RPR Physical Layer

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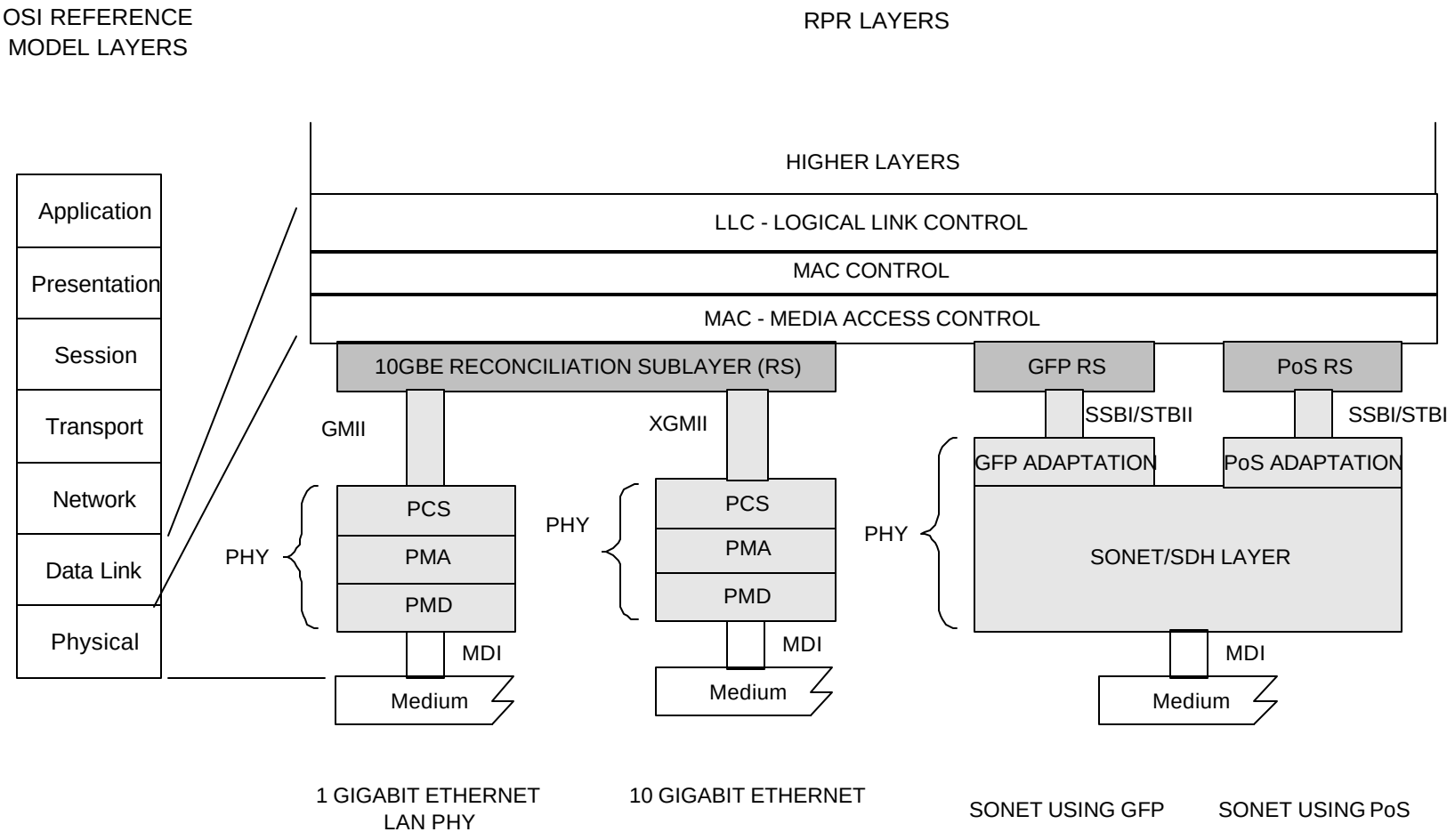
Overview

- PHY Objectives
- Layer Diagram Update
- XSBI
- P-SAP Interface
- Ethernet RS and PHYs
  - Gigabit Ethernet
  - 10G Ethernet
- SONET/SDH/OTN RS and PHYs
  - GFP
  - PoS
- Summary

