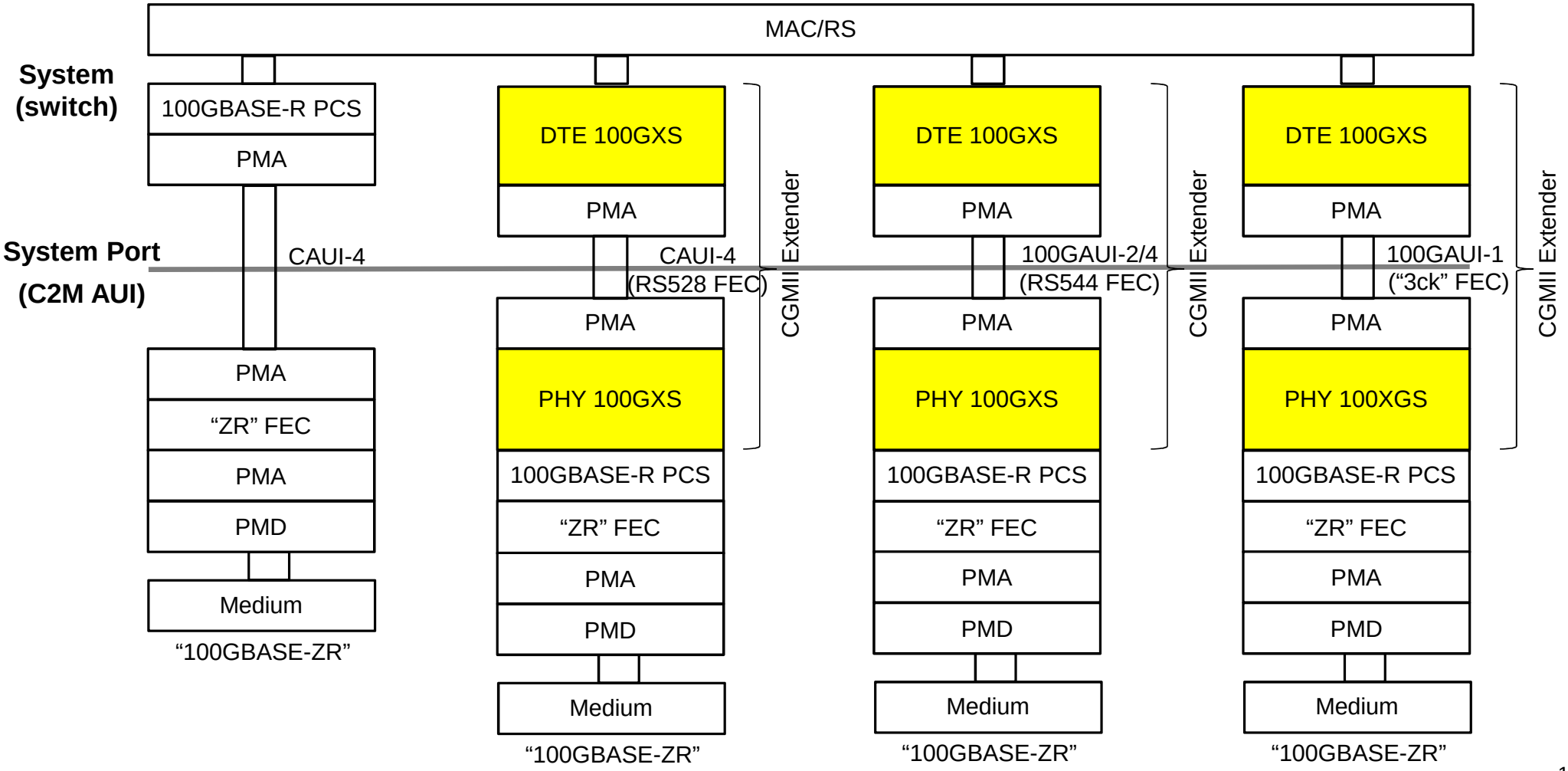

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