

Architectural Support for 50 GbE and 100 GbE Breakout

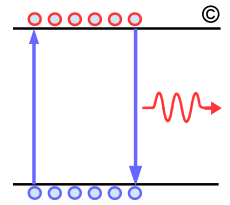
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IEEE 802.3cd Task Force Meeting

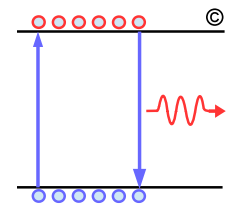
San Diego

July 26, 2016

Overview



- ❑ **Baseline PCS for 50 GbE and NG 100 GbE adopted in Whistler**
 - http://www.ieee802.org/3/cd/public/May16/nicholl_3cd_01a_0516.pdf
 - Leveraging CL82 40 GbE for 50 GbE having 4 PCS lanes
 - Leveraging CL82 100 GbE PCS for NG 100 GbE having 20 PCS lanes
 - Adopted PCS's are compatible with P802.3bs architecture and supports both 25G and 50G IO
- ❑ **In Whistler we didn't make a decision on # FEC lanes or distribution to further study the burst error not using the P802.3bs interleaved FEC**
 - TX differential pre-coding was investigated for 50 Gb/s link
 - http://www.ieee802.org/3/cd/public/adhoc/archive/hegde_070616_3cd_01_adhoc.pdf
 - RS(544,514) FEC performance with pre-coding and bit/symbol were investigated
 - http://www.ieee802.org/3/cd/public/adhoc/archive/anslow_070616_3cd_01_adhoc.pdf
 - TX differential pre-coding helps burst error on links with large dominant 1st tap allowing to build a PMA supporting bit-mux and compatible with P802.3bs
 - A PMA supporting bit mux is key to building common ports/modules and breakout applications
- ❑ **In this contribution the need to support 25G FEC lanes in support of breakout applications will be discussed.**



Supporting Breakout Applications

❑ QSFP56 – 4x50G (200 GbE)

- 2x100 GbE
- 4x50 GbE

❑ QSFP-DD – 8x25G (200 GbE)

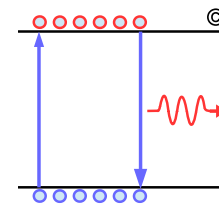
- 2x100 GbE
- 4x50 GbE
- 8x25 GbE (in the time frame not likely application)

❑ CFP8 – 16x25G (400 GbE)

- 2x200 GbE
- 4x100 GbE
- 8x50 GbE
- 16x25 GbE (in the time frame not likely application)

❑ Next will examine architectural requirement to support breakout.