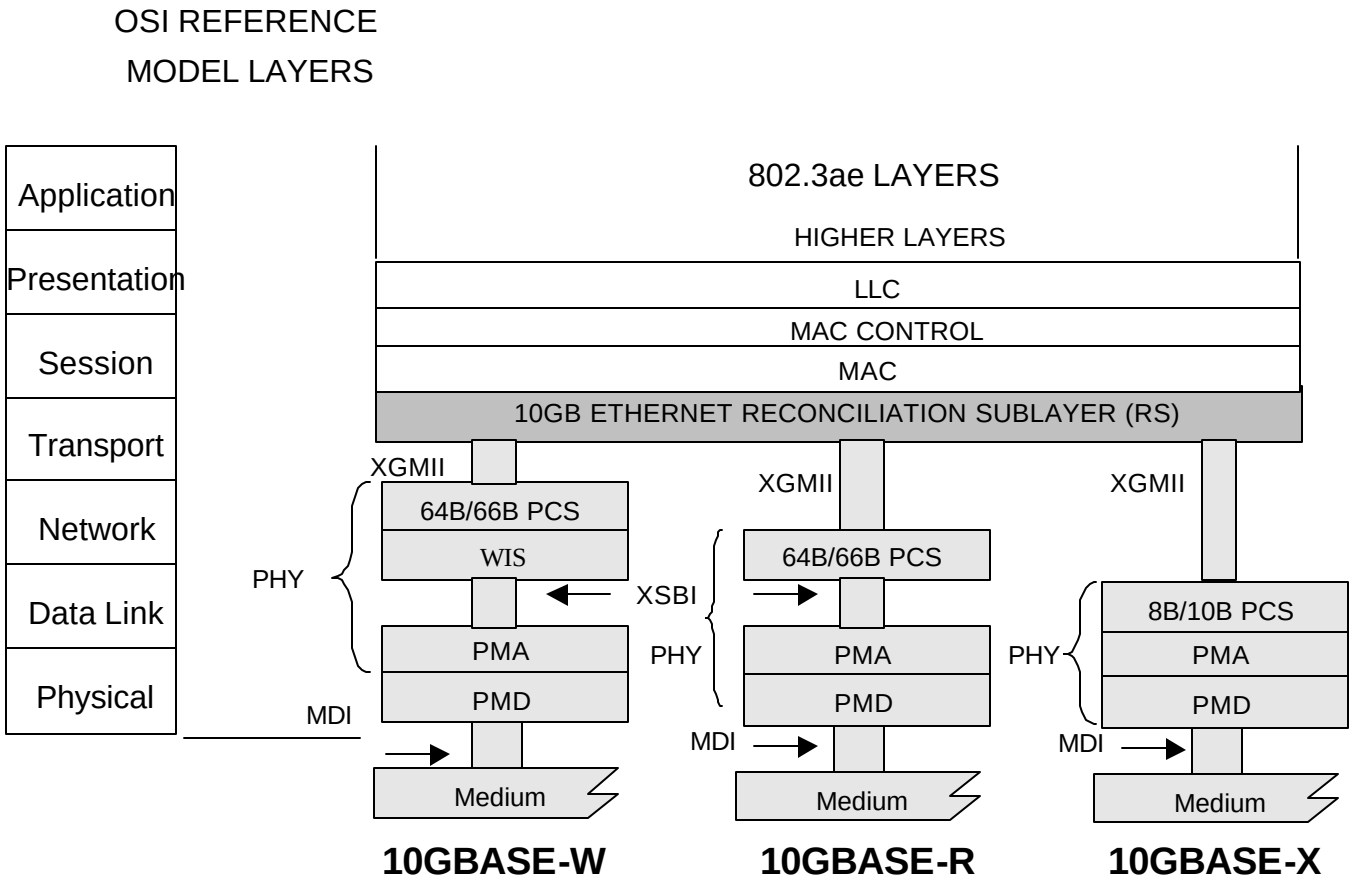
MAC Objectives

- Media independent MAC
  - Reconciliation provide MAC to PHY translation
  - SONET PHY
    - POS
    - GFP (G.7041)
      - Optional behavior for MAC to provide length to GFP framer
      - Some PHYs support length
      - Delay concern below OC-12 rate
- Ethernet PHY includes
- 1 GB and 10 GB
- IPG, preamble, frame delineation are part of the 802.17 RS

