

Definitions of “PHY” and “link segment” relative to supporting both balanced and unbalanced media

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General form of 802.3 PHY objective

Define a link segment ... for at least XXm reach... and a PHY to support operation at YY rate over this link segment...

A PHY is defined at 1.4.467

- **1.4.467 Physical Layer device (PHY):** Within IEEE 802.3, the portion of the Physical Layer between the Medium Dependent Interface (MDI) and the media independent interface specific to the data rate (e.g., MII, GMII, XGMII). The PHY contains the functions that transmit, receive, and manage the encoded signals that are impressed on and recovered from the physical medium.

Source: IEEE Std 802.3-2022

Definition of PHY in 802.3 vs. “Plain meaning”

DEFINITION

Physical layer device:

- Includes everything from the interface to the MAC xMII to the interface to the link segment (MDI)
- This means transceiver, passives, connector, etc.
- At the MDI, the PHY has as many connections as the link segment does

PLAIN MEANING

That portion of the physical layer (generally an IC) with the functions for transmission, reception, clock recovery & skew alignment (if multiple lanes), encode data bits for transmission & decode the received conditioned signal from the medium.

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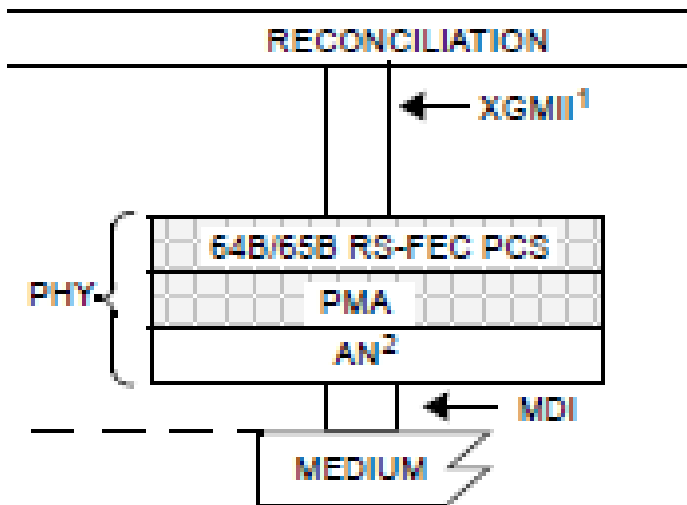
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This is the 802.3 definition of the combination of the PCS & PMA

Two Models of a PHY stackup:

PCS, PMA

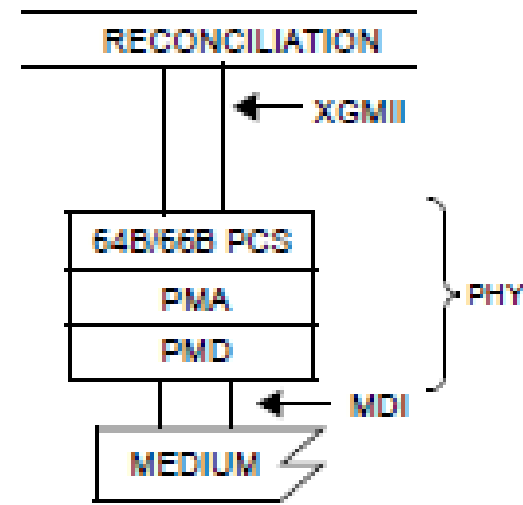
Interfaces at xMII & MDI



Usual for BASE-T, BASE-T1, there is one medium type only

PCS, PMA, PMD, MDI

Interfaces at xMII & MDI



Used in Physical Layers with multiple media types (e.g. optics)

What about the link segment & MDI?

1.4.379 link segment: The point-to-point full-duplex medium connection between two and only two Medium Dependent Interfaces (MDIs).

(IEEE Std 802.3-2022)

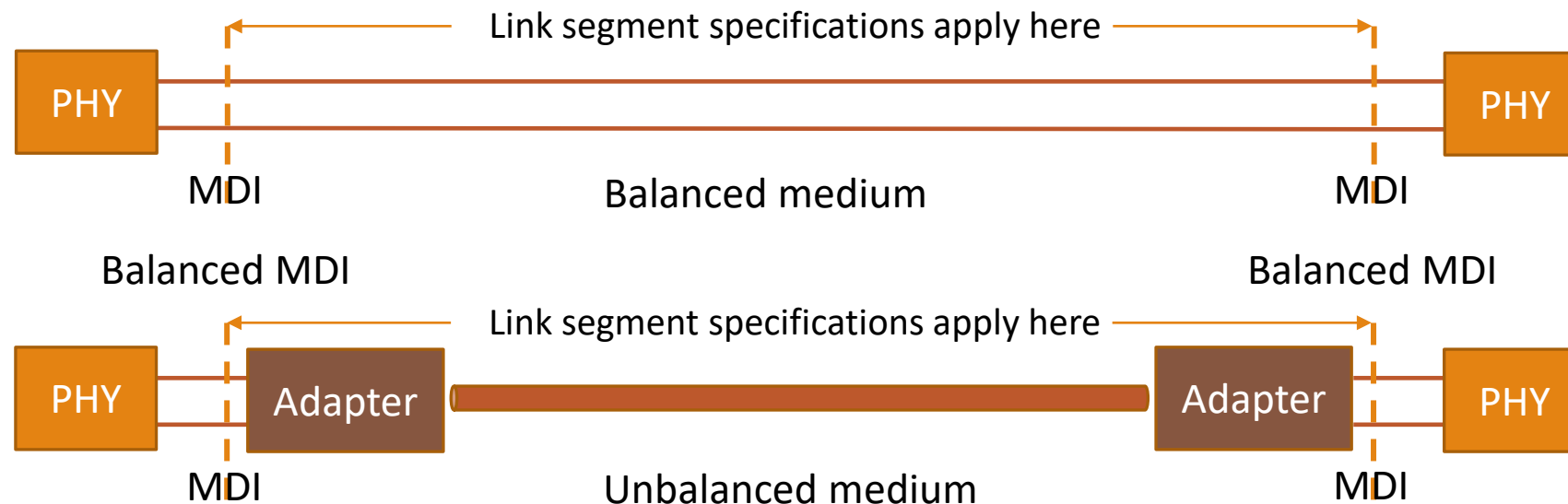
1.4.395 Medium Dependent Interface (MDI): The mechanical and electrical or optical interface between the transmission medium and the MAU (e.g., 10BASE-T) or the PHY (e.g., 1000BASE-T) and also between the transmission medium and any associated (optional per IEEE Std 802.3, Clause 33, Clause 104, and Clause 145) Powered Device (PD) or Endpoint Power Sourcing Equipment (PSE).

