400/200GbE PCS Overview

Next-generation 200 Gb/s and 400 Gb/s MMF PHYs Study Group

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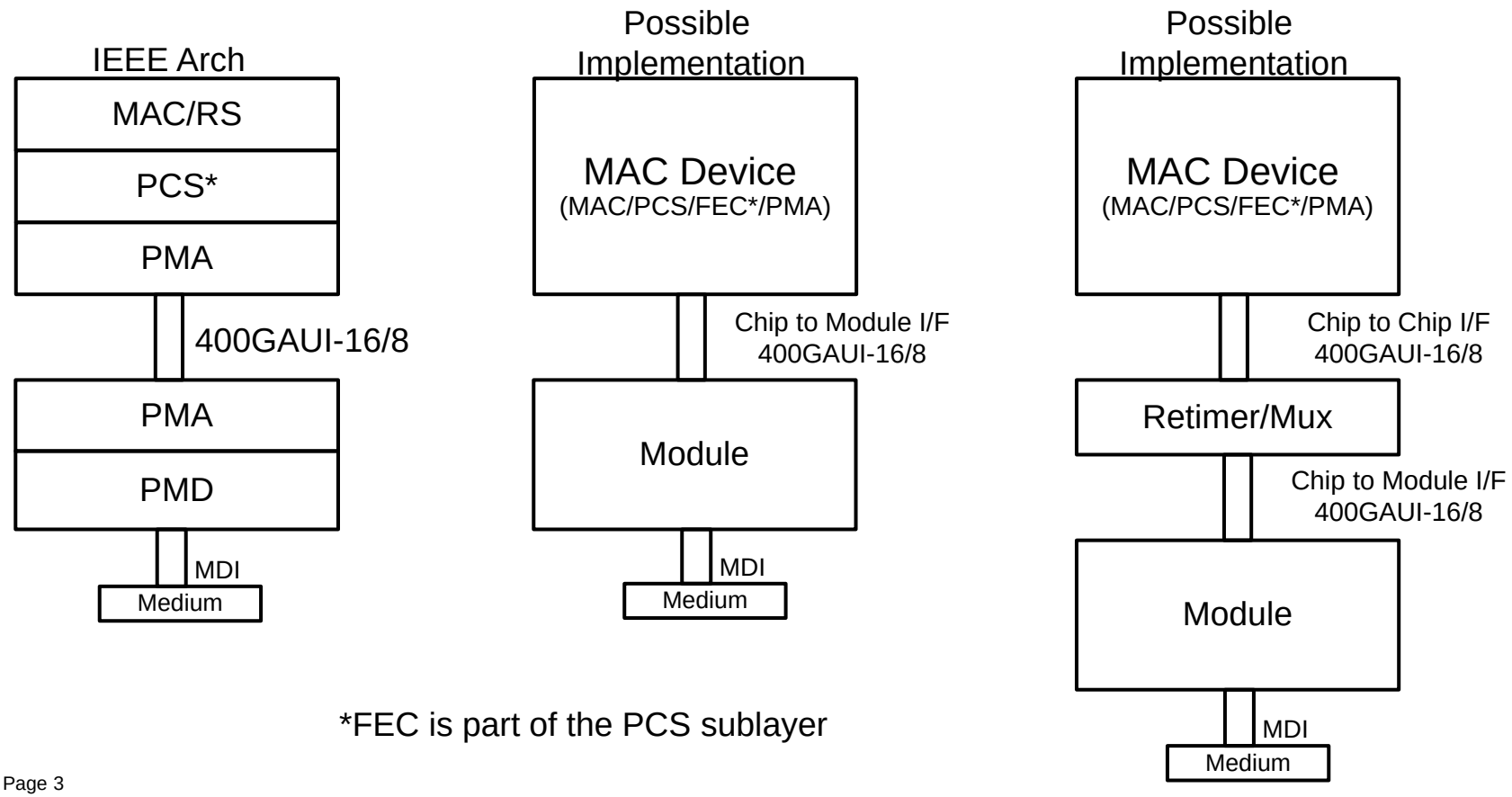
Introduction

- This describes the 802.3bs architecture and PCS structure for possible reuse by the Next Gen MMF PMDs