802.17 Layer Diagram



10 GBE Layering Diagram

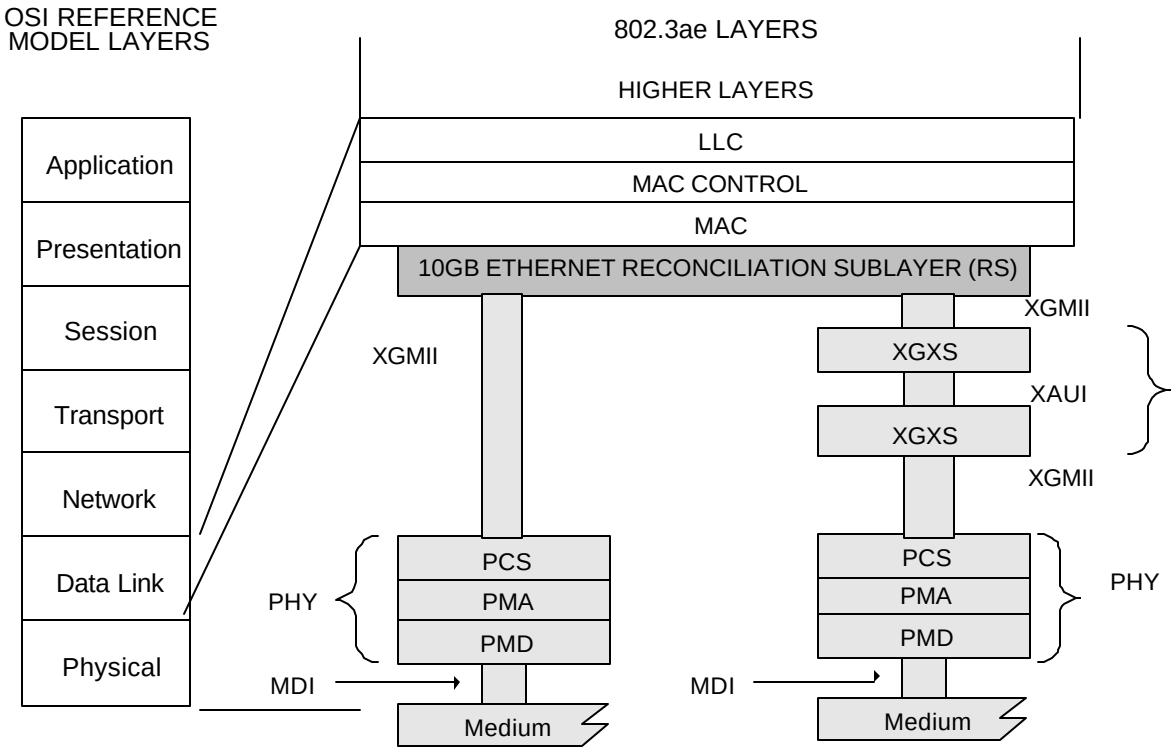


LLC = LOGICAL LINK CONTROL
MAC = MEDIA ACCESS CONTROL
MDI = MEDIUM DEPENDENT INTERFACE
PCS = PHYSICAL CODING SUBLAYER
PHY = PHYSICAL LAYER ENTITY
PMA = PHYSICAL MEDIUM ATTACHMENT
PMD = PHYSICAL MEDIUM DEPENDENT
WIS = WAN INTERFACE SUBLAYER
XGMII = 10 GIGABIT MEDIA INDEPENDENT INTERFACE

10GBASE-X Clause 48 4 lane 8B10B
10GBASE-R Clause 49 64B/66B serial
10GBASE-W Clause 49 64B/66B clause 50 WIS

- Draft 802.3ae/D3.4

10 Gigabit Layering



Optional XGMII extender

LLC = LOGICAL LINK CONTROL
MAC = MEDIA ACCESS CONTROL
MDI = MEDIUM DEPENDENT INTERFACE
PCS = PHYSICAL CODING SUBLAYER
PHY = PHYSICAL LAYER ENTITY
PMA = PHYSICAL MEDIUM ATTACHMENT
PMD = PHYSICAL MEDIUM DEPENDENT
XGXS = XGMII Extender SUBLAYER
XGMII = 10 GIGABIT MEDIA INDEPENDENT INTERFACE

