

Nomenclature for electrical interfaces (“AUIs”) within an xGMII Extender

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Problem statement

- The term “AUI” has most commonly been used in recent projects (3bm, 3bs, 3cd, 3ck) as the name of the electrical interface between adjacent PMAs inside of a (Type 1) PHY.
- The same name is also used for physical interfaces within 200GMII/400GMII Extenders.
- For 200G and 400G PHYs, the term “AUI” was used agnostically to represent either use case, because so far, electrical characteristics and channel specifications have been identical.
- With 200G/lane signaling and the rise of “Type 3” PHYs, is it time to consider distinct specifications and nomenclature?

Background

- P802.3df (D2.1) specifies two physical instantiations of the PMA service interface
 - 800GAUI-8 C2C and 800GAUI-8 C2M, in annexes 120F and 120G respectively
 - Also known as electrical interfaces
- These interfaces can be either **part of a PHY** or **part of an 800GMII extender**, as shown on the right
 - The specifications in P802.3df are the same in both cases
- We also have similar electrical interfaces specified for lower data rates and/or lower signaling rates, which we refer to collectively (and unofficially) as “AUIs”
 - Annexes 120B through 120G for 200G and 400G Ethernet
 - They can be within “xGMII Extenders” (collective unofficial name)
- 802.3dj has objectives to define interfaces at 200 Gb/s per lane with similar architectural positioning
 - For example: **“Support optional four-lane 800 Gb/s attachment unit interfaces for chip-to-module and chip-to-chip applications”**.

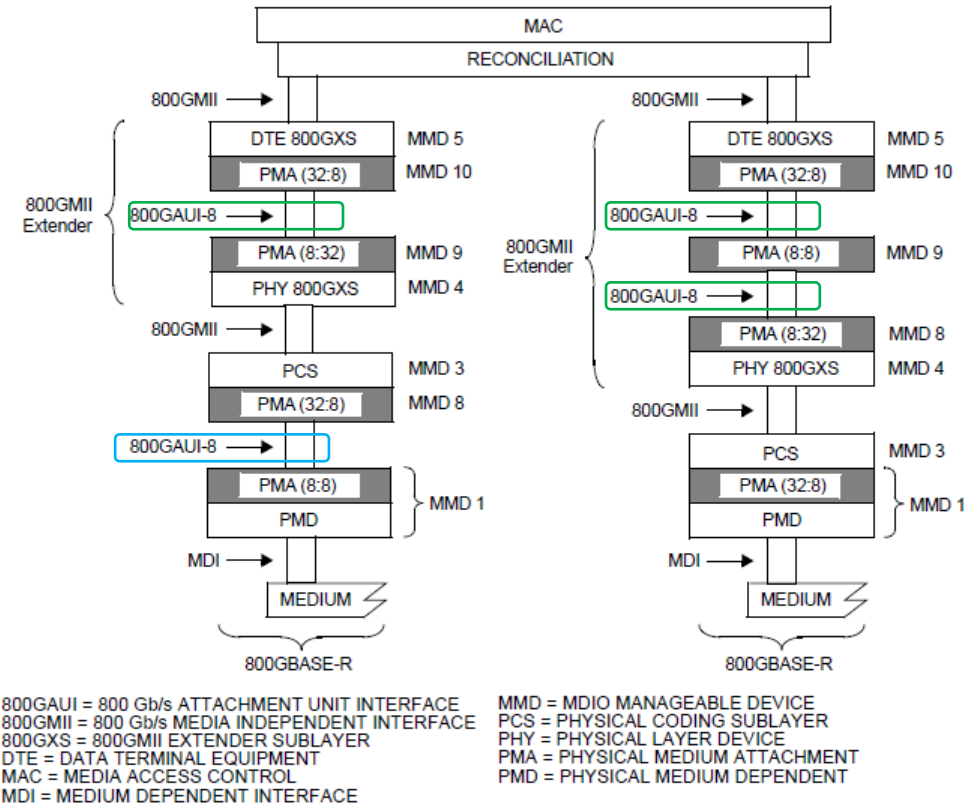
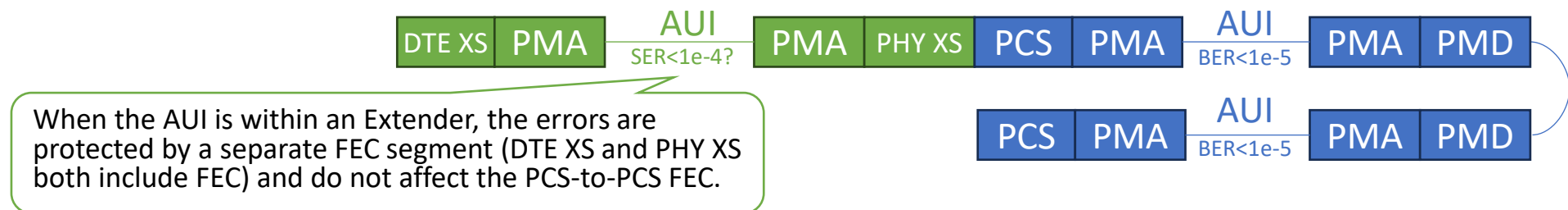
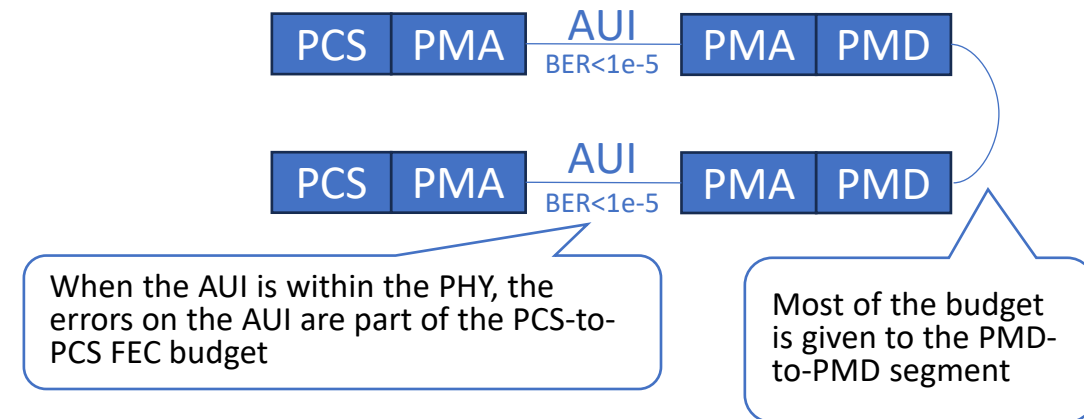


