

MII / XGMII options and their technical implications

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Motivation

- Different technical options for xMII are possible for 802.3dm
- This presentation identifies MII / XGMII options and evaluates the implications for the high-speed downstream (DS) and the low speed upstream (US) directions
- This presentation addresses resulting efforts for potential duplexing schemes
- This presentation is meant as a starting point to collect opinion and nourish further discussions

Content

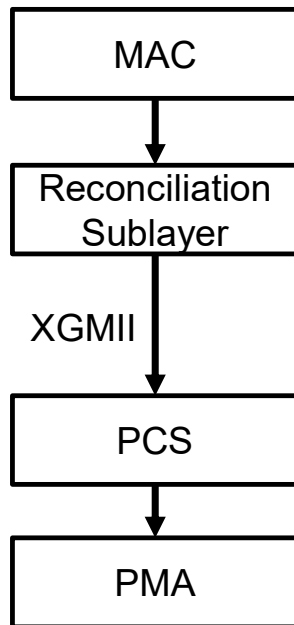
- References to contributions
- Overview of XGMII / MII Options
- Downstream direction xMII options
- Upstream direction xMII options
- XGMII rate management options
- Conclusion

References

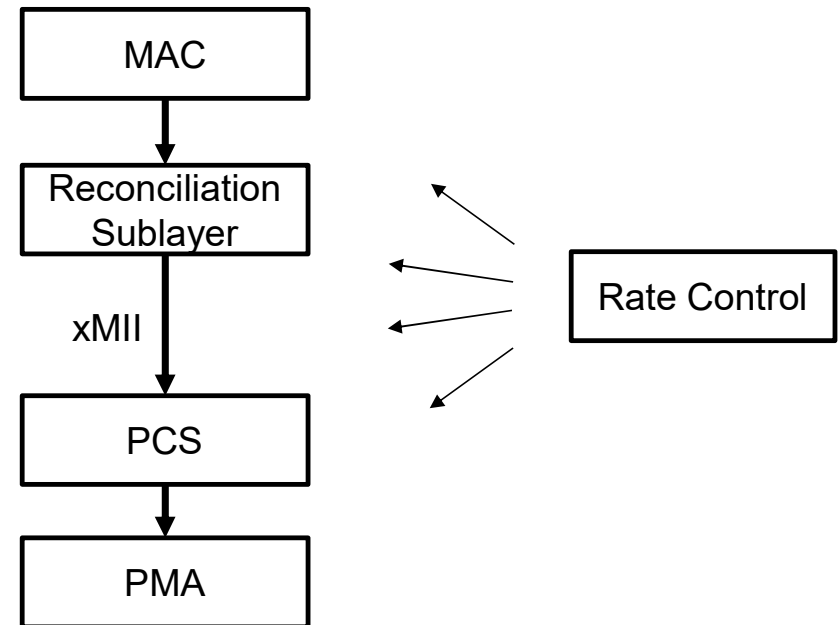
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- https://www.ieee802.org/3/ISAAC/public/082823/chini_dalmia_ISAAC_01_08282023.pdf

XGMII / MII Options

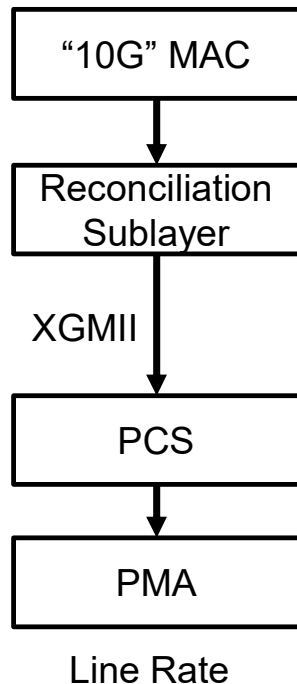
10 Gbps Egress (DS)



