Extensible Architecture for NG-EPON

Feasibility

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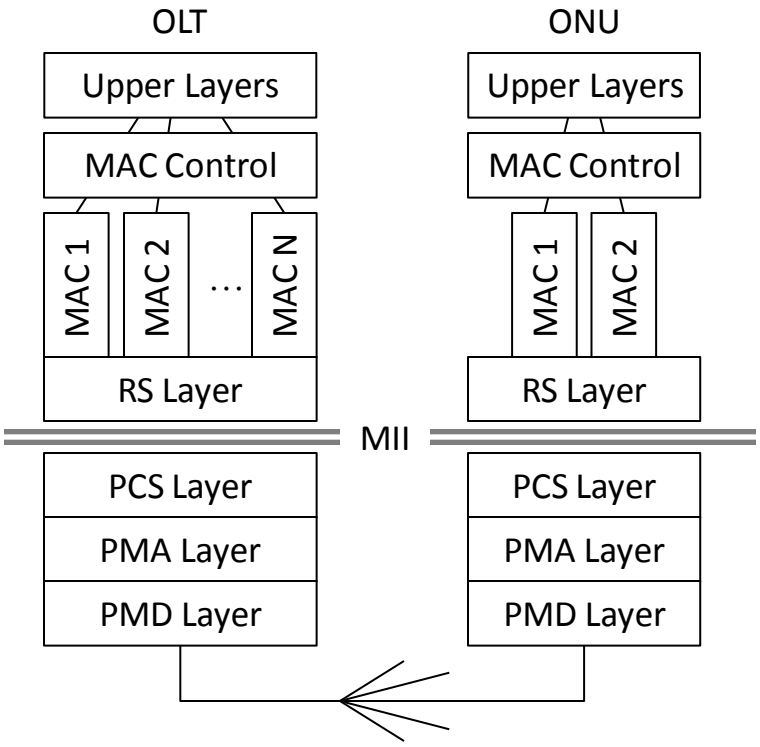
EPON Layers

- **If # MAC's = N then # ONUs = N-1**
  - Each ONU has two LLIDs that it listens to;
    - **One Unicast <or> Broadcast and**
    - **One default Broadcast**
- **All MACs handle one and only one LLID**
- **An ONU implementation may serve multiple "virtual" ONUs but this is outside the standard.**

