

100GbE Optics Evolution

IEEE 802.3bm

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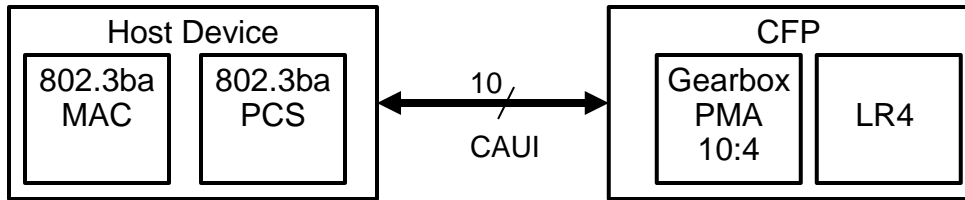
Introduction

- The following slides take a look at possible evolutions of optical modules and electrical interfaces and any interactions with the 802.3ba/bj architectures
- Evolving electrical or optical interfaces is complicated and we should think about it ahead of time and try to avoid as many future complexities that we can
- Note that in the following slides any mention of 802.3bj RS-FEC assumes the FEC used for the NRZ PHY within 802.3bj
- Any mention of a 802.3bj PMA means it is a PMA that multiplexes on Reed Solomon boundaries (10 bit symbols), a 802.3ba PMA bit multiplexes for comparison
- There are many possible future implementations, including functionality split between host ASIC, external gearbox etc; optics form factors and names. This does not try to show all possible options or permutations! Also, many things shown might never be implemented.

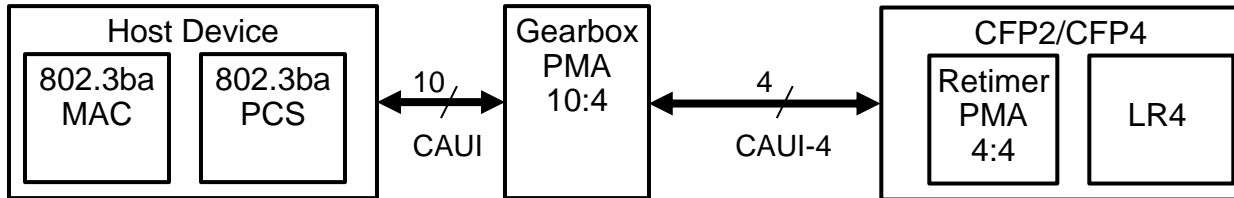
LR4 Evolution

- Note that the CAUI-4 electrical budget must be closed without FEC since no FEC is used on the LR4 optical interface