Supporting Breakout in CFP8

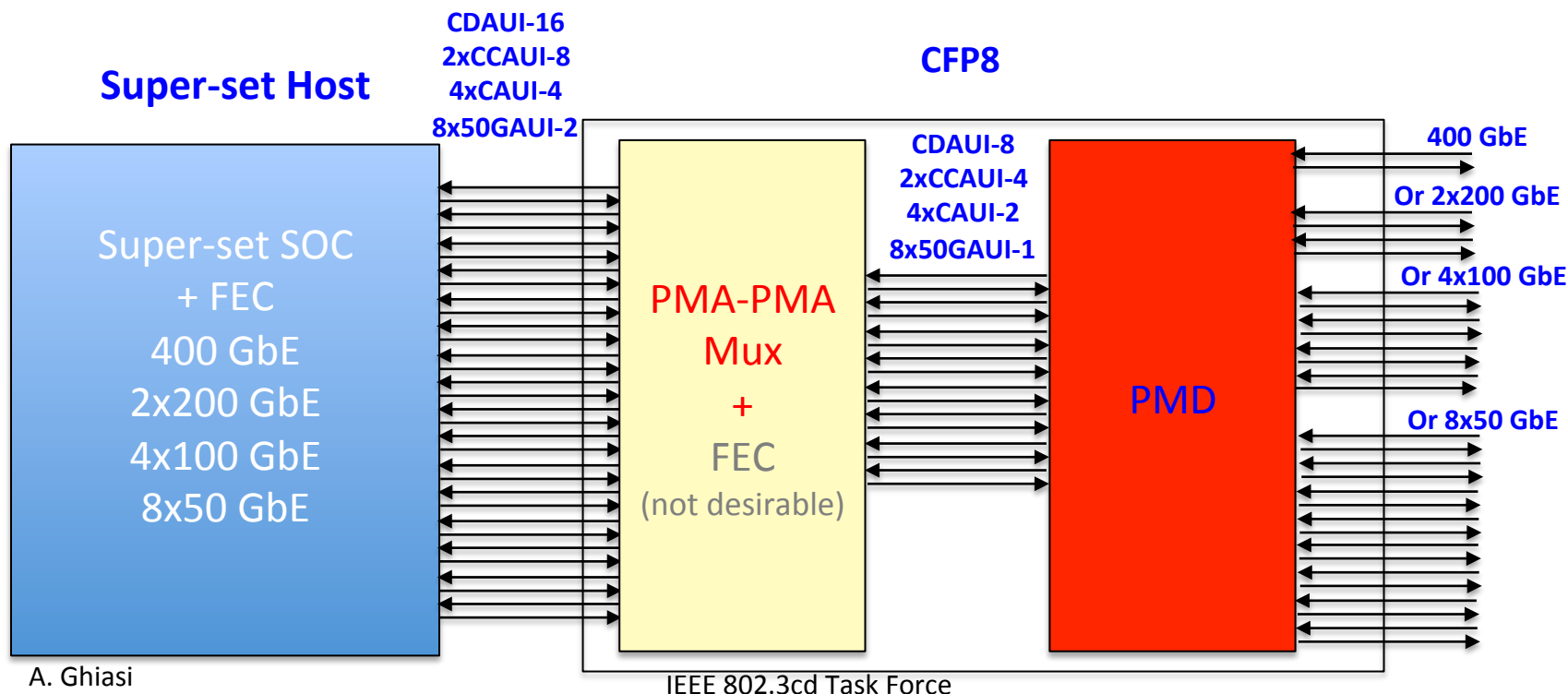


❑ PCS baseline already supports 25G PCS lane ✓

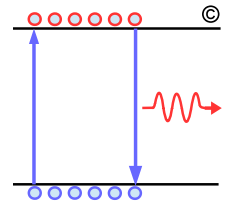
– http://www.ieee802.org/3/cd/public/May16/nicholl_3cd_01a_0516.pdf

❑ FEC also needs to support 25G FEC lane

- Currently 200 GbE/400 GbE support 25G FEC lanes and allow implementing FEC into 25G IO host ASIC
- Unless 50 GbE and NG 100 GbE supports 25G FEC lane then FEC is forced into the CFP8 module resulting in more complex module
- FEC architecture recommended to support 25G FEC lanes in support of breakout application, flexibility, compatibility with BS, and allow FEC to reside on host ASIC or in the PMA-PMA chip.



