

# **Action Item: Project Scope Issues: Active Cables**

**John D'Ambrosia**

**Chair, IEEE P802.3dj Ethernet Task Force**

**Futurewei Technologies, U.S. Subsidiary of Huawei**

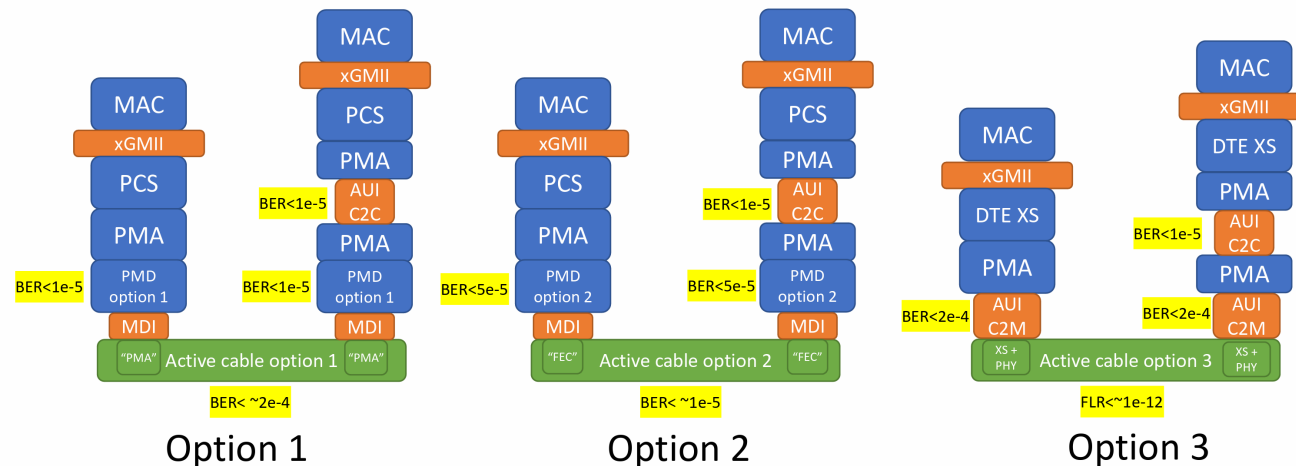
**04 May, 2023**

# Introduction

## 20 Apr 2023 Electrical Ad hoc Meeting

- Task Force Chair John D’Ambrosia noted that he would review the project scope implications of options 1 and 2 in presentation #4 with the Working Group Chair.
- Ref: [https://www.ieee802.org/3/dj/public/adhoc/electrical/23\\_0420/ran\\_3dj\\_elec\\_02\\_230420.pdf](https://www.ieee802.org/3/dj/public/adhoc/electrical/23_0420/ran_3dj_elec_02_230420.pdf)

### Possible BER budgeting with active cable



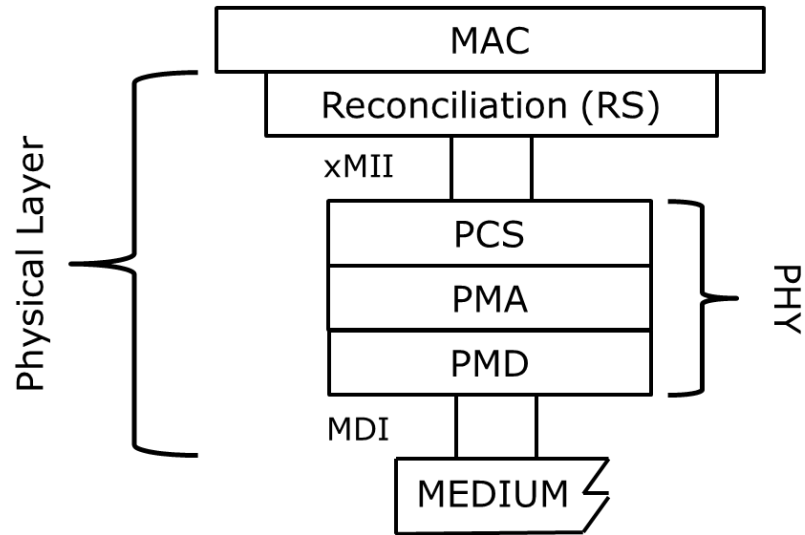
These are the same options we have in optical modules; with "PMD" replacing AUI-C2M

The BER values are for random error events (for analysis purposes) and do not represent measured BER (for compliance purposes).