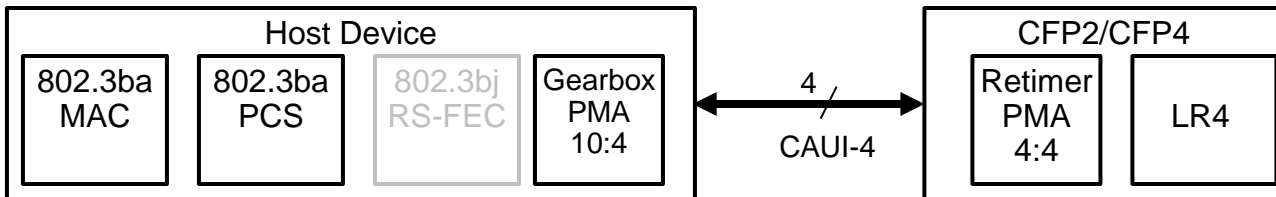
Notes



Today

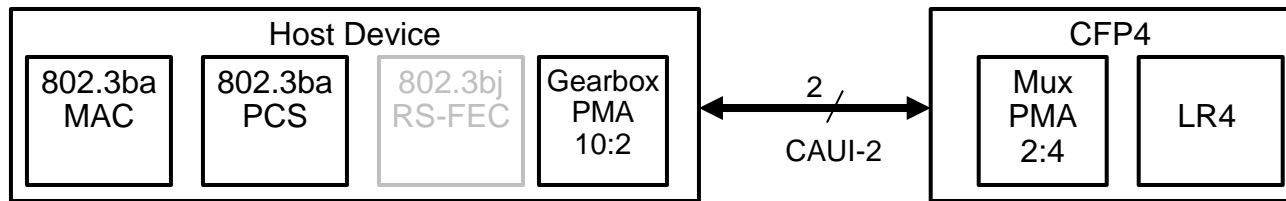


Soon



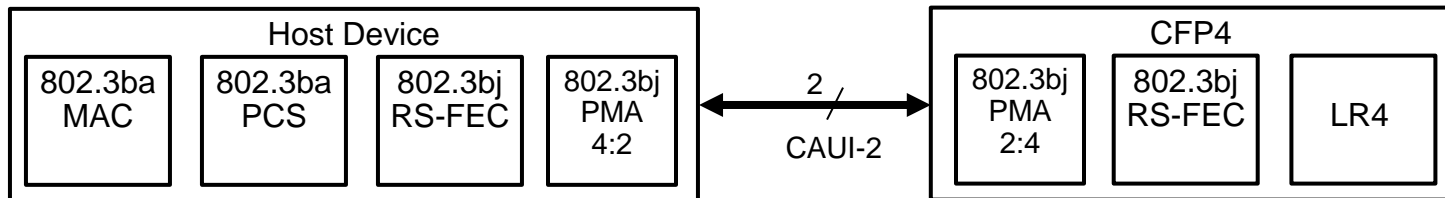
Future

LR4 Evolution – Long Term Alternatives



Notes

If FEC is not needed for the 50G electrical I/F

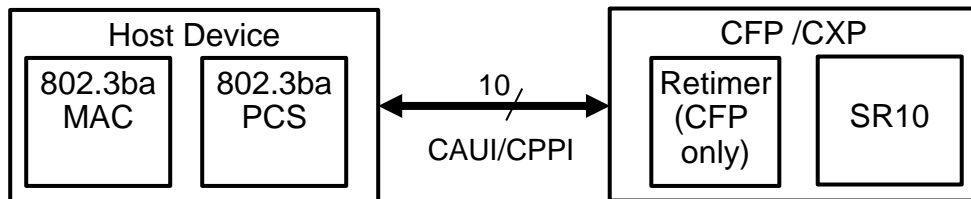


If FEC is needed for the 50G electrical I/F

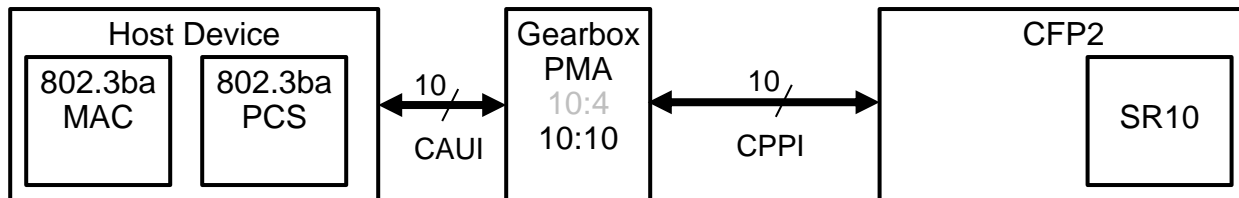
CAUI-2 might first be implemented with an external gearbox device