Figure 173A-4—Example PMA layering with eight-lane PMD, 800GMII Extender, and two 800GAUI-8

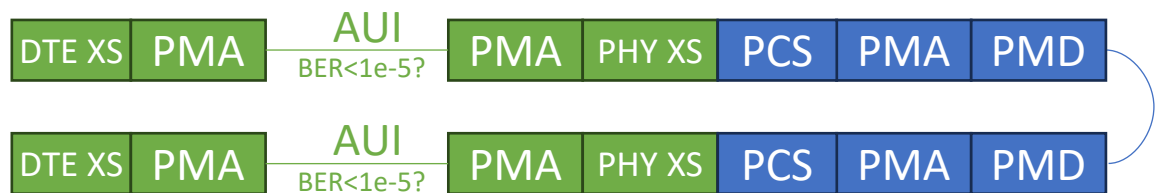
Error allocation for existing AUIs

- All existing AUIs defined with PAM4 and signaling rates of 26.5625 GBd and 53.125 GBd are specified with:
 - FEC symbol error ratio (SER) lower than $1e-4$ for C2C
 - BER lower than $1e-5$ for C2M
- An AUI within an Extender could be allowed a much higher error budget, but it wasn't specified that way
 - The SER/BER requirements above were considered feasible for the targeted channels.



AUIs for Type 3 PHYs

- A Type 3 PHY is likely to have a PCS within a module, so the chip-to-module interface would always be within an Extender.
- The Extender is protected by a dedicated RS-FEC, and higher BER could be tolerated with negligible impact on link performance.
 - But there is no separate specification



What is different?

- In P802.3dj, a DER0 value of $2.67e-5$ was adopted for the higher-loss AUIs *within a PHY*
 - See [motion #8 \(ran 3dj 02 2305\)](#)
- With PAM4 signaling at 106.25 GBd, this channel requirement may be difficult to meet in some applications, e.g., if higher reach is required
- Use of xGMII Extenders has been discussed as a way to enable such applications (“segmented FEC scheme”)
 - The designation “within a PHY” excludes this case
- An electrical interface within an Extender is protected by its own RS-FEC, so it could be given a higher error budget
 - A module that terminates the RS-FEC can support a wider range of host channels
 - This would require different electrical and channel specifications
 - It would not be the same as an AUI within a PHY!
- For different things, we need different terms → **nomenclature**

Existing nomenclature

- Nomenclature for AUIs has been adopted ([Iusted 3df 01 220111](#) slide 25).
 - E.g., 400GAUI-2 C2M
 - It is suggested to keep this nomenclature for the AUIs within the PHY
- 10 Gb/s Ethernet has XAUI (**1.4.87** and clause 47) as the interface between two instances of XGXS
 - This matches the “electrical interface within an Extender” concept
 - Note that the “X” is a roman numeral denoting 10G, and the acronym is defined as “10 Gigabit Attachment Unit Interface”
- Note that the term AUI is defined as an interface between a DTE and a PMA (**1.4.198 Attachment Unit Interface (AUI)**, specific to 10 Mb/s Ethernet).