Supporting Breakout in QSFP-DD

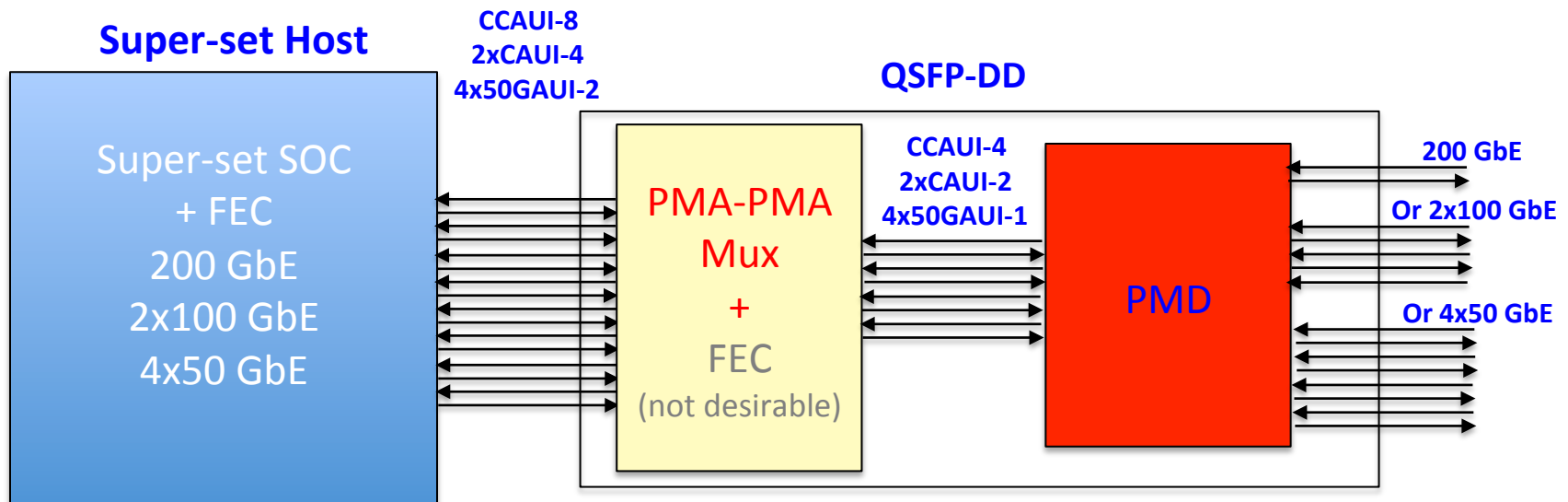


☐ PCS baseline already supports 25G PCS lane ✓

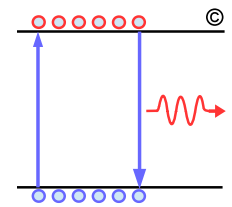
- http://www.ieee802.org/3/cd/public/May16/nicholl_3cd_01a_0516.pdf

☐ FEC also needs to support 25G FEC lane

- Currently 200 GbE/400 GbE support 25G FEC lanes allow implementing FEC into 25G host ASIC
- Unless 50 GbE and NG 100 GbE supports 25G FEC lanes then FEC is forced into the QSFP-DD module resulting in more complex module and possibly exceeding QSFP-DD power envelope
- FEC architecture recommended to support 25G FEC lanes in support of breakout application, flexibility, compatibility with BS, and allow FEC to reside on host ASIC or in the PMA-PMA chip.



