MII Issues for 10Gb/s Operation

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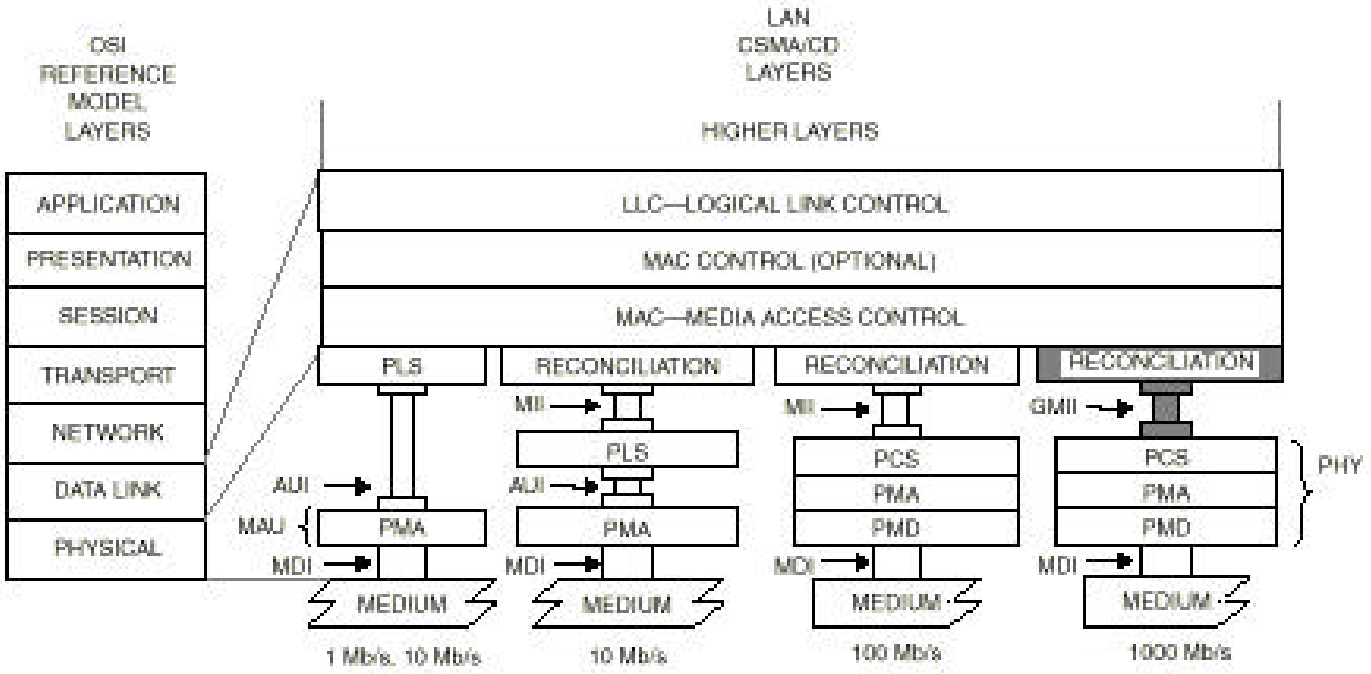
Proposed Objective

Include a specification for an optional Media Independent Interface

802.3 Architecture (1000BASE-X)



AUI = ATTACHMENT UNIT INTERFACE
MDI = MEDIUM DEPENDENT INTERFACE
MII = MEDIA INDEPENDENT INTERFACE
GMII = GIGABIT MEDIA INDEPENDENT INTERFACE
MAU = MEDIUM ATTACHMENT UNIT

PLS = PHYSICAL LAYER SIGNALING
PCS = PHYSICAL CODING SUBLAYER
PMA = PHYSICAL MEDIUM ATTACHMENT
PHY = PHYSICAL LAYER DEVICE
PMD = PHYSICAL MEDIUM DEPENDENT

Figure 35-1—GMII location in the OSI protocol stack

Why an MII?