SR10 Evolution

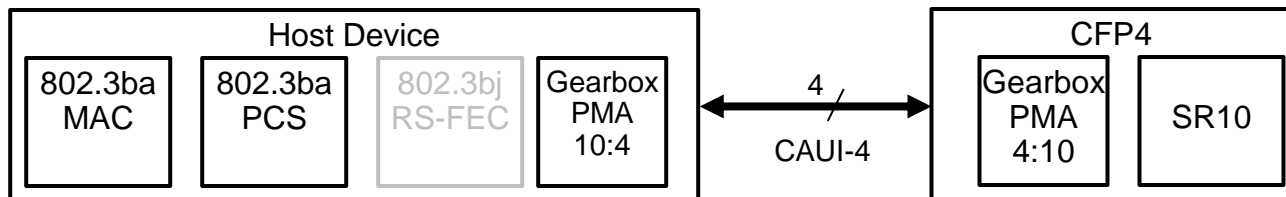
Notes



Today

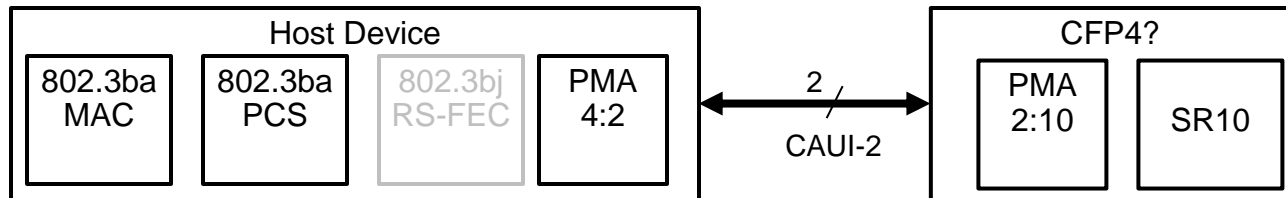


Soon



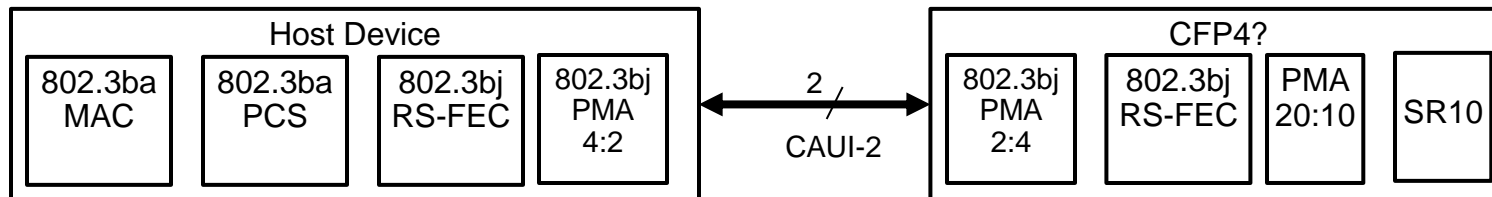
Future

SR10 Evolution – Long Term Alternatives



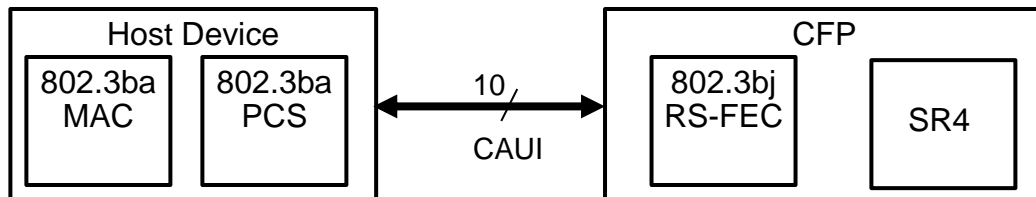
Notes

If FEC is not needed for the 50G electrical I/F



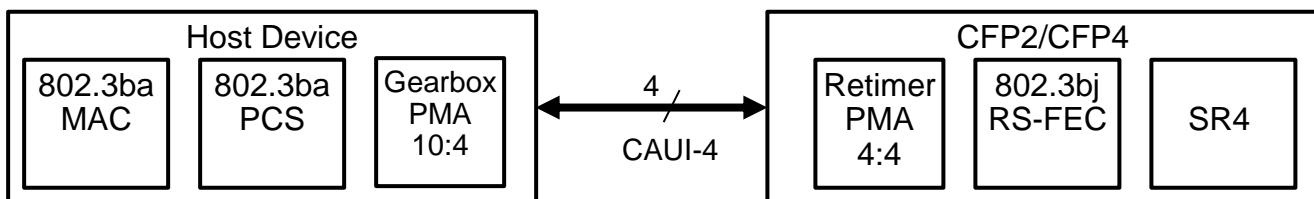
If FEC is needed for the 50G electrical I/F