Possible nomenclature for interfaces within xMII Extenders

- A. Use the string AUI prefixed with data rate and suffixed with width, the letter X (for “eXtender”), and C2C/C2M; for example, **200GAUI-1X C2M**
 - Enables other letter suffixes if we define more than one “PHY” AUI
- B. Using the string XAUI prefixed with data rate and suffixed with width and C2C/C2M; for example, **200GXAUI-1 C2M**
 - X stands for “eXtender”
 - May be pronounced “two hundred G ZAUI...”
- C. Similar to B, but using the string EUI instead; for example, **200GEUI-1 C2M**
 - E stands for “Extender”
 - May be pronounced “two hundred Yoo Ee...”
- D. Similar to B, but using the string XSAUI instead; for example, **200GXSAUI-1 C2M**
 - XS stands for “eXtender Sublayer”
 - May be pronounced “two hundred Gee Ex Es AUI...”

Nomenclature options

Item	Option A	Option B	Option C	Option D
1-lane electrical interface within a 200GMII Extender	200GAUI-1X C2C 200GAUI-1X C2M	200GXAUUI-1 C2C 200GXAUUI-1 C2M	200GEUI-1 C2C 200GEUI-1 C2M	200GXSAUI-1 C2C 200GXSAUI-1 C2M
2-lane electrical interface within a 400GMII Extender	400GAUI-2X C2C 400GAUI-2X C2M	400GXAUUI-2 C2C 400GXAUUI-2 C2M	400GEUI-2 C2C 400GEUI-2 C2M	400GXSAUI-2 C2C 400GXSAUI-2 C2M
4-lane electrical interface within an 800GMII Extender	800GAUI-4X C2C 800GAUI-4X C2M	800GXAUUI-4 C2C 800GXAUUI-4 C2M	800GEUI-4 C2C 800GEUI-4 C2M	800GXSAUI-4 C2C 800GXSAUI-4 C2M
8-lane electrical interface within a 1.6TMII Extender	1.6TAUI-8X C2C 1.6TAUI-8X C2M	1.6TXAUUI-8 C2C 1.6TXAUUI-8 C2M	1.6TEUI-8 C2C 1.6TEUI-8 C2M	1.6TXSAUI-8 C2C 1.6TXSAUI-8 C2M

Backup

Existing definitions

- **1.4.198 Attachment Unit Interface (AUI):** In 10 Mb/s CSMA/CD, the interface between the Medium Attachment Unit (MAU) and the data terminal equipment (DTE) within a data station. Note that the AUI carries encoded signals and provides for duplex data transmission. (See IEEE Std 802.3, Clause 7 and Clause 8.)
 - **1.4.394 Medium Attachment Unit (MAU):** A device containing an Attachment Unit Interface (AUI), Physical Medium Attachment (PMA), and Medium Dependent Interface (MDI) that is used to connect a repeater or data terminal equipment (DTE) to a transmission medium.
 - **1.4.279 data terminal equipment (DTE):** Any source or destination of data connected to the local area network.
- **1.4.87 10 Gigabit Attachment Unit Interface (XAUI):** The interface between two 10 Gigabit Extender Sublayers (XGXS) to extend the reach of the XGMII for 10 Gb/s operation. (See IEEE Std 802.3, Clause 47.)
- **1.4.145 400 Gb/s Attachment Unit Interface (400GAUI-n):** A physical instantiation of the PMA service interface to extend the connection between 400 Gb/s capable PMAs over n lanes, used for chip-to-chip or chip-to-module interconnections. For chip-to-module interconnections and for chip-to-chip interconnections, three widths of 400GAUI-n are defined: a sixteen-lane version (400GAUI-16), an eight-lane version (400GAUI-8), and a four-lane version (400GAUI-4). (See IEEE Std 802.3, Annex 120B and Annex 120C for 400GAUI-16, or Annex 120D and Annex 120E for 400GAUI-8, or Annex 120F and Annex 120G for 400GAUI-4.)
 - **1.4.147 400GMII Extender:** The 400 Gb/s Media Independent Interface Extender extends the reach of the 400GMII and consists of two 400GXS sublayers with a 400GAUI-n between them. (See IEEE Std 802.3, Clause 118.)