- Separates MAC and PHY for ease of specification and implementation
- Solve problems common to different PHYs
  - Common management framework
  - Simplifies specification
- Decouple development of MAC and PHY components
- Easier addition of a new PHY to the standard

GMII Transmit

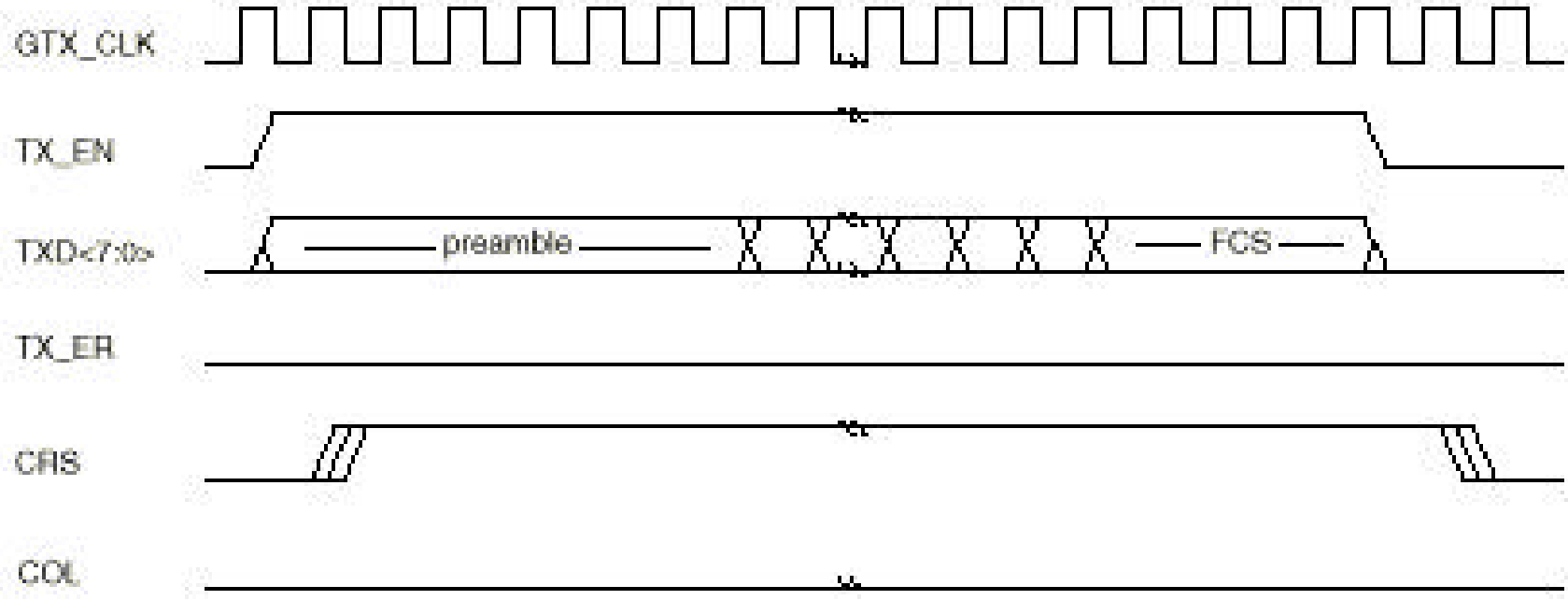


Figure 35-3—Basic frame transmission

GMII Receive

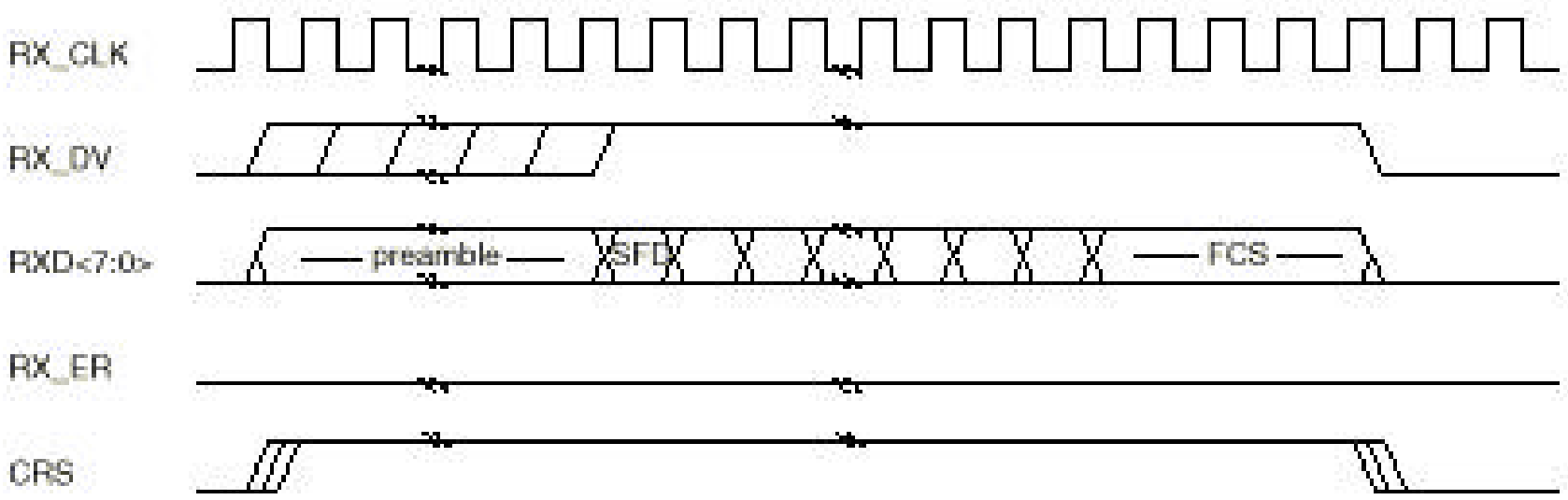


Figure 35-8—Basic frame reception

Reconciliation Sublayer

- Architectural entity that adapts the bit serial MAC of clause 4 (with its bit serial PLS Service Primitives) to the 4-bit wide MII and 8-bit wide GMII
- Includes mappings to service primitives specified for higher speeds (clause 22, clause 35)

HSSG MII “Requirements”

- Capable of supporting: 10 Mb/s, 100 Mb/s 1000 Mb/s and ~10,000 Mb/s data rates.
- Allow practical implementation as on-board chip-to-chip interface.
- Precisely delimit frame lengths.
- Allow block code and word oriented PCS.
- Support existing management interface and register set.
- Not required to support multiple PHYs.

Some Options

- Use existing GMII
  - 1250 MHz for 10 Gb/s
  - Limits implementation technologies (cost)
  - Avoids complexity of a multi-octet interface width
- Go wider and faster
  - 32-bit Þ312.5 MHz for 10 Gb/s
  - 64-bit Þ156.25 MHz for 10 Gb/s

Multi-Octet Issues

- Creating a word orientation within 802.3 has wide ranging implications
- The MII is not the only thing that brings up the issues of word orientation
