400GbE Architecture Baseline Proposal (Update)

IEEE P802.3bs 400 Gb/s Ethernet Task Force

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Pete Anslow - Ciena
John D'Ambrosia – Dell
Mark Gustlin – Xilinx
Adam Healey – Avago
David Law – HP
Gary Nicholl - Cisco
Dave Ofelt – Juniper
Steve Trowbridge - ALU

What Needs to be Supported in the Architecture?

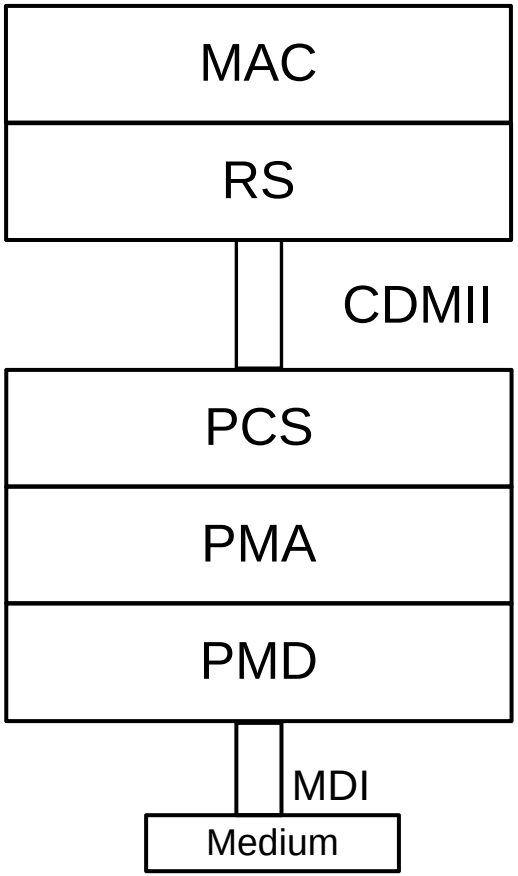
- The coding needs of the electrical interface may vary independently from the PMD interface
- The requirements for each interface can be different, both the FEC, modulation and number of lanes can change over time for each interface
- We need a single high level architecture which can support the evolving requirements of the interfaces over time
  - This does not mean it requires a complicated implementation
- A Media Independent interface needs to be specified to enable standardization of different PHYs today and future, “unknown”, PHYs tomorrow.
- We need an electrical interface between different devices, CDAUI (C2C & C2M)
- IEEE 802.3 supports two “levels” of implementers
  - The system implementer
  - The component implementer

Sublayer Functions (at a high level)

Sublayer	10GbE	100GbE	400GbE (proposed)
MAC	Framing, addressing, error detection	Framing, addressing, error detection	Framing, addressing, error detection
Extender	XGXS (PCS + PMA function)	N/A	CDXS (PCS + FEC function)
PCS	Coding (X: 8B/10B, R: 64B/66B), lane distribution, EEE	Coding (64B/66B), lane distribution, EEE	Coding, lane distribution, EEE, FEC
FEC	FEC, transcoding	FEC, transcoding, align and deskew	N/A
PMA	Serialization, clock and data recovery	Muxing, clock and data recovery, HOM	Muxing, clock and data recovery, HOM??
PMD	Physical interface driver	Physical interface driver	Physical interface driver