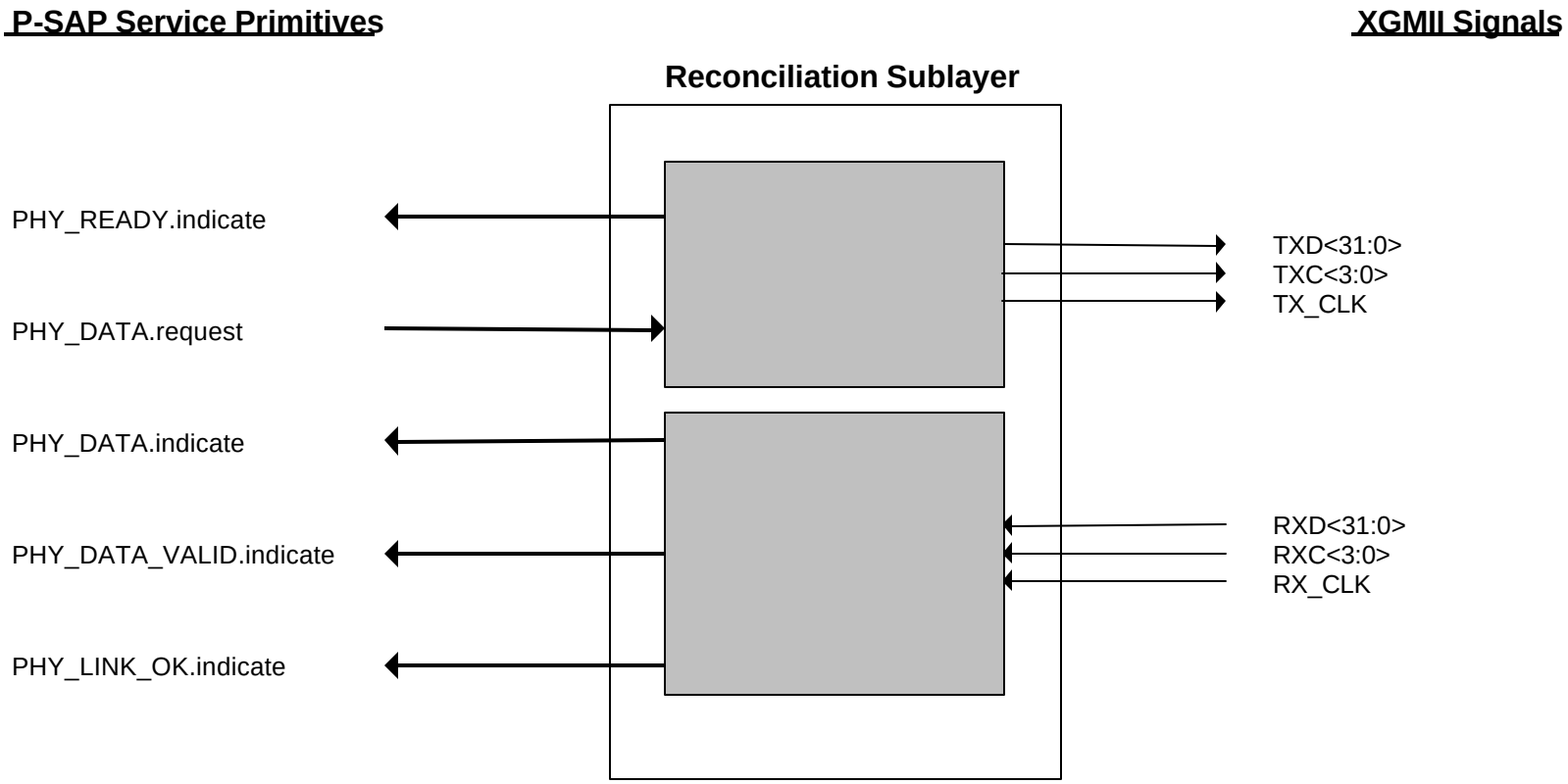
- 802.3ae/D3.4 Clause 46
- Extender specified in clause 47