SR4 -100m Evolution

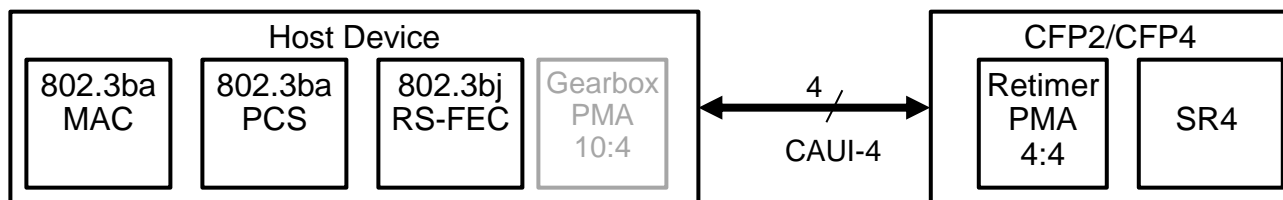


Notes

Legacy host



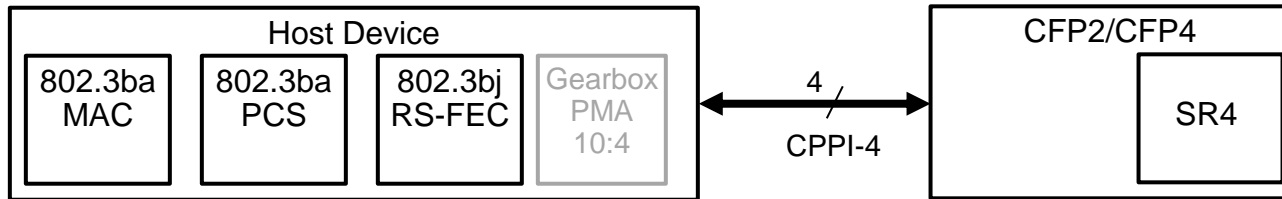
Module based FEC
FEC could be by-passable



Host based FEC

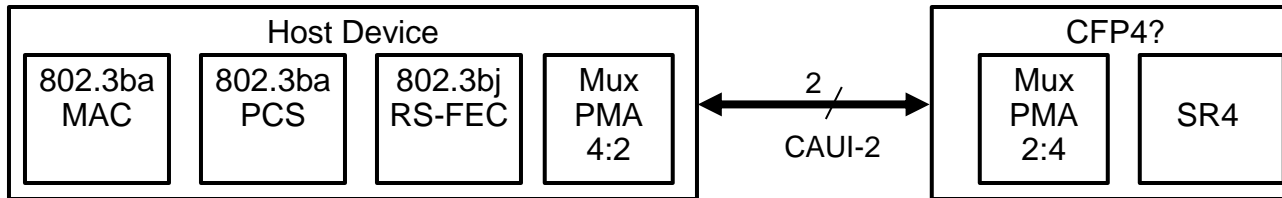
Notes: PSM4 has this same evolution
Assumes that 802.3bj FEC is needed to support 100m