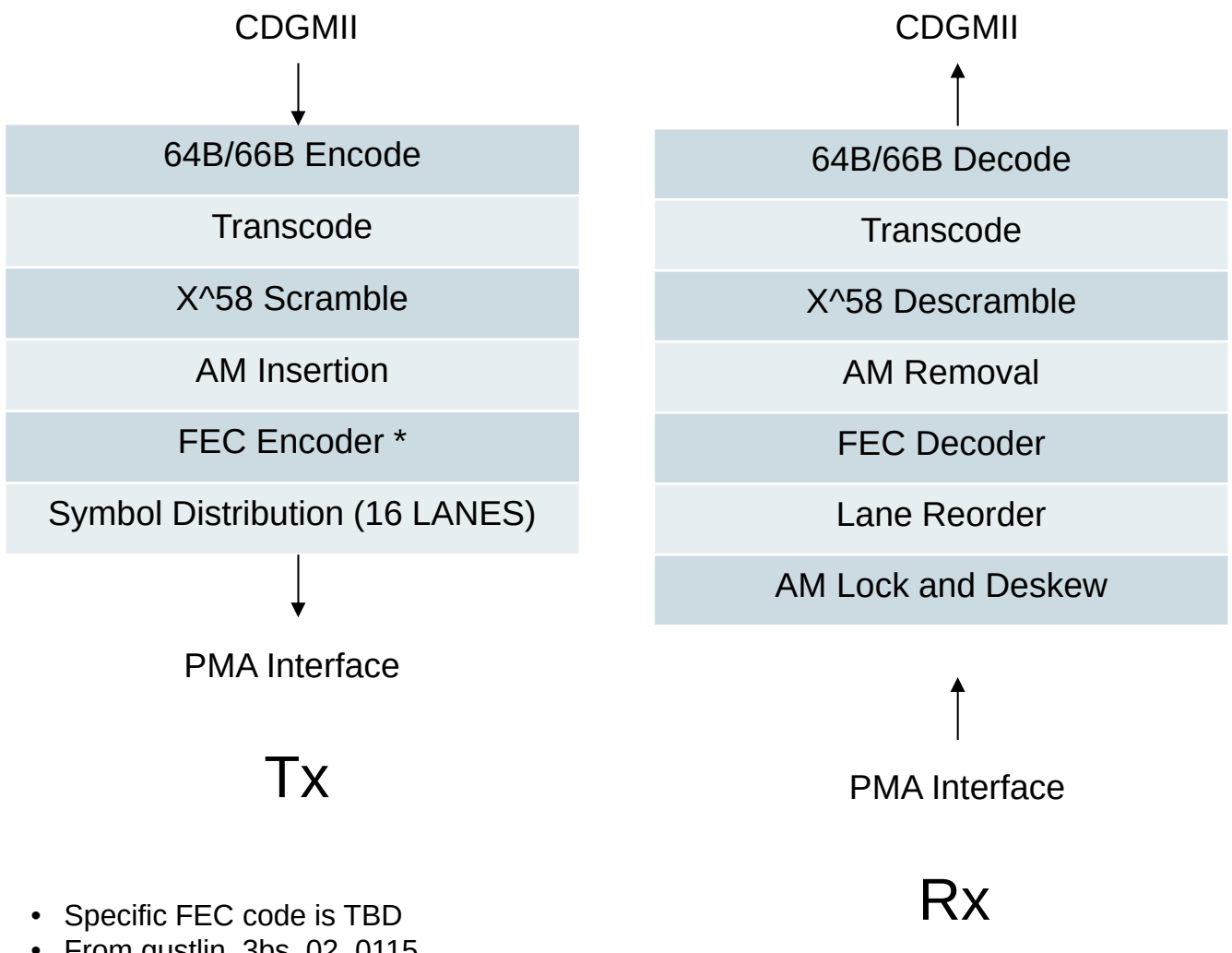
Note that there are variations with a single speed, not all are captured in this table

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

PCS Block Diagrams



- Specific FEC code is TBD
- From gustlin_3bs_02_0115

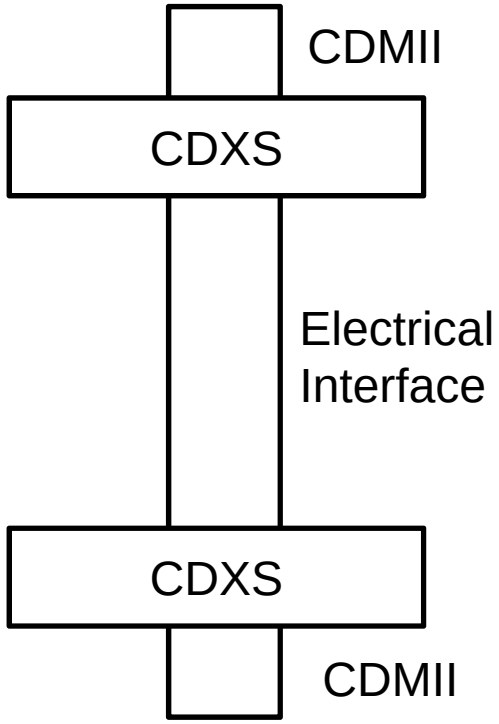
PMA

The following are the functions performed by the PMA sublayer

- Provide appropriate multiplexing
- Provide appropriate modulation (PAM4 for instance if required)
- Provide per input-lane clock and data recovery
- Provide clock generation
- Provide signal drivers
- Optionally provide local loopback to/from the PMA service interface
- Optionally provide remote loopback to/from the PMD service interface
- Optionally provide test-pattern generation and detection
- Tolerate Skew Variation