# Relevant Scopes

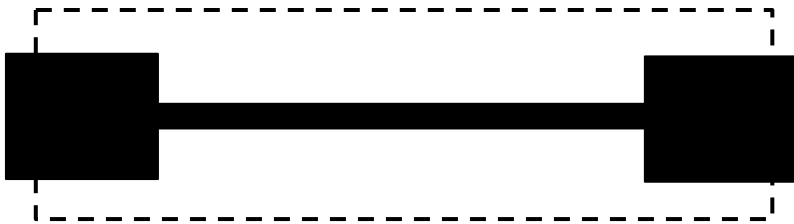
- **802.3dj** - Define Ethernet MAC parameters for 1.6 Tb/s. Define physical layer specifications, and management parameters for the transfer of Ethernet format frames at 800 Gb/s and 1.6 Tb/s over copper and single-mode fiber physical medium dependent (PMD) sublayers based on 200 Gb/s or greater per lane signaling technologies. Using these new definitions for 800 Gb/s and 1.6 Tb/s, define physical layer specifications and management parameters for the transfer of Ethernet format frames at 200 Gb/s and 400 Gb/s, when applicable
- **802.3** - This standard defines Ethernet local area, access and metropolitan area networks. Ethernet is specified at selected speeds of operation; and uses a common media access control (MAC) specification and management information base (MIB). The Carrier Sense Multiple Access with Collision Detection (CSMA/CD) MAC protocol specifies shared medium (half duplex) operation, as well as full duplex operation. Speed specific Media Independent Interfaces (MIIs) provide an architectural and optional implementation interface to selected Physical Layer entities (PHY). The Physical Layer encodes frames for transmission and decodes received frames with the modulation specified for the speed of operation, transmission medium and supported link length. Other specified capabilities include control and management protocols, and the provision of power over selected twisted pair PHY types.
- **Both 802.3 and 802.3dj contain the scope to within the Physical Layer.**

# Scope Boundaries



- Scope of P802.3dj is the MAC / RS boundary to the MDI / Medium boundary

## Active Cable Assembly

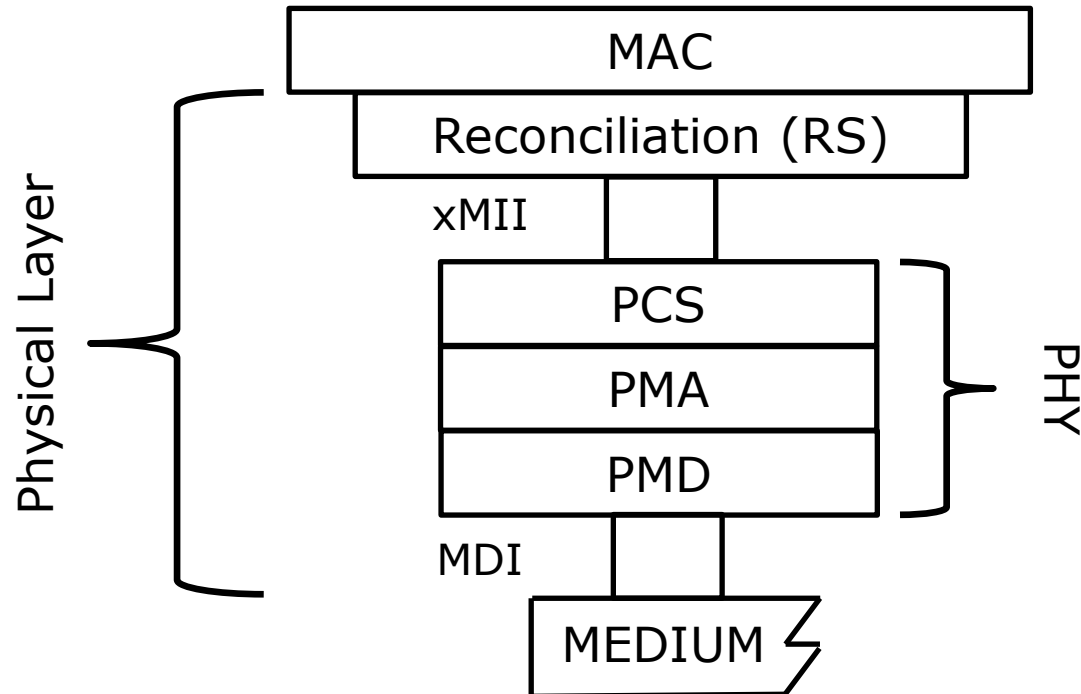


- Active cable is “medium”
- Closed System
- Could be anything in cable itself – Cu, SMF, MMF – we don’t know
- “Channel performance” can be bounded (i.e. performance constraints such as “BER” or latency)
- Specific design details of active cable assembly not in scope