100 Mbps Egress (US)



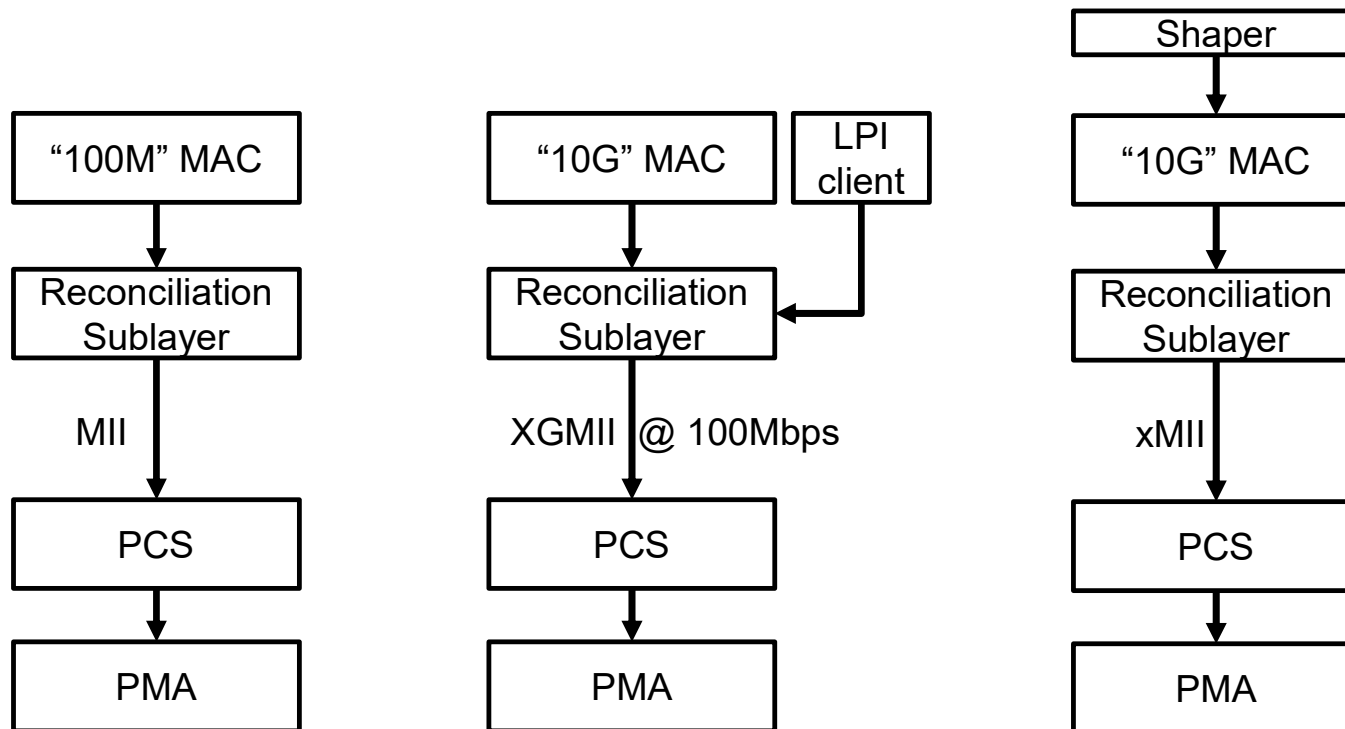
10 Gbps Egress Data Rate XGMII Case (DS)



- „Continuous“ data flow
 - Independent of physical layer duplexing scheme
 - Not flow controlled by PHY
- **no change to MAC**

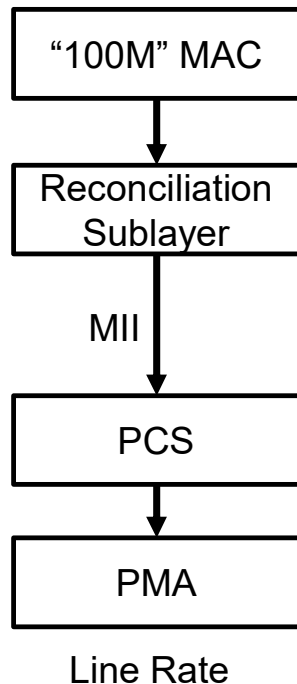
- Implied Buffer/FIFO in PCS
- PMA line rate is typically higher than data rate for all duplexing schemes
- Half Duplex line rate is typically somewhat higher than Full Duplex line rate
- FIFO is small and does not overflow

100 Mbps Egress XGMII / MII Options (US)



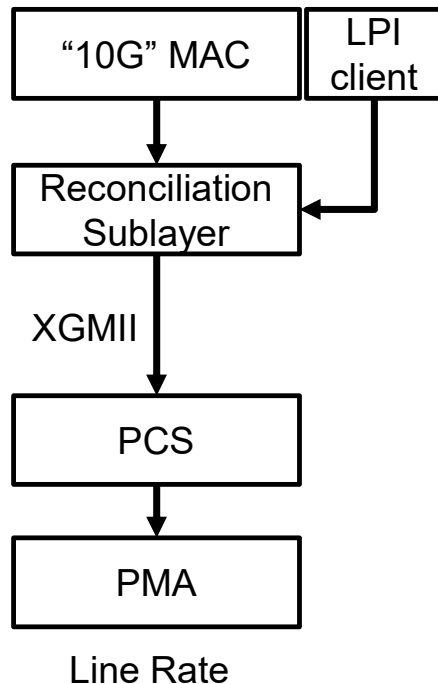
Other options ... ?