Supporting Breakout in QSFP56

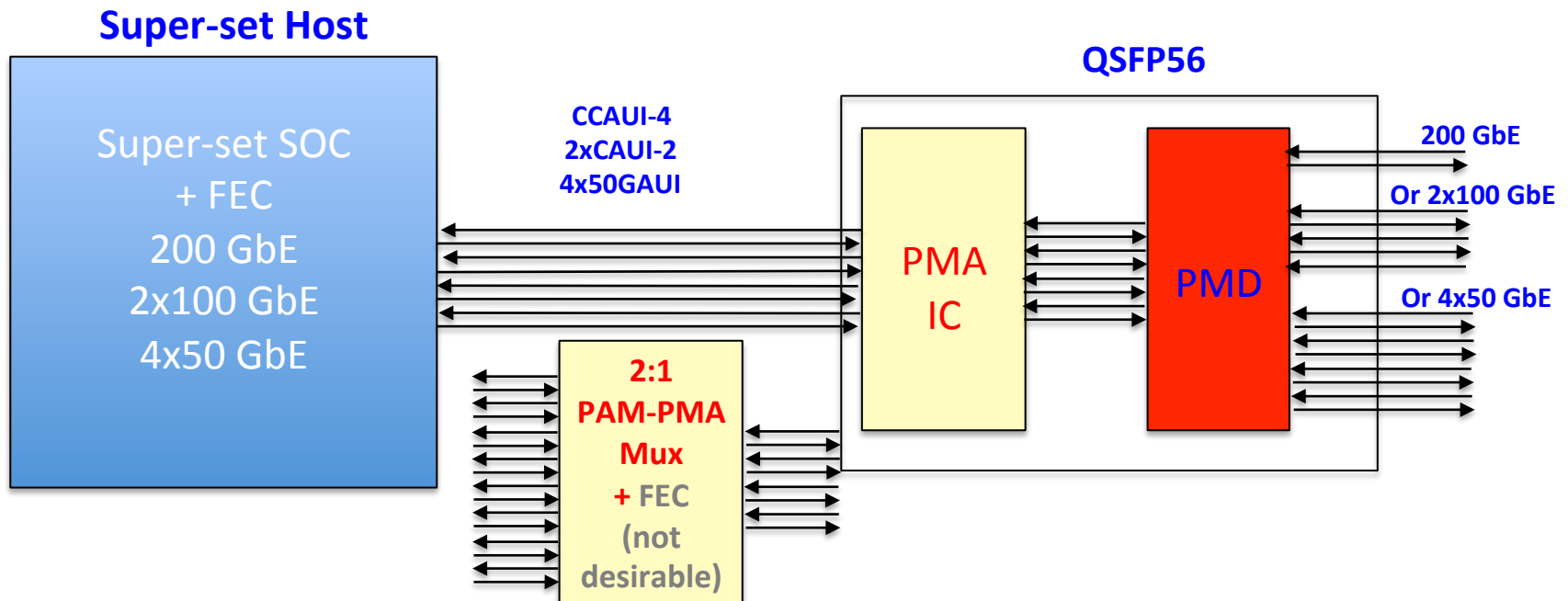


❑ PCS baseline already supports 25G PCS lane ✓

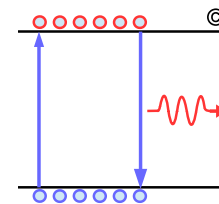
– http://www.ieee802.org/3/cd/public/May16/nicholl_3cd_01a_0516.pdf

❑ QSFP56 having native 50G IO is designed to operate with native 50G host IO but early ASIC implementation may require 2:1 PMA-PMA mux