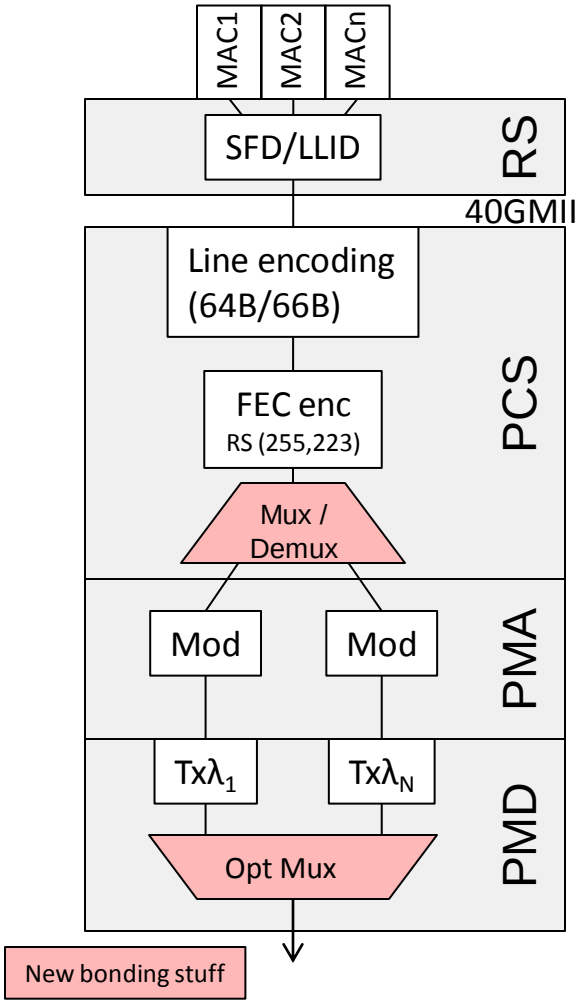


- **For EPON where is the optimal point for Channel Bonding?**

How & Where to bond

Option A

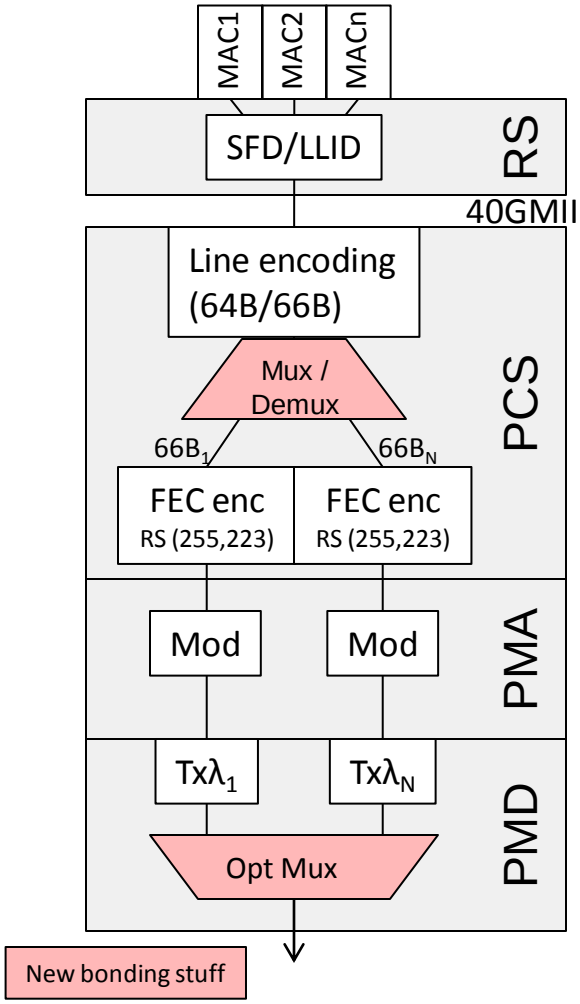
- **Stripe after FEC at bottom of PCS**
  - Difficult to align FEC CW?
    - **Would need a lane marker**
  - PCS must work at aggregate speed for all ONUs on the PON
    - **Layer violation to mux/demux stream for some LLIDs and not others – all ONUs on the bonded channels must be bonded**
    - **More than just a simple optics change out for 10G ONUs**



How & Where to bond

Option B

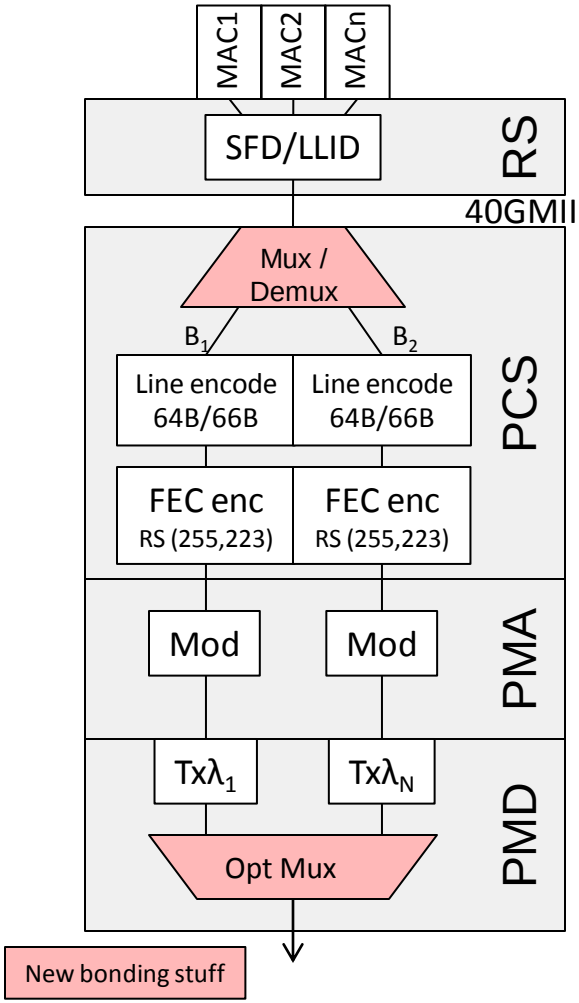
- **Stripe after 64B/66B coder before FEC**
  - What is done for 40/100G (see Cl 82)
    - **Includes a lane marker**
    - **Well known to 802.3 WG**
  - PCS must work at aggregate speed for all ONUs on the PON
    - **Layer violation to mux/demux stream for some LLIDs and not others – all ONUs on the bonded channels must be bonded**
    - **More than just a simple optics change out for 10G ONUs**