100 Mbps Egress Data Rate MII Case (US)



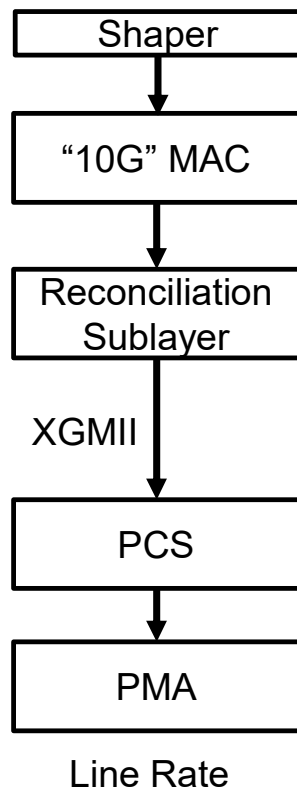
- „Continuous“ data flow @ 100Mbps
- Independent of physical layer duplexing scheme
- Not flow controlled by PHY
- **no change to MAC**
- RS “pulls” the bits from MAC at a rate of 100Mbps
- Implied Buffer/FIFO in PCS
- PMA line rate is typically higher than data rate for all duplexing schemes
- Half Duplex line rate is typically somewhat higher than Full Duplex line rate
- FIFO is small and does not overflow

100 Mbps Egress Data Rate XGMII Case (US)



- LPI client controls the flow to 100 Mbps average
- Average data flow @ 100Mbps
- Independent of physical layer duplexing scheme
- Controlled bursts @ 10Gbps
- Not flow controlled by PHY
- **no change to MAC**
- RS “pulls” the bits from MAC at an average rate of 100Mbps (controlled by LPI client)
- Implied Buffer/FIFO in PCS
- PMA line rate is typically higher than data rate for all duplexing schemes
- Half Duplex line rate is typically somewhat higher than Full Duplex line rate
- FIFO is small and does not overflow

100 Mbps Egress Data Rate Shaper Case (US)



- Shaper rate less or equal to 100Mbps
 - Average data flow @ 100Mbps (matching Shaper rate)
 - Independent of physical layer duplexing scheme
 - Controlled bursts @ 10Gbps
 - Not flow controlled by PHY
- **no change to MAC**
-
- Implied Buffer/FIFO in PCS
 - PMA line rate is typically higher than data rate for all duplexing schemes
 - Half Duplex line rate is typically somewhat higher than Full Duplex line rate
 - FIFO is small and does not overflow