802.3bs Architecture

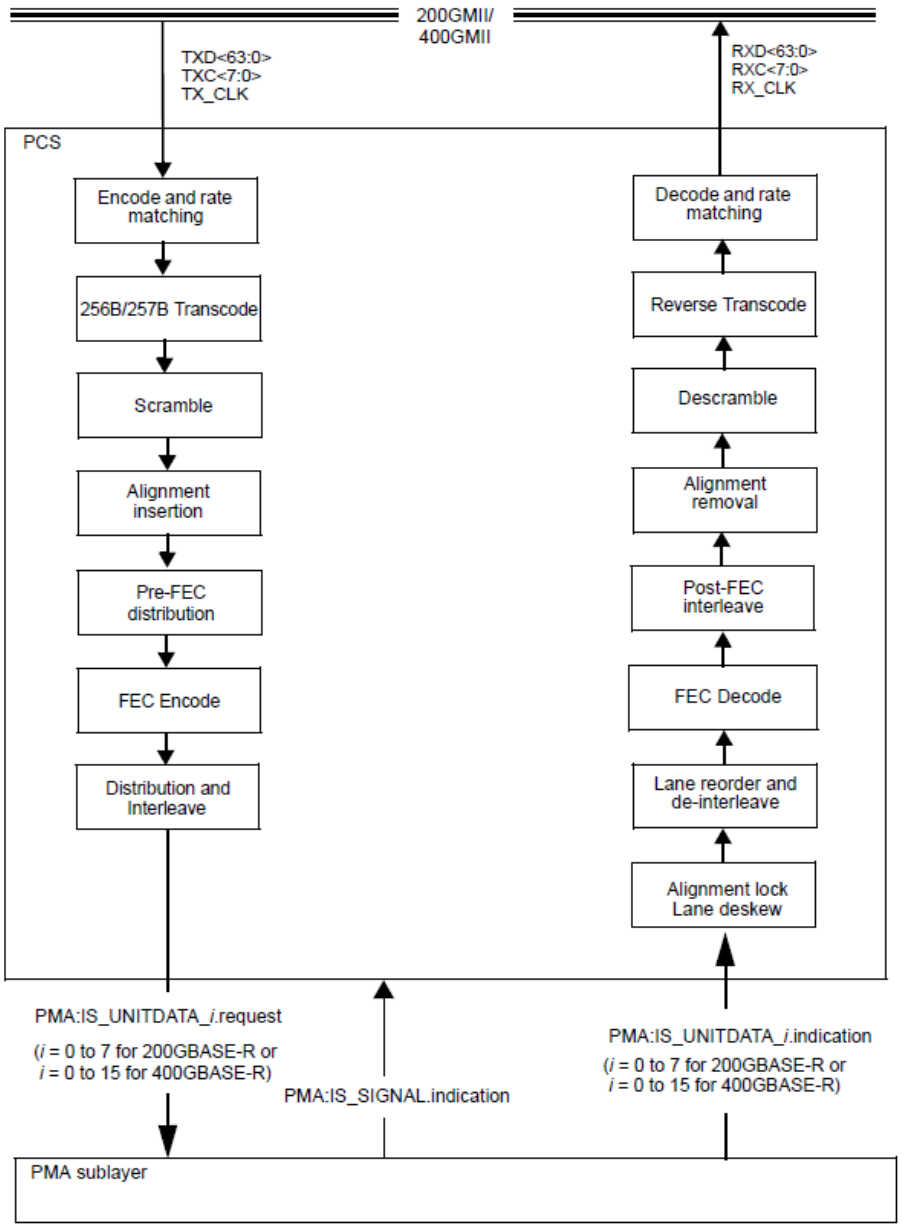
- Adopted architecture and possible implementations are shown below for 400GbE
  - 200GbE is identical except for # lanes and data rate
- A single FEC is used in the PCS sublayer, RS(544,514) aka KP4 FEC
- An extender sublayer is also defined



*FEC is part of the PCS sublayer

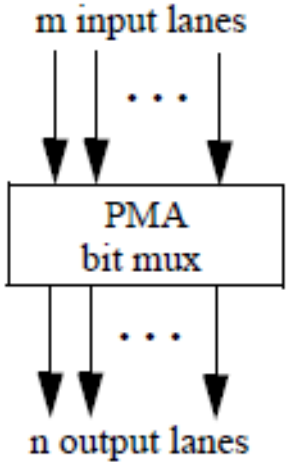
802.3bs PCS

- PCS processing flow is shown in the figure
- The PCS distributes data to 16 PCS lanes for 400GbE and 8 PCS lane for 200GbE



802.3bs PMA

- From a muxing point of view, the PMA is simple, m input lanes are bit muxed to n output lanes
- Bit muxing is blind, lanes can move around, the RX PCS sorts things out
- Clock content and baseline wander simulations have been performed for 1:1, 2:1 and 4:1 muxing scenarios



802.3bs Architecture Applicability to Next Gen MMF

- If it was decided to support 400GBASE-SR4.2 for instance:
  - You have 8 bit streams across the PMD
  - For a 400GAUI-8 you directly connect up electrical lane to optical ‘lane’
  - PCS lanes are 2:1 multiplexed onto each electrical and optical ‘lane’
- The existing 802.3bs BER budget is split out across AUI interfaces and the PMD budget
  - $1x10^{-5}$ for the AUI interfaces
  - $2.4x10^{-4}$ for the PMD interface
    - provided that the error statistics are sufficiently random that this results in a frame loss ratio (see 1.4.223) of less than 1.7×10^{-12} for 64-octet frames with minimum interpacket gap
  - The new PMD would need to match these requirements, if they do, then the current 802.3 architecture and PCS is directly applicable to this project
  - FEC block latency is ~25ns for 400GbE (2x for 200GbE)
    - Total FEC latency includes processing delays

Conclusion

- The 802.3bs architecture and PCS can be re-used if the next gen MMF PMDs meet the same BER requirements as the existing PHY solutions

Thanks!