SR4 -100m Evolution – Long Term Alternatives

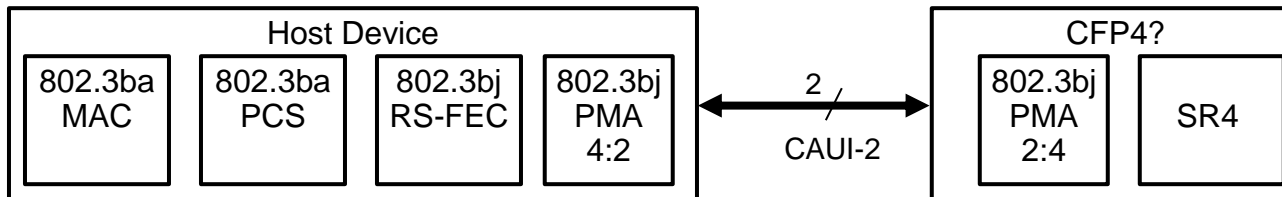


Notes

Degradation due to CPPI-4 Interface must be included in end-to-end budget

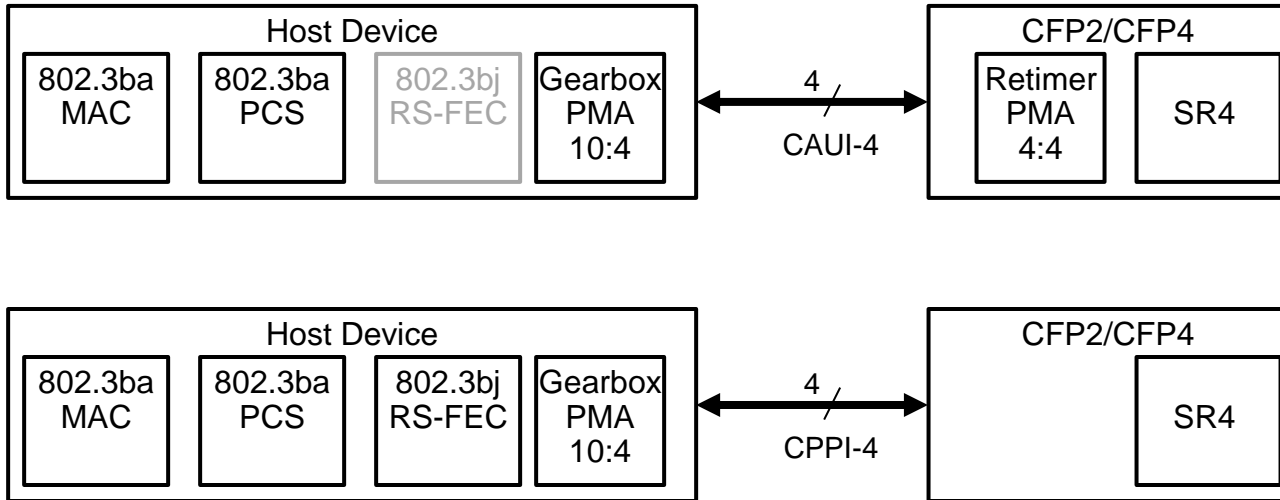


If FEC is not needed for the 50G electrical I/F



If FEC is needed for the 50G electrical I/F. Errors due to electrical I/F must be << errors due to optical I/F or included in budget.

SR4 - 20m Evolution



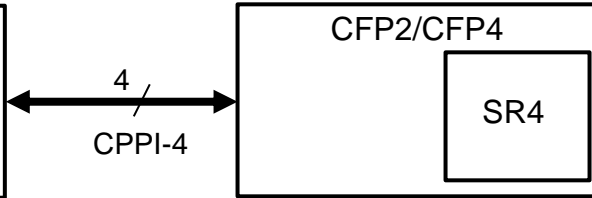
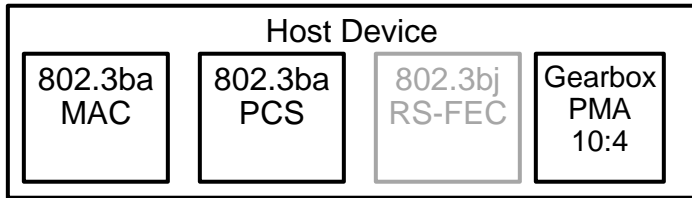
Notes

Retimed I/F

If FEC is required for the CPPI-4 and the 20m PMD combination. Are we ok with the latency and always have FEC enabled?

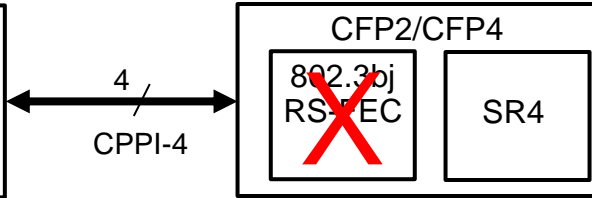
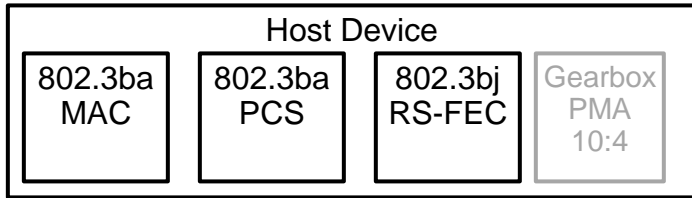
SR4 - 20m Evolution – Long Term Alternatives

Notes



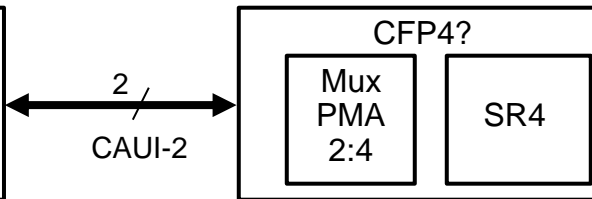
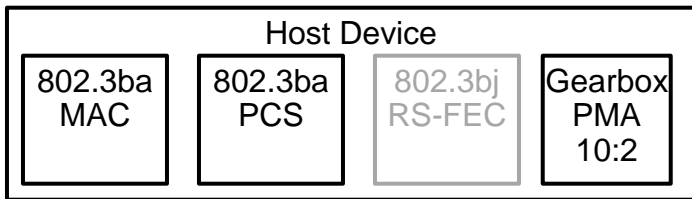
4 / CPPI-4