XSBI summary

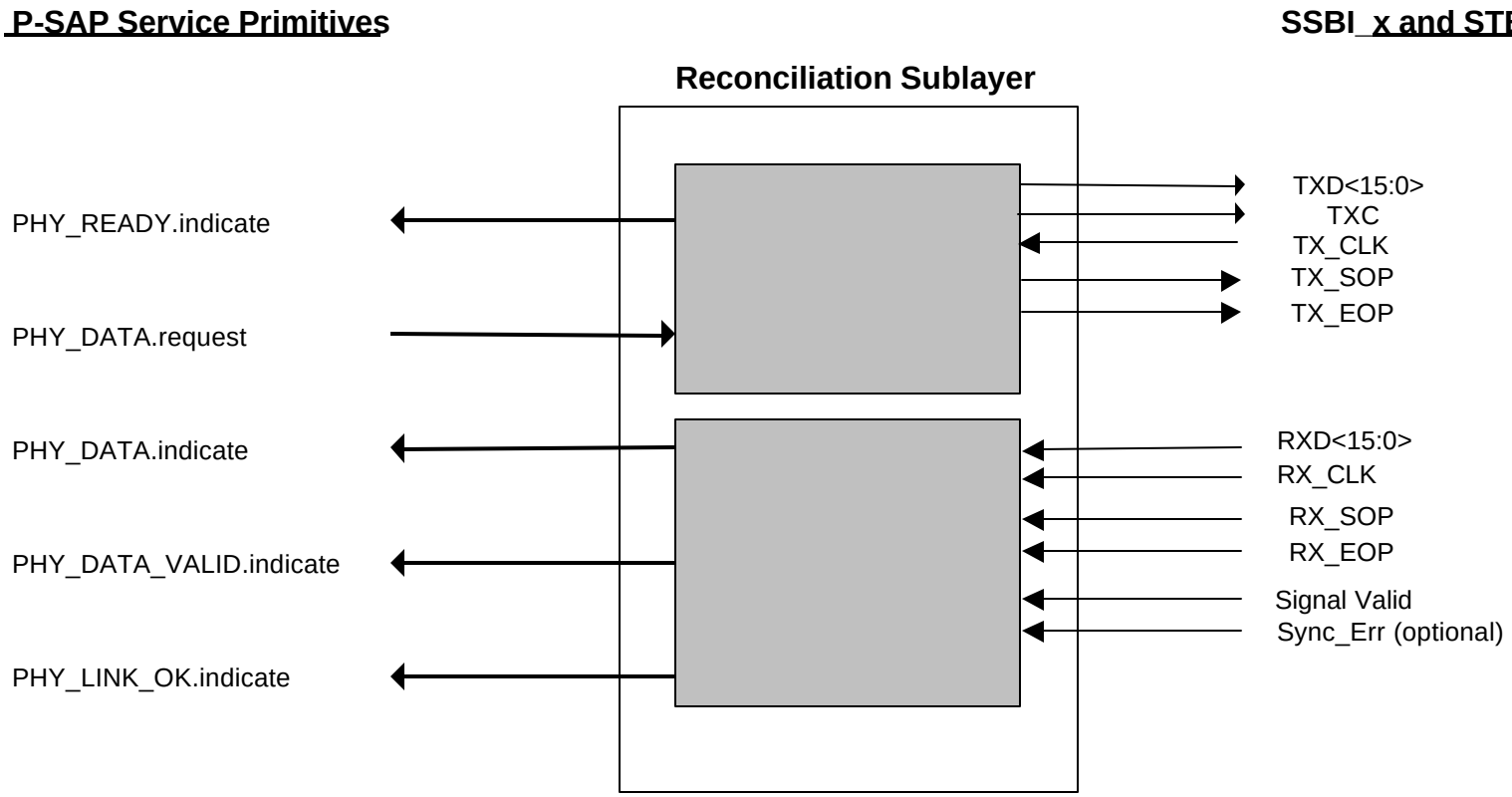
- 10G 16 bit Interface (XSBI)
  - Clause 51.4
  - General electrical characteristics of the XSBI: Clause 51.5
    - Requried signals
      - Transmit data <15:0>
      - Transmit clock
      - Transmit clock_source
      - Received data <15:0>
      - Receive clock
      - Receive signal indicate: valid data
      - Optional: sync error clock recovery ok
- Need to define OC-48 Rate 32 bit Interface and PHY performs delineation

Note: OIF is an implementor forum. SFI-4 was used as a basis for the development of the XSBI instantiation.