# IEEE 802.3 Specifications

- **Prior specifications “enabled” active cables through specification of AUIs.**
  - **No other specifications provided – PMD, MDI, BER performance, etc.**
- **IEEE P802.3dj**
  - **Use of AUI interfaces without additional constraints perceived to be insufficient.**
    - **Could a normative “BER” budget applicable to existing P802.3dj physical layer specifications (-DR, -LR) be developed based on AUIs and leveraged as the basis by the industry to enable active cable assemblies?**
  - **xMII Extenders could be used to enable active cables, but latency thought to be too high.**
- **It has been proposed that IEEE 802.3 specifications could improve interoperability between systems and active cable assemblies.**

# Creating a New Physical Layer Specification



- Assumed to be different from –CR (which has been historically passive) – new objective needed.
- New nomenclature! 😊
- Next – need to fit into 802.3 layering diagram.
- New PMD sublayer
  - Leverage AUI with additional specifications?
- MDI – see next page
- Medium – need proposal on how to bound performance
  - “BER”?
  - Latency?
  - Lane-to-lane skew?
  - Other parameters?

# MDI Consideration

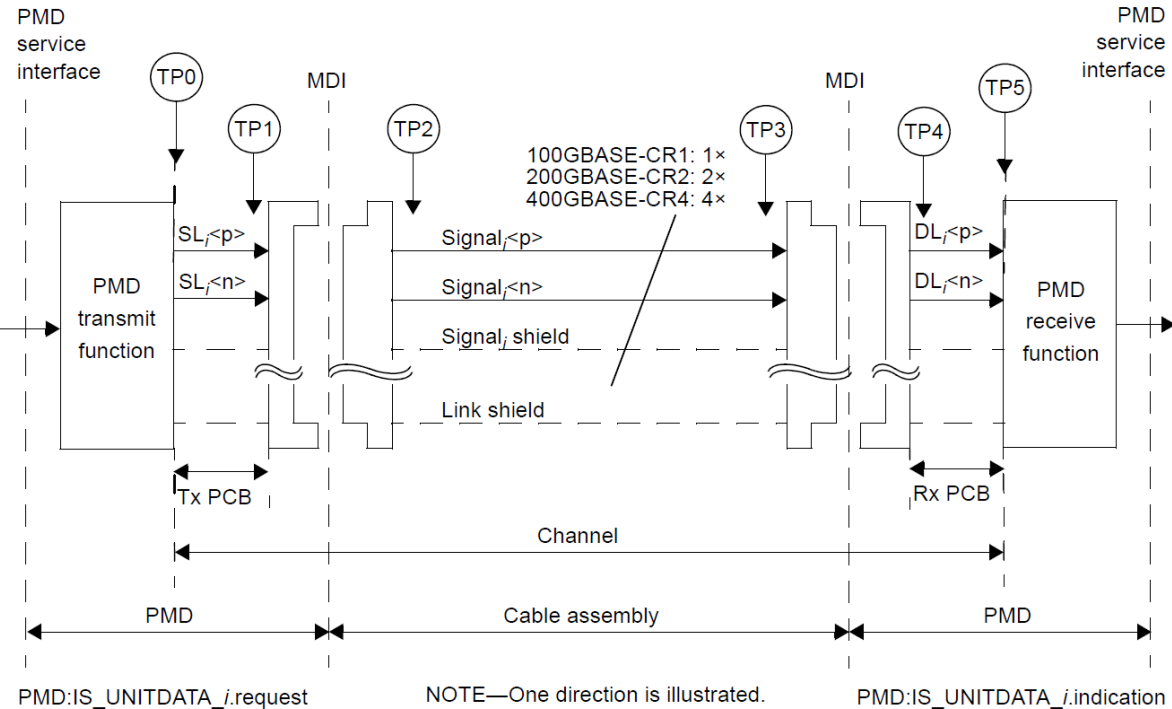


Figure 162-2—100GBASE-CR1, 200GBASE-CR2, or 400GBASE-CR4 link

IEEE Std 802.3ck™-2022

- Analogous to –CR implementations
- For 400GBASE-CR4 MDI Types specified in Table 162C-1
- Specifying the MDI & pinouts could help industry interoperability

# Summary

- **The scope of the P802.3dj project is bounded by the Physical Layer**
  - **Can't specify medium, ie active cable**
  - **Can bound performance of channel**
- **There are different paths that could be proposed**
  - **Develop normative BER budget for other physical layer specifications (example - -DR or -FR) that could be leveraged**
  - **Define new objective for active cables**
- **Potential Issues if pursuing an active cable objective / specification**
  - **This is new – how do we specify it? What are the issues that need addressed?**
  - **Wording of the objective??**
  - **Nomenclature**
  - **Treating the active cable assembly as a “black box”**
  - **What parameters can we leverage or create to address all potential active cable solutions?**
  - **Maybe “Active Cable Assemblies” should be discussed in the NEA?**
- **Reminder – we are a contribution driven organization!**