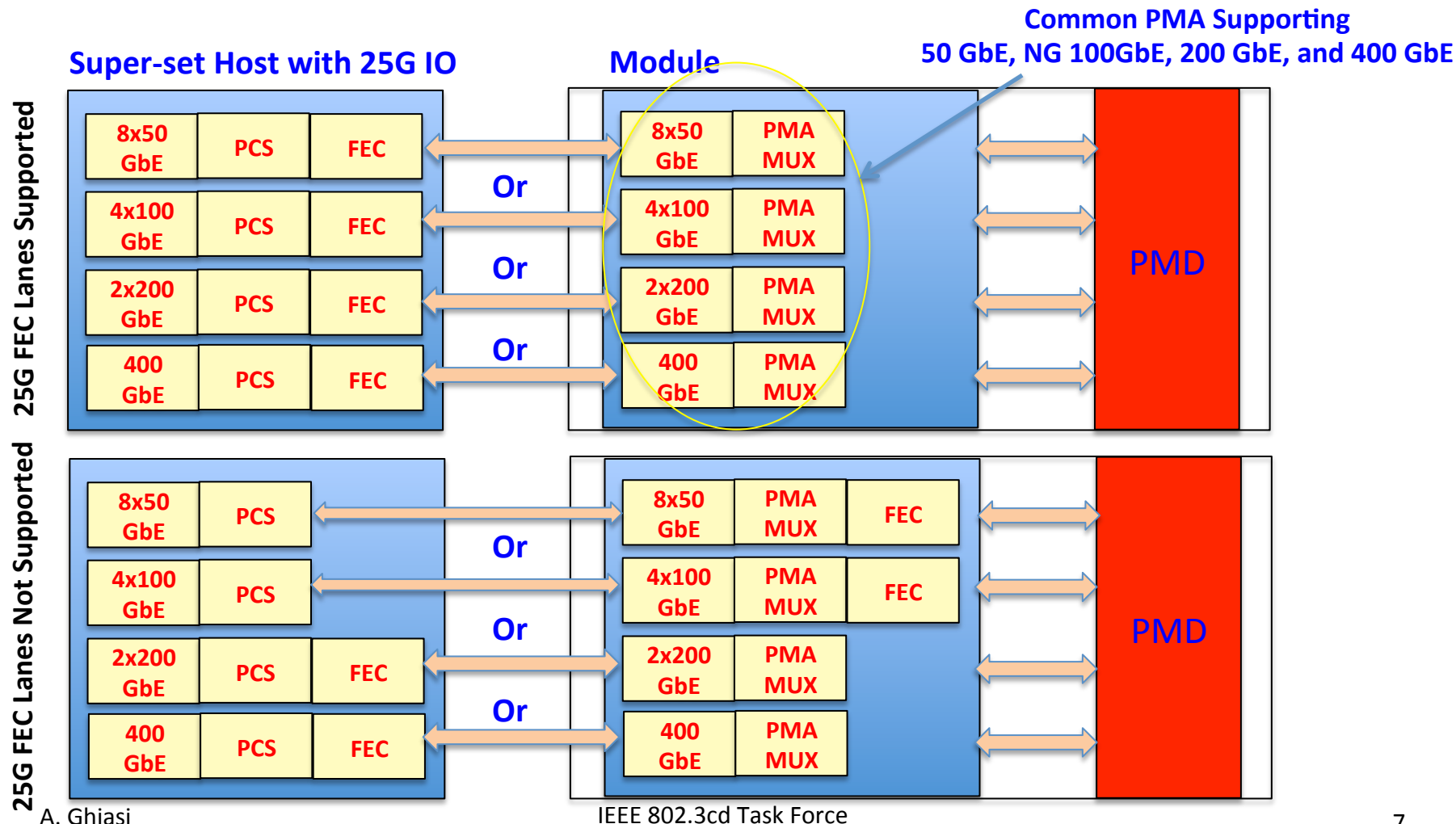
- Currently 200 GbE/400 GbE support 25G FEC lanes and allow implementing FEC into 25G host ASIC
- Any 2:1 PMA-PMA mux/FEC on the line card it will not add complexity or power to the QSFP56
- FEC architecture supporting 25G FEC lanes provide benefit even in this scenario by allowing optimizing the implementation based on availability host ASIC/FPGA and PMA-PMA Mux.



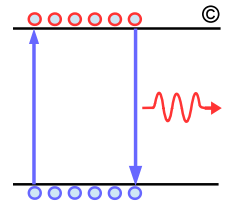
Supporting Breakout



- ❑ In addition to the PCS supporting 25G lanes for ease of implementation FEC needs to support 25G lanes as well!



Summary



- ❑ **Commonality of PMA and where possible PMD with 802.3bs allow broadest set of breakout applications**
 - 50 GbE will be most common breakout from 200G ports
 - 100 GbE will be the most common breakout from 400G ports
- ❑ **Adhoc investigation of (544,514) FEC with differential pre-coding indicate PMA bit mux can be support on non-interleaved 50 GbE/NG 100 GbE allowing to build common PMA/module supporting P802.3bs applications**
- ❑ **The 50 GbE and NG 100 GbE PCS supports 25 PCS lane which allow early implementation as well as more efficient 2nd generation implementations based on 50G IO**
- ❑ **Recommend FEC to also support 25 FEC lane for compatibility with P802.3bs and allow breakout application using a common PMA IC without the need to force FEC into the module.**