  - There is experience with 16- and 32-bit wide MAC designs, and implementers will not want to be restricted to an octet MAC implementation
  - We had the 2-byte ordered set in 1000BASE-X
  - Some WDM proposals create the same problems
  - PHY proposals must balance the implementation trade-offs (e.g., compressed IPG for SONET)

Data Stream

<inter-frame>	<preamble>	<sfd>	<data>
≥12	7	1	64-1522

- 802.3 does not easily support a word width
  - Legacy 802.3 is octet oriented
  - Word orientation properties cannot be depended on with optional MII
- Interframe and preamble lengths might change between transmit and receive
  - A word oriented PCS may require preamble shrinkage
  - An odd data length must change inter-frame

Frame Delimitation

- Multi-octet interface doesn’t match octet nature of 802.3 framing
  - Additional signal are required to indicate valid data, e.g., RX_V<3:0>
- Requires some interframe to align next frame
- Requires at least one word of preamble + Start Frame Delimiter to align Destination Address

Multi-Octet Characteristics

- Assume MAC is word aligned with MII
- 4-octet is a fairly natural width, 8-octet moves Type/Length field within word
  - Preamble + SFD = 8
  - DA + SA = 12
  - VLAN tag = 4
- 4-octet allows preamble shrinkage, while 8-octet does not
- A multi-octet interface would affect granularity of shrinkage or expansion

Conclusions

- GMII is possible but limits technology
- 4-octet width is “bleeding-edge” for high density logic
- 8-octet width produces most dramatic changes in handling of interframe gap and preamble

TANSTAAFL

(There Ain’t No Such Thing As A Free Lunch)