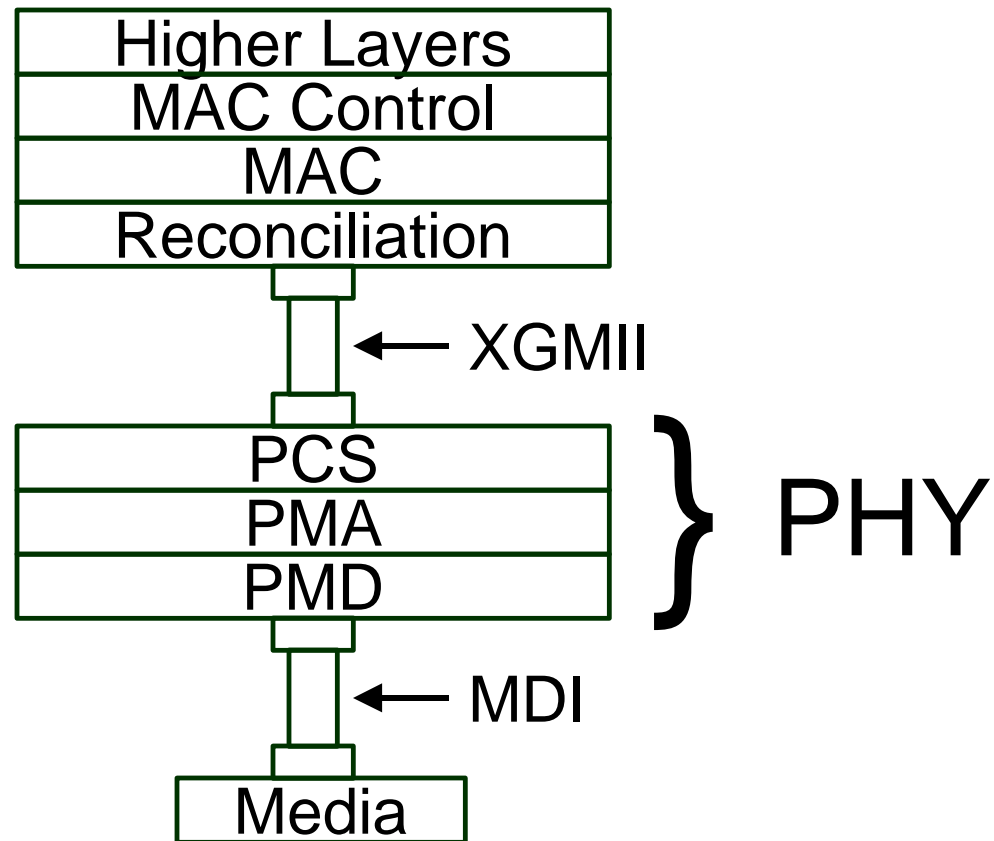


# 10 Gig PMD Technologies

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# Architectural Model



# PMD Evaluation Criteria

- Rate ability to meet broadest set of application & distance/fiber
- Relative cost comparison - short/long term
- Time to standardization, Time to market
- Qualitative Reliability (e.g. MTBF, etc.)
- Undetected frame error rate at the MAC client IF
- Working prototype of PHY available by completion of Sponsor Ballot (meets MDI specs)
- Multiple vendor supply available by completion of Sponsor Ballot

# Support for Multi Mode Fiber

- Strong desire to support MMF, both current installed base as well as new installations
- Three approaches have been proposed for 10 Gb/s multi mode fiber optic links
  - Serial solution at 850nm on new MMF
  - WDM at 1300nm over “any” fiber
  - MAS over “any” fiber

# 10 GbE PMD Proposals

- Serial @ 1300/1550 & 850nm
  - 100m using uncooled 1300nm FP over standard MMF
  - 300m using 850nm VCSELs with enhanced MMF
  - 2 km using uncooled unisolated 1300nm FP over SMF
  - 10 km using uncooled 1300nm over SMF
  - 40km using cooled 1300nm DFB over SMF
- Parallel proposals
  - Parallel Optics (including fibers) @ 850nm
  - 4 x 2.5/3.125 Gb/s WDM @ 1300nm (WWDM)
- Multilevel Analog Signaling (MAS) using PAM encoding

# Serial vs. Parallel

## ***Serial Links***

- Single fiber solution
- Low complexity
- Small part count
- High reliability
  - Small size
  - Low power consumption
- Within reach of existing technology

## ***Parallel Links***

- 1.0, 1.25, 1.5 Gb/s x 12 Channels available now
- 4 x 2.5/3.125 Gb/s available soon
- Could use same electrical I/O as WDM.
- Low cost for short distances
- Low cost packaging (“parallel advantage”, no SERDES)

# 850nm Serial

- 850nm serial transmission, direct modulation using uncooled lasers over 1 – 400m of MMF
- Simple extension of current Gb Ethernet
- Possibly less expensive than SMF serial or WWDM

# 1300 nm Serial

- Directly modulated uncooled DFB laser for typical LAN distances
- Single mode fiber, 1m to 40km
- 10 Gb/s links with 12.5 Gbaud signaling rates are feasible
- Optical Transceiver components from current production may be adapted to 10 GbE LAN requirements



# Wide WDM (WWDM)

- 4 x 2.5/3.125 Gb/s eases transmission and jitter specifications
- 1300 nm DFB single interface supports:
  - 300 m of installed or new 62MMF and 50MMF
  - 10 km of SMF
- WWDM's large channel spacing enables low cost optical demultiplexers
- Larger number of lower speed devices than serial transceivers
- Requires lasers having separated wavelengths; adding complexity to the specification

# MAS

- Multilevel Analog Signaling
  - PAM-5 coding
  - Reduces line rate by 50% or more relative to On-Off-Keying
  - Adaptation of 1000BASE-T Ethernet modulation
- Broad application—Optical LW/SW, MMF/SMF, CX Copper
- Small, Low Power, accommodates Small Form Factor package
- Meets or exceeds ALL HSSG distance objectives
- Higher rates with more sophisticated modulation (e.g. PAM9, QAM), and WWDM or Parallel Optics
- New technology for optics, Need Linear TIA