XGMII and EEE LPI

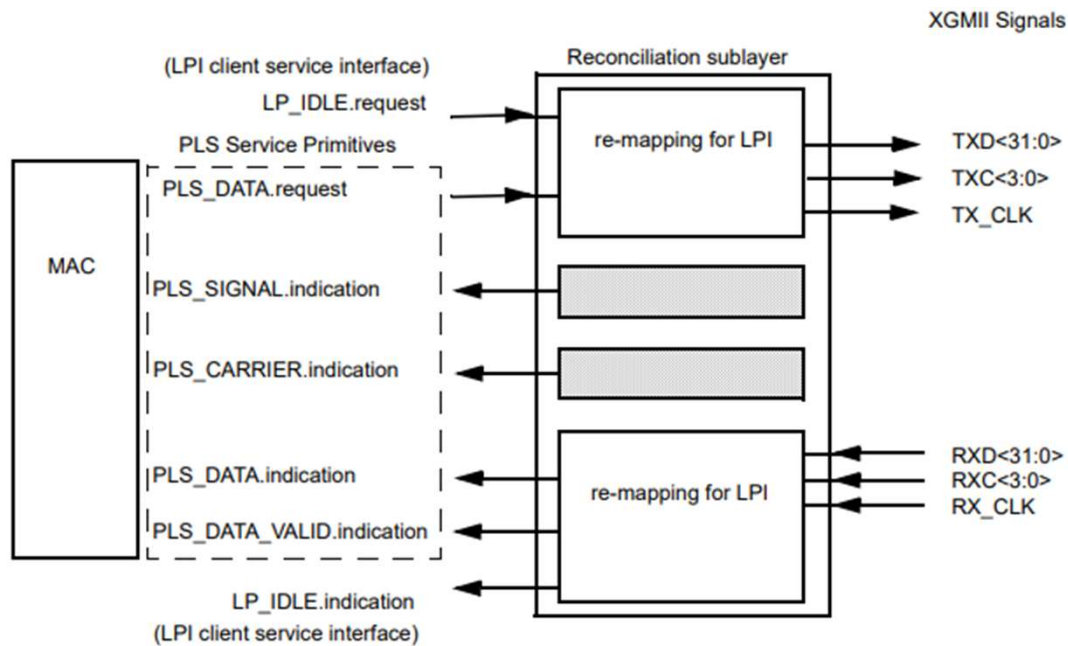
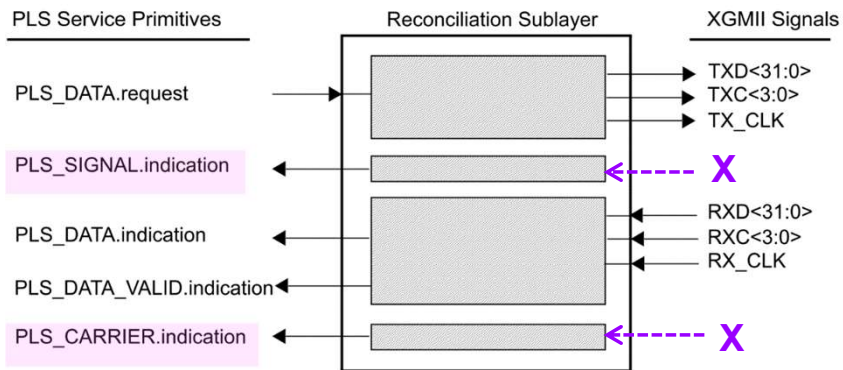


Figure 46-12—LPI assertion and detection mechanism

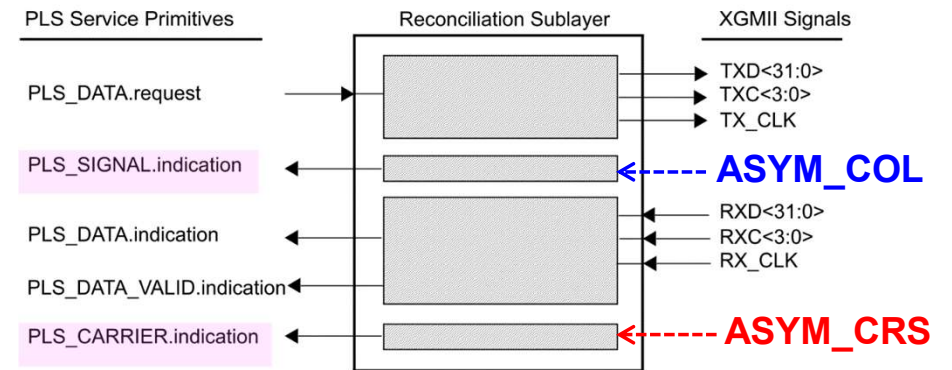
For an asymmetric PHY operation CARRIER.indication may be used to defer traffic when PHY is not immediately available (as in EEE for an example).

XGMII and asymmetric operation

RS I&O to XGMII



RS I&O to XGMII with ASYM mode



- Using CRS (Carrier Sense), COL (Collision Detection), and MAC handshake protocols in MII/GMII/XGMII to inform the MAC of the appropriate time to send packets.
- Utilize the MAC's packet buffer for transmission deferment (as the MAC already has a buffer for EEE, MACsec and flow control).
- No additional buffer needed for asymmetric operation.

Conclusion

- Different xMII options are possible for the low speed US traffic
- The discussed options for US were MII or XGMII
- In case of XGMII a rate management is needed to ensure the US traffic does not exceed the nominal rate.
- Only options were discussed that
 - Do not change the MAC and
 - Reuse existing mechanisms.
- Regarding effort, reusing existing parts and solutions means lower effort
 - Existing MACs and xMIIs can be re-used with new asymmetric PHYs
 - Existing EEE and LPI solutions as well as traffic shaping can be re-used for asymmetric operation
 - The utilization of COL and CRS signals may also be considered as solution for asymmetric operation with XGMII

Thank You!