How & Where to bond

Option C

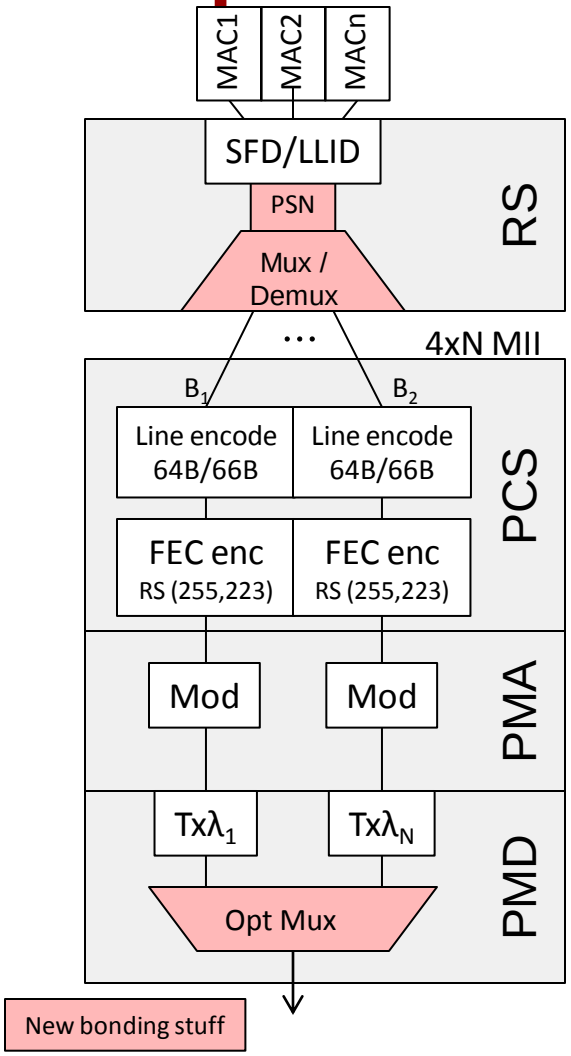
- **Stripe after MII before 64B/66B coder**
  - First operation in PCS
    - **Would need a lane marker**
  - PCS must work at aggregate speed for all ONUs on the PON
    - **Layer violation to mux/demux stream for some LLIDs and not others – all ONUs on the bonded channels must be bonded**
    - **More than just a simple optics change out for 10G ONUs**



How & Where to bond

Option D

- **Stripe in RS before MII**
  - PHY relatively unaffected
  - Compatibility
    - **Not all ONUs would need to support bonding**
    - **Bonded and non-bonded ONUs could coexist on the same ODN**
    - **Compatible with existing ONU PHYs**



Pros & Cons

Option	Pros	Cons
A – after FEC	• ??	• Non-standard • ONUs must be homogeneous
B – after 64B/66B	• Same as 100G (we steal)	• ONUs must be homogeneous • Requires lane markers
C – top of PCS	• ??	• Non-standard • ONUs must be homogeneous
D – in RS	• Can mix & match bonded & non-bonded ONUs • Compatible with 10G ONUs • Can bond PHYs with unequal rates • No additional overhead	• Delay looks like delay of slowest bonded channel • May need to adjust delay or accept large PDV • Required buffering in RS • Non-standard

Technical Feasibility

- **Conclusion**
  - There are several ways that channel bonding could be incorporated in NG-EPON
  - The Task Force will need to choose one and work out the details
- **Items to be considered in selecting a mechanism**
  - Simplicity
  - Efficiency
  - Backwards compatibility & coexistence

Thank you

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