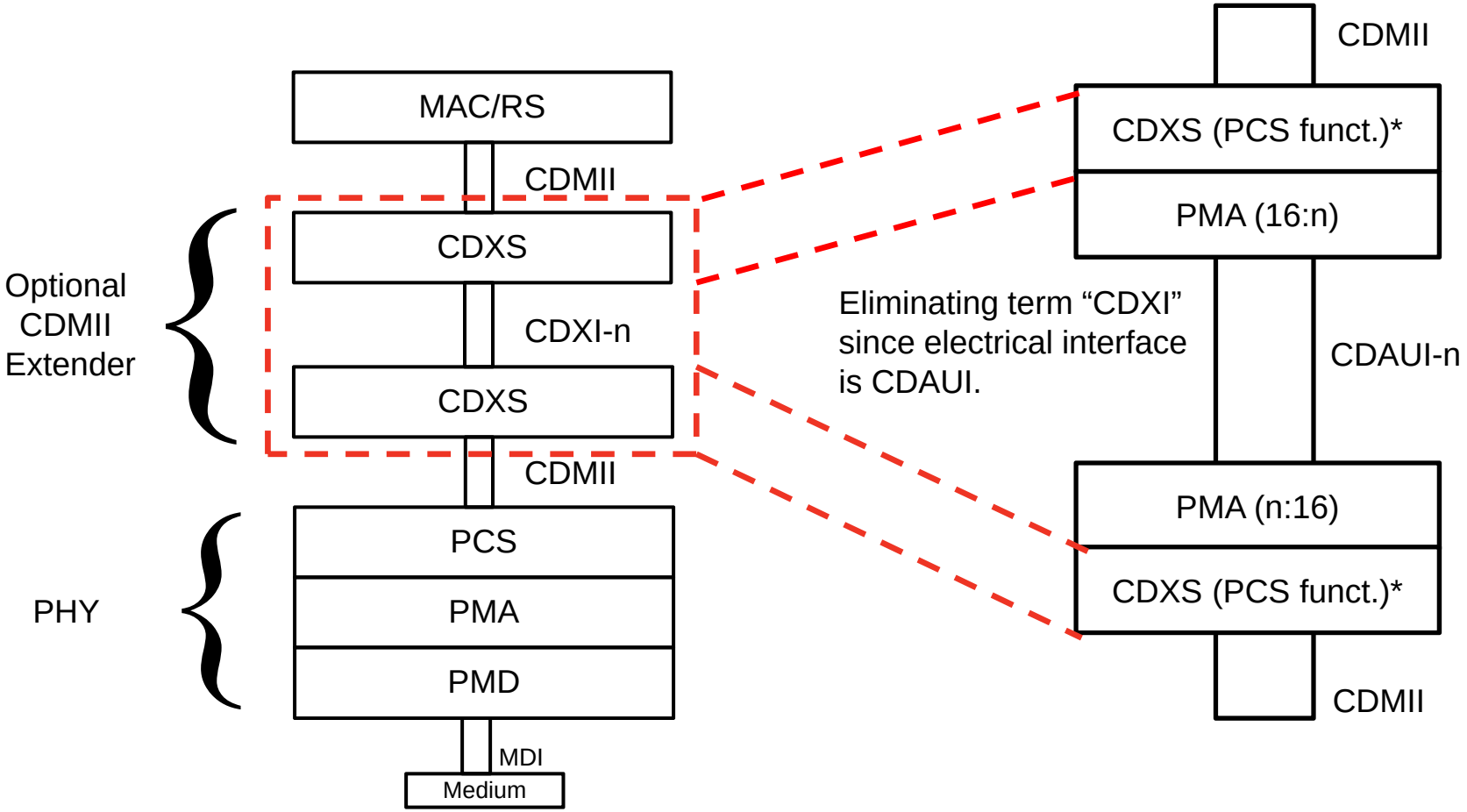
- From gustlin_3bs_02_0115

Comments on CDXS



- CDMII is the only media independent interface
- Different implementations or future PHYs may require changing FEC, which would require a return to CDMII (from a standardization perspective)
- The CDXS, as shown, is an extension of the CDMII.
- This allows support for new PCS / PMA functionality below the extended CDMII, if needed.
- The CDXS provides the coding / FEC of the electrical interface, not the coding / FEC of the PHY.