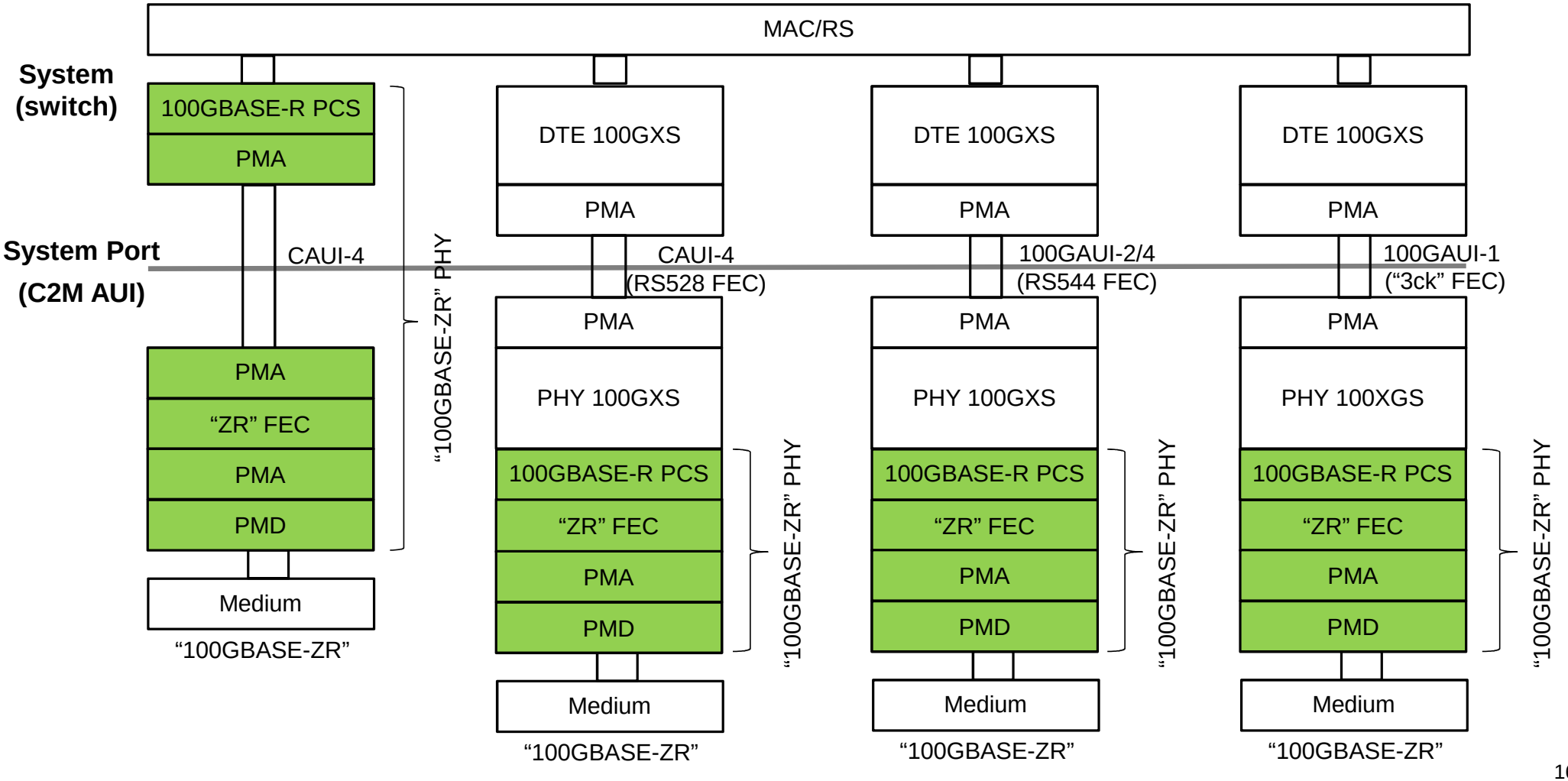
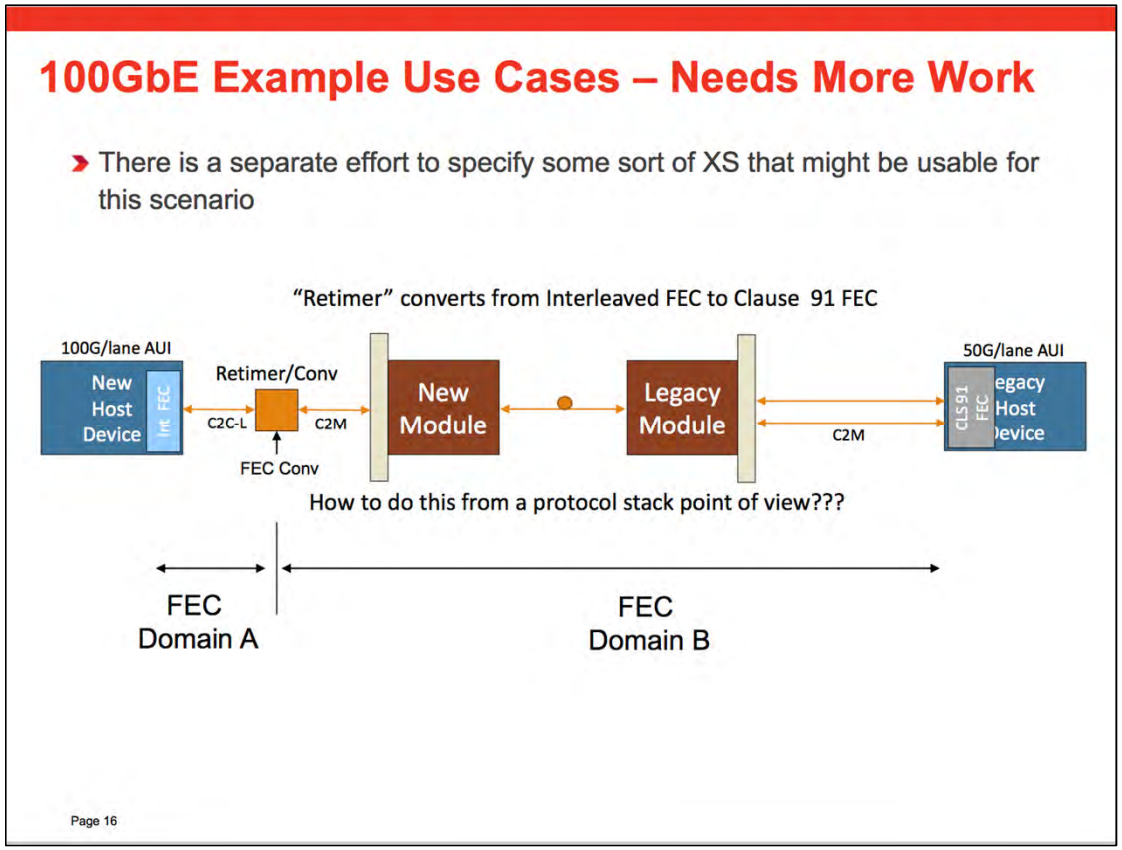


802.3ck “FEC Converter” Use Case