(IEEE Std 802.3-2022)

NOTE – none of this says anything about what is inside that full-duplex medium, only that the MDI is the mechanical and electrical (or optical) interfaces between the PHY and the transmission medium.

Two ways to get to supporting 2 media (1)

One PHY (a balanced PCS/PMA), a balanced MDI, and one link segment spec, with the Balanced/Unbalanced conversion within the link segment:



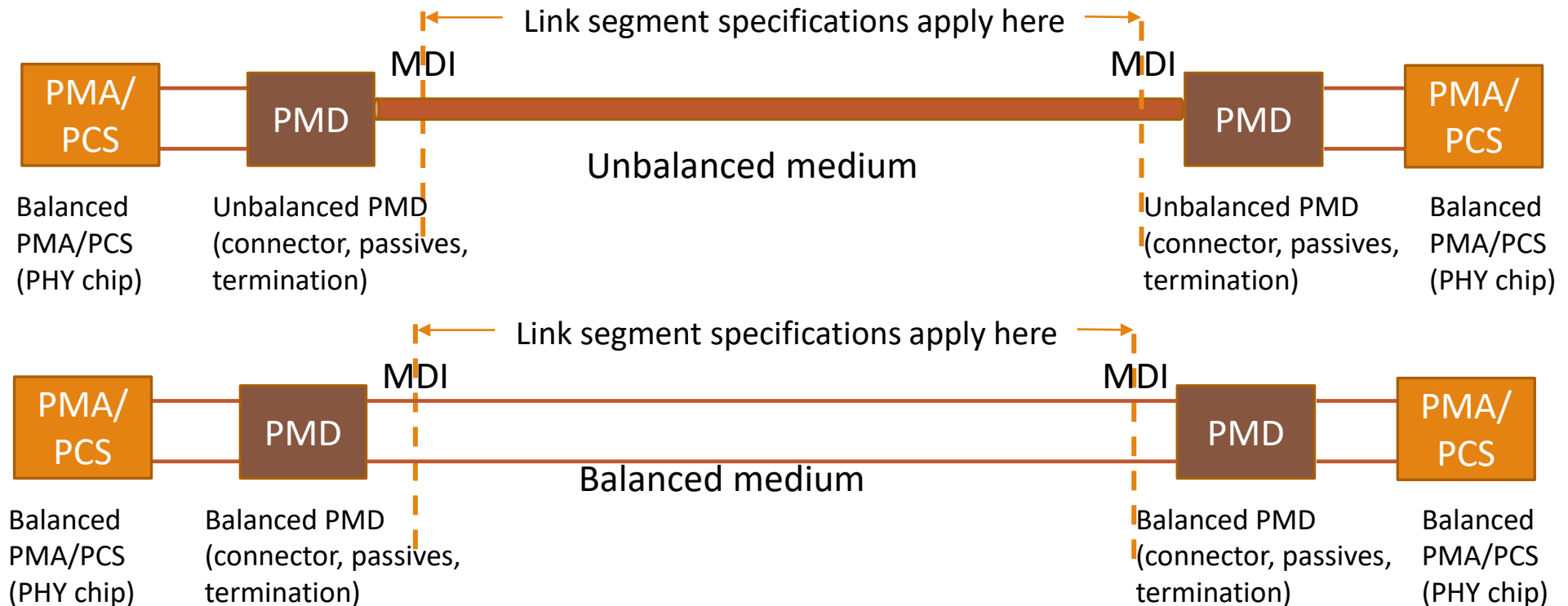
Does not allow for differentiation of link segments...

Power interface would also need to be within the link segment specs...

Two ways to get to supporting 2 media (2)

Two PHY types: Balanced & Unbalanced

- Same PCS/PMA, different PMD/MDI



Recommendation – objective form

I believe there is consensus to have a single PCS/PMA “PHY chip” specification that can be used to build ECUs that can connect either to coax or to STP.

- The same physical ECU port would not be expected to connect to both coax & STP

If this is true, suggest something like:

Define link segments ... for at least XXm reach... and a PMA/PCS to support operation at YY rate over this link segment... with a PMD for each link segment type.

Suggestion based on Matheus_Dalmia_Jonsson:

Define performance characteristics of link segments suitable for use with automotive balanced pair and automotive unbalanced coaxial cables supporting up to 2 inline connectors and up to at least 15m reach on at least one type of automotive cable.

Define a common electrical PMA/PCS and (media-dependent) PMDs to support up to 10 Gbps point-to-point operation in one direction and up to 100 Mb/s point-to-point operation in the other direction over both of the defined link segments when used the PMD/MDI for the link segment type.

Discussion?

Thank you