CDMII Extender Functional Concept

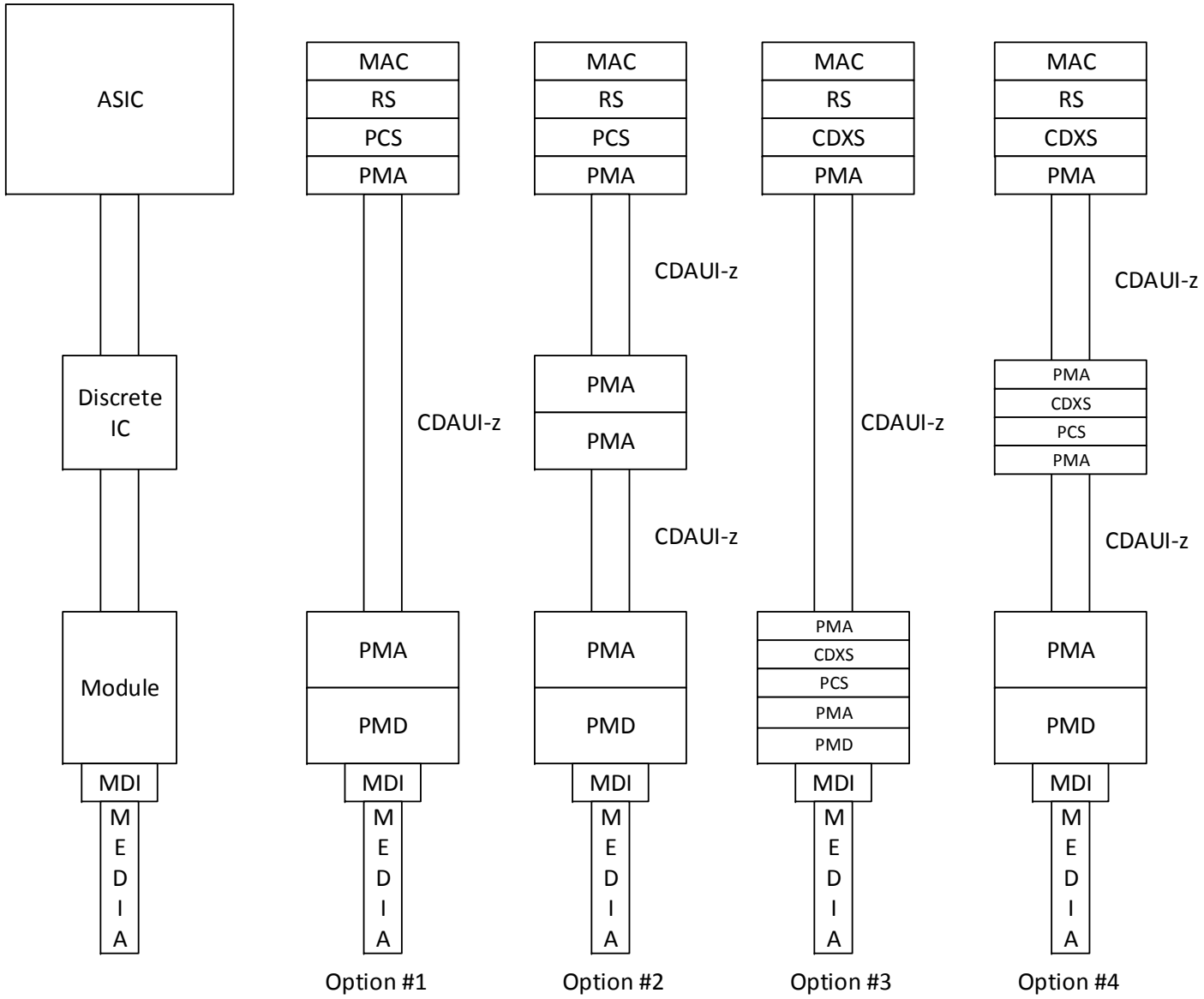


Initial Proposal

Updated Proposal

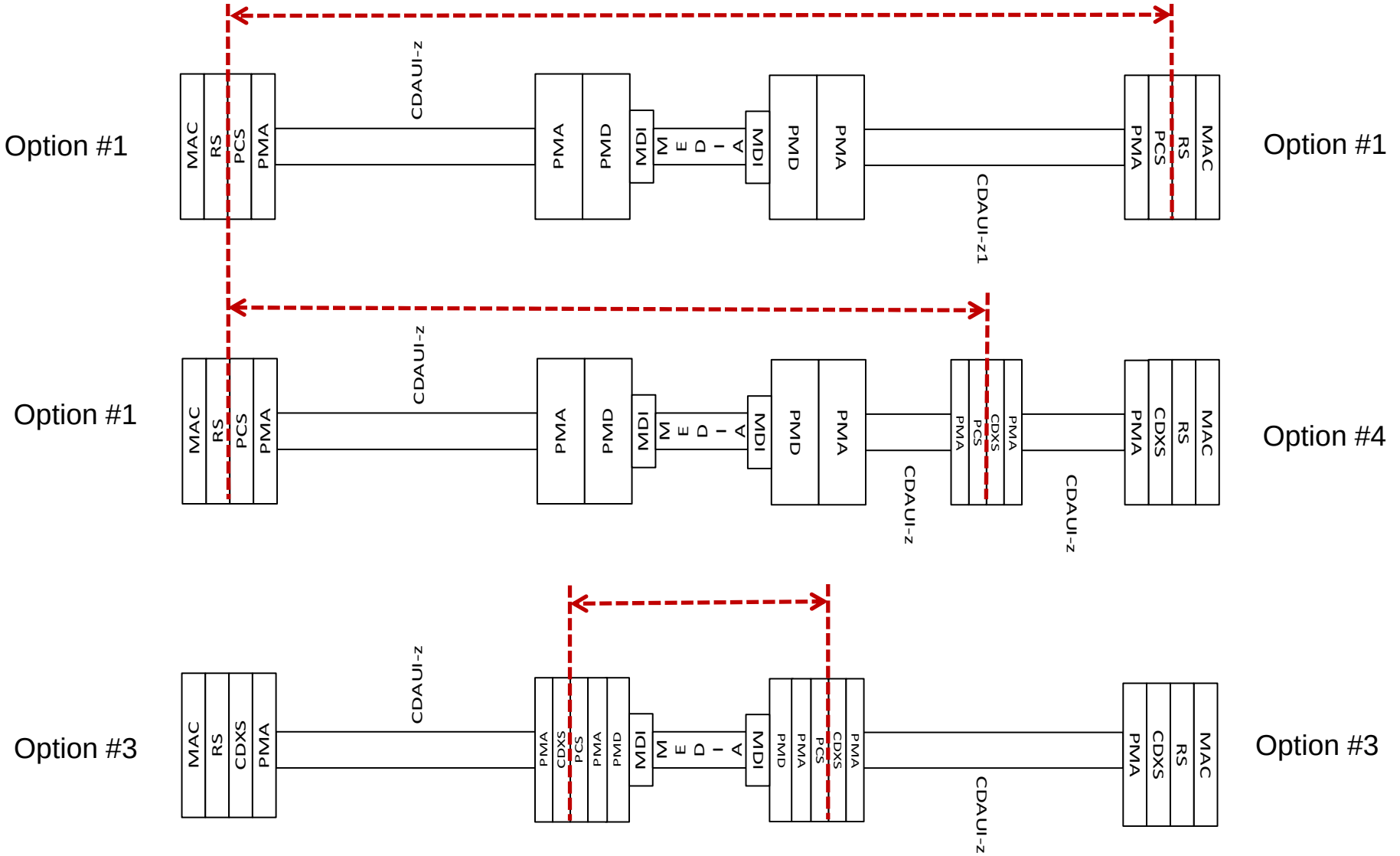
*** Note - Same as PCS (including FEC) to be defined.**

400GbE Example Implementations



"z" may be different for various interfaces cited for CDAUI

Leveraging the Proposed Architecture



Thanks!