Assuming no FEC is needed for a CPPI-4 I/F



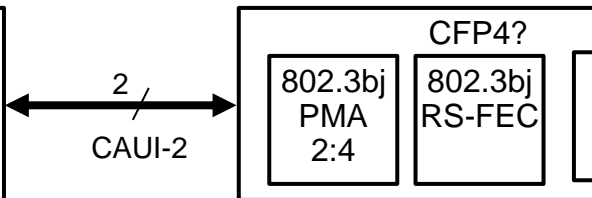
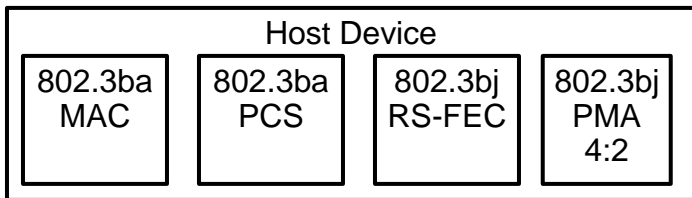
4 / CPPI-4

If FEC is required for the CPPI-4 and the 20m PMD does not require FEC for the optical span, then this is not supportable, it would be a CAUI-4!



2 / CAUI-2

If FEC is not needed for the 50G electrical I/F

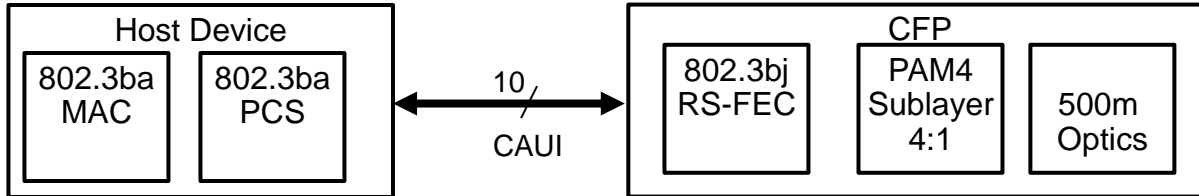


2 / CAUI-2

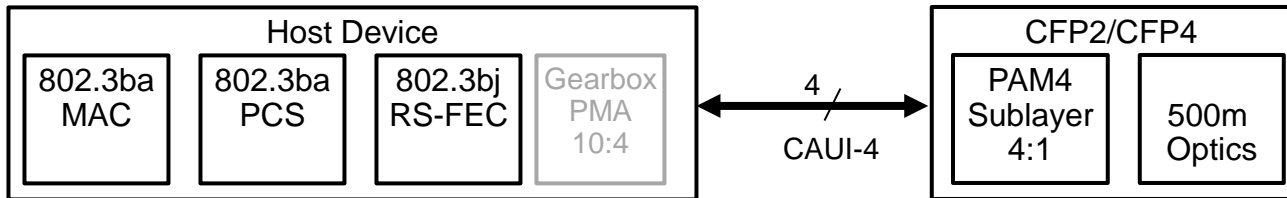
If FEC is needed for the 50G electrical I/F.