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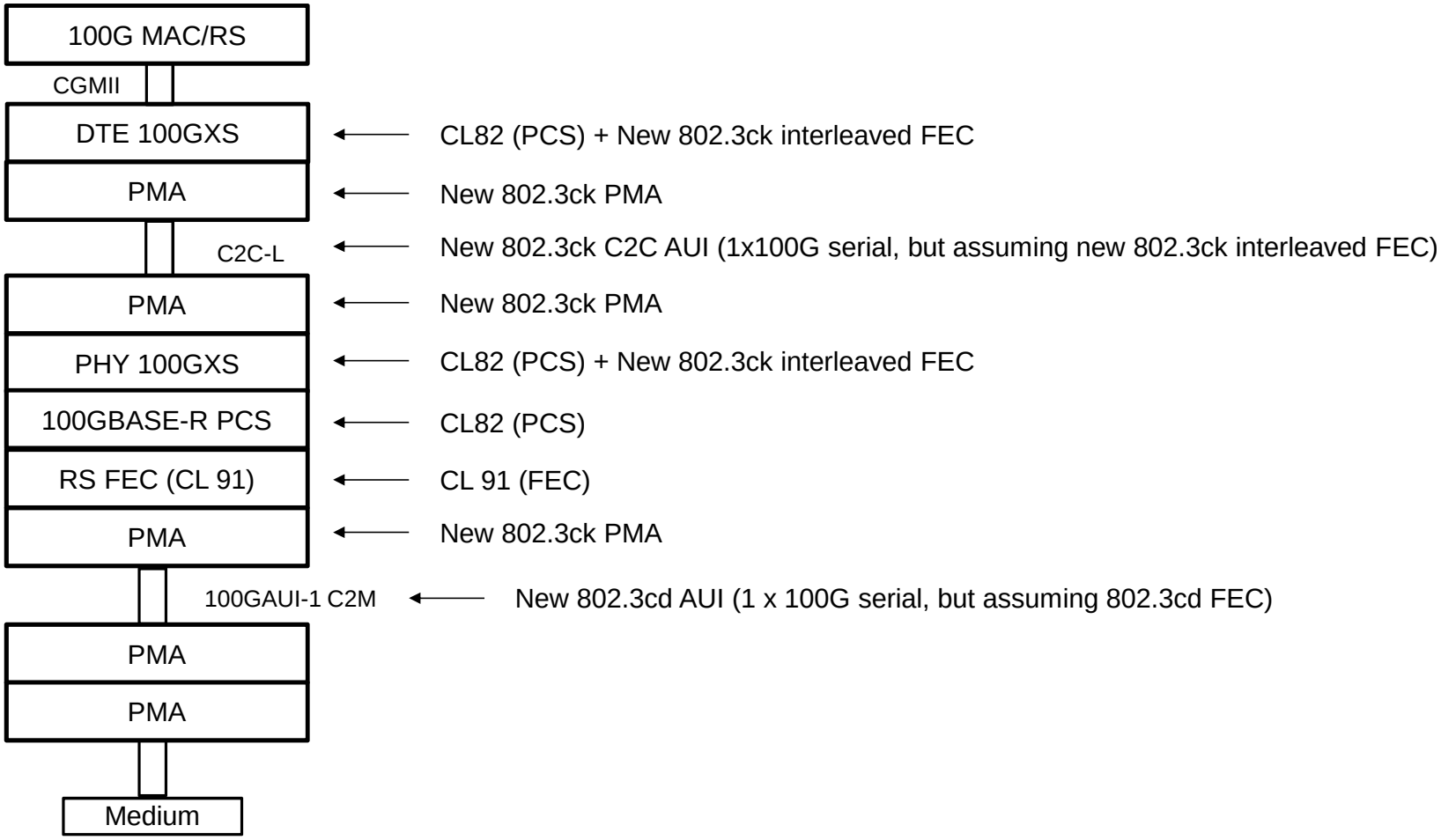
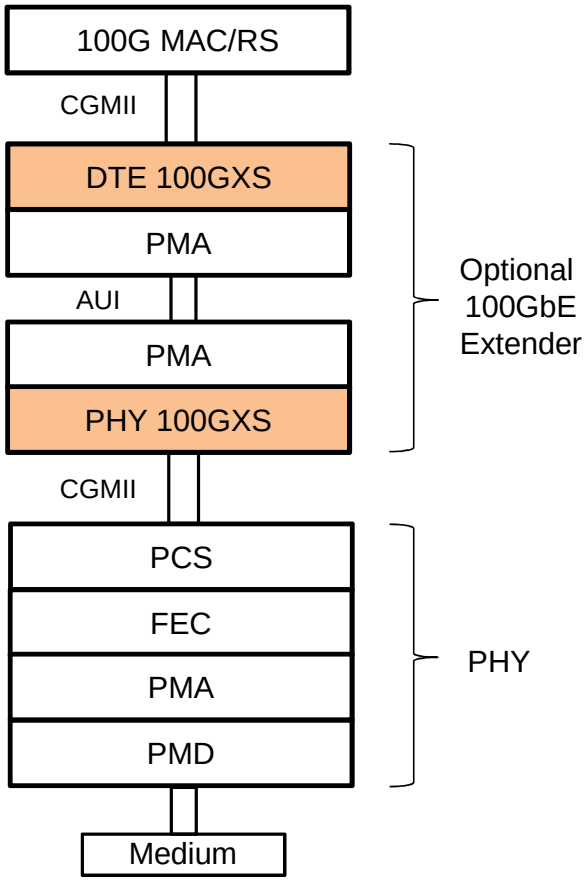
802.3ck “FEC Converter” Use Case – Stack up



Summary



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