RS for XGMII


P-SAP Service Primitives
XGMII Signals
Reconciliation Sublayer
PHY_READY.indicate
PHY_DATA.request
PHY_DATA.indicate
PHY_DATA_VALID.indicate
PHY_LINK_OK.indicate
TXD<31:0>
TXC<3:0>
TX_CLK
RXD<31:0>
RXC<3:0>
RX_CLK

RS for SONET/SDH



Bit Ordering

- SONET PHY
  - Bit ordering consistent with “SBI”
- Ethernet PHY
  - Bit ordering consistent with GMII and XGMII
- 10G rate pacing requirement

Bit Ordering and Different MAC

- The transmission of data for IEEE 802.3 and 802.4 LAN media occurs LSB first
  - For the entire packet:
    - LAN MAC address
    - MAC specific field (e.g. length)
    - MAC Information Field
- The transmission of data for IEEE 802.5
  - LAN MAC address field are transmitted with first bit being the I/G Address Bit group. Similar to 802.3
  - MAC information field is transmitted most significant bit (MSB) first on the Medium
  - Information field: after the header, before the FCS

802.17 bit ordering and transmission

- Physical mediums
  - POS
  - GFP
  - Ethernet
- Fields
  - MAC address
  - MAC specific fields
  - FCS
    - FCS calculation
- Bit ordering has to be consistent with 802 definitions and existing SONET packet transports.

Summary

- Need to incorporate
  - Synchronous 16 bit interface SSBI_x
  - Synchronous 32 bit interface STBI_x
  - Where x:
    - RPR frame without length
    - RPR frame with explicit length field
    - Other options
- Bit order of transmission
  - For MAC fields
  - For MAC specific fields
  - For MAC information field
  - For FCS

Backup

10GBASE-R

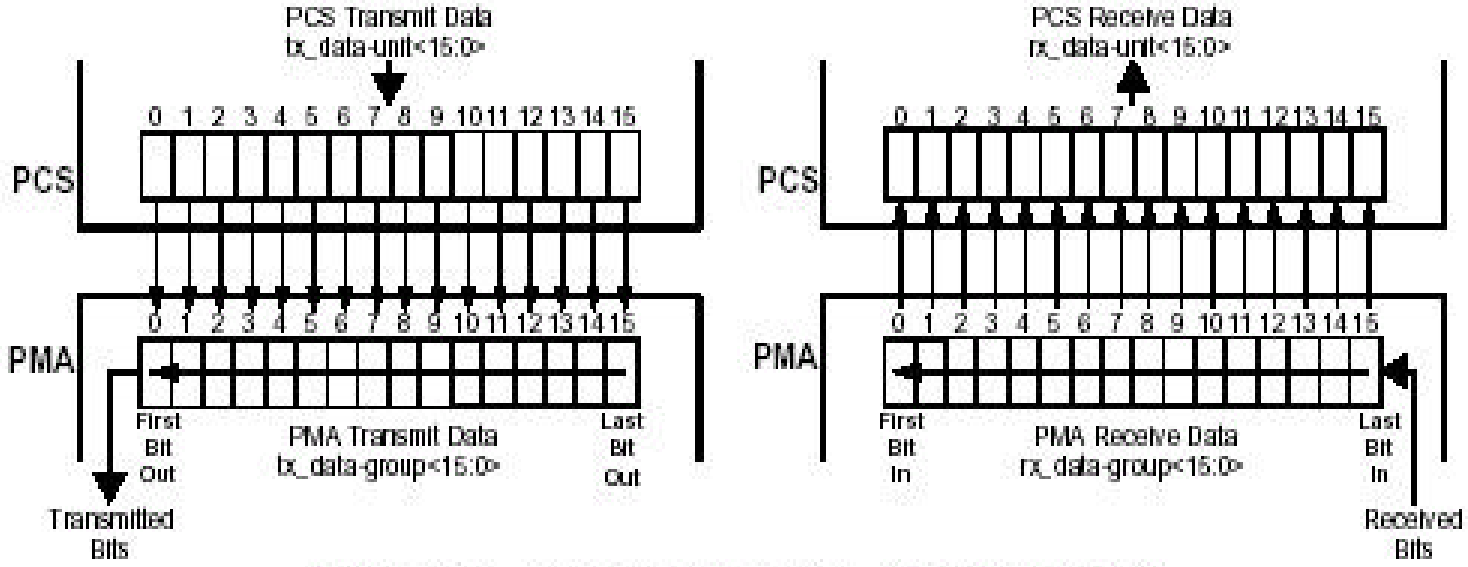


Figure 49–2—Transmission order - 10GBASE-R PHY

10GBASE-W