PAM4 PMD Evolution

Notes



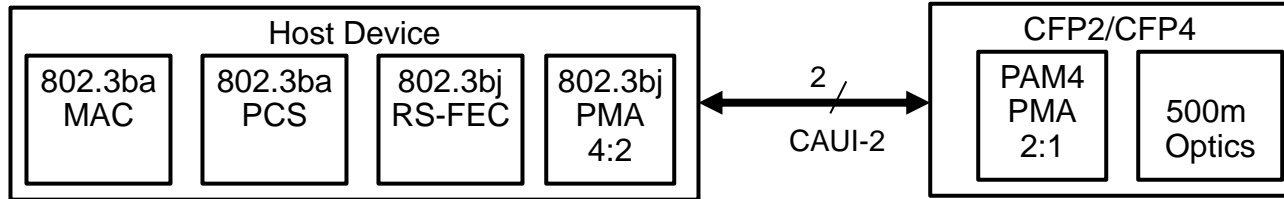
Legacy host



Near Future

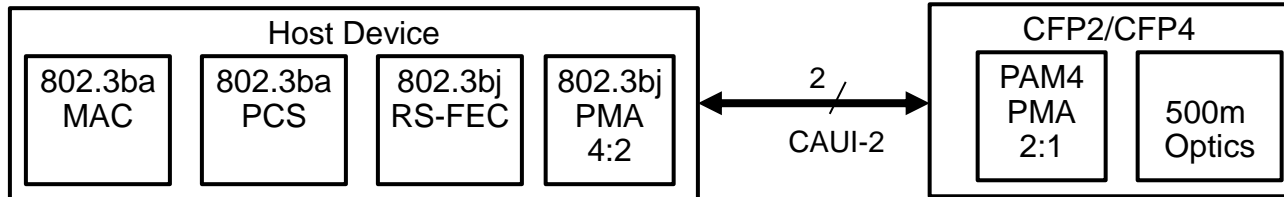
Note: It is not clear yet if 802.3bj FEC is sufficient for this PMD

PAM4 PMD Evolution – Long Term Alternatives



Notes

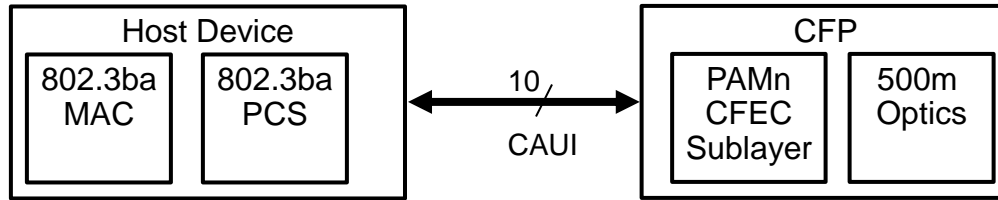
If FEC is not needed for the 50G electrical I/F



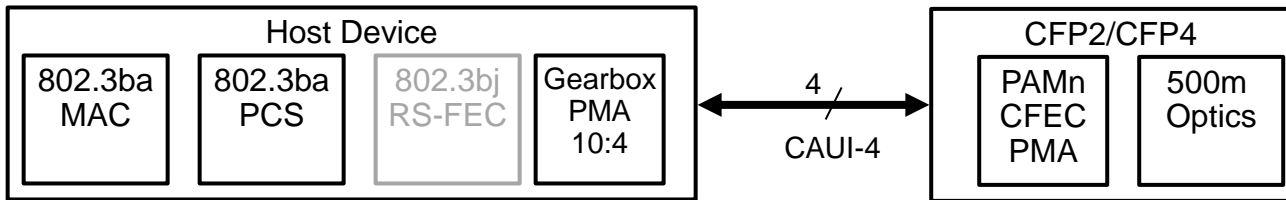
If FEC is needed for the 50G electrical I/F. Errors due to electrical I/F must be << errors due to optical I/F or included in budget.

PAM8/16 or other Complex Modulation PMD Evolution

Notes



Legacy host

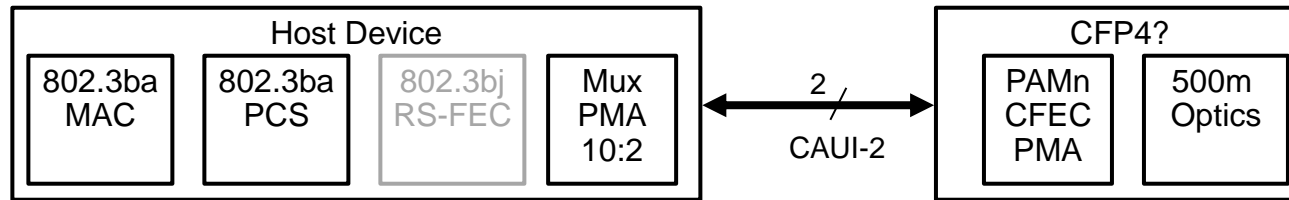


Near Future

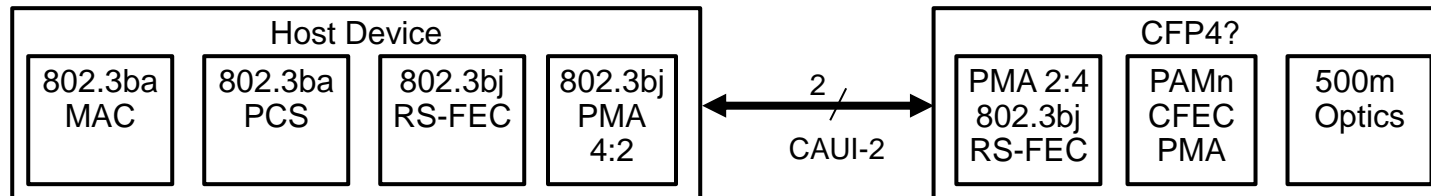
PAM8/16 or other Complex Modulation PMD Evolution

Long Term Alternatives :

Notes

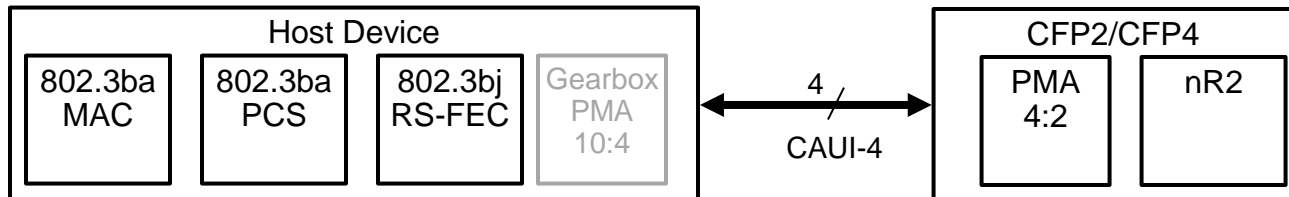


If FEC is not needed for the 50G electrical I/F



If FEC is needed for the 50G electrical I/F.

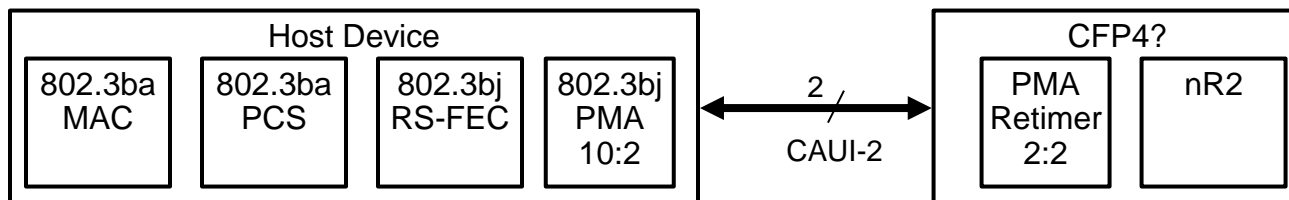
nR2 PMD Evolution



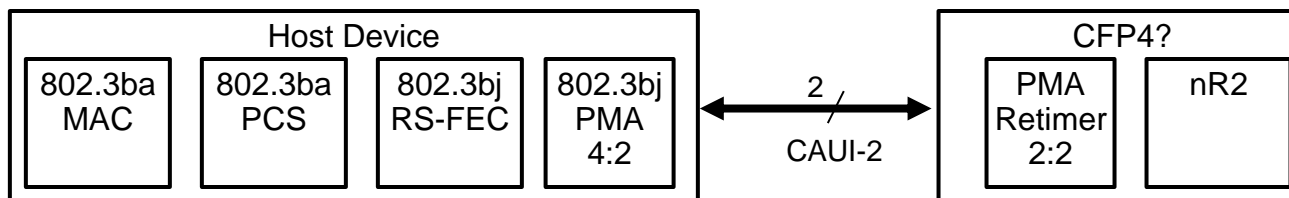
Notes

Assumes nR2 is defined to always use RS-FEC

Long Term Alternatives :



If FEC is not needed for the 50G electrical I/F



If FEC is needed for the 50G electrical I/F. Errors due to electrical I/F must be << errors due to optical I/F or included in budget.

Summary

- One common issue we need to worry about is will future electrical (chip to module) interfaces require FEC?
 - Examples are a 2x50G interface or a CPPI-4 interface
 - If they do, what do we need to do about it today?
 - Reserve some 802.3bj FEC gain for them?
 - But how much and what is the impact to the optics?
 - Not an issue as long as errors due to electrical I/F \ll errors due to optical I/F
- It is very likely that a 802.3bj PMA will be needed in the future, but it is not needed in 802.3bj or 802.3bm so far
 - So when to specify it?
 - Proposal is to specify it when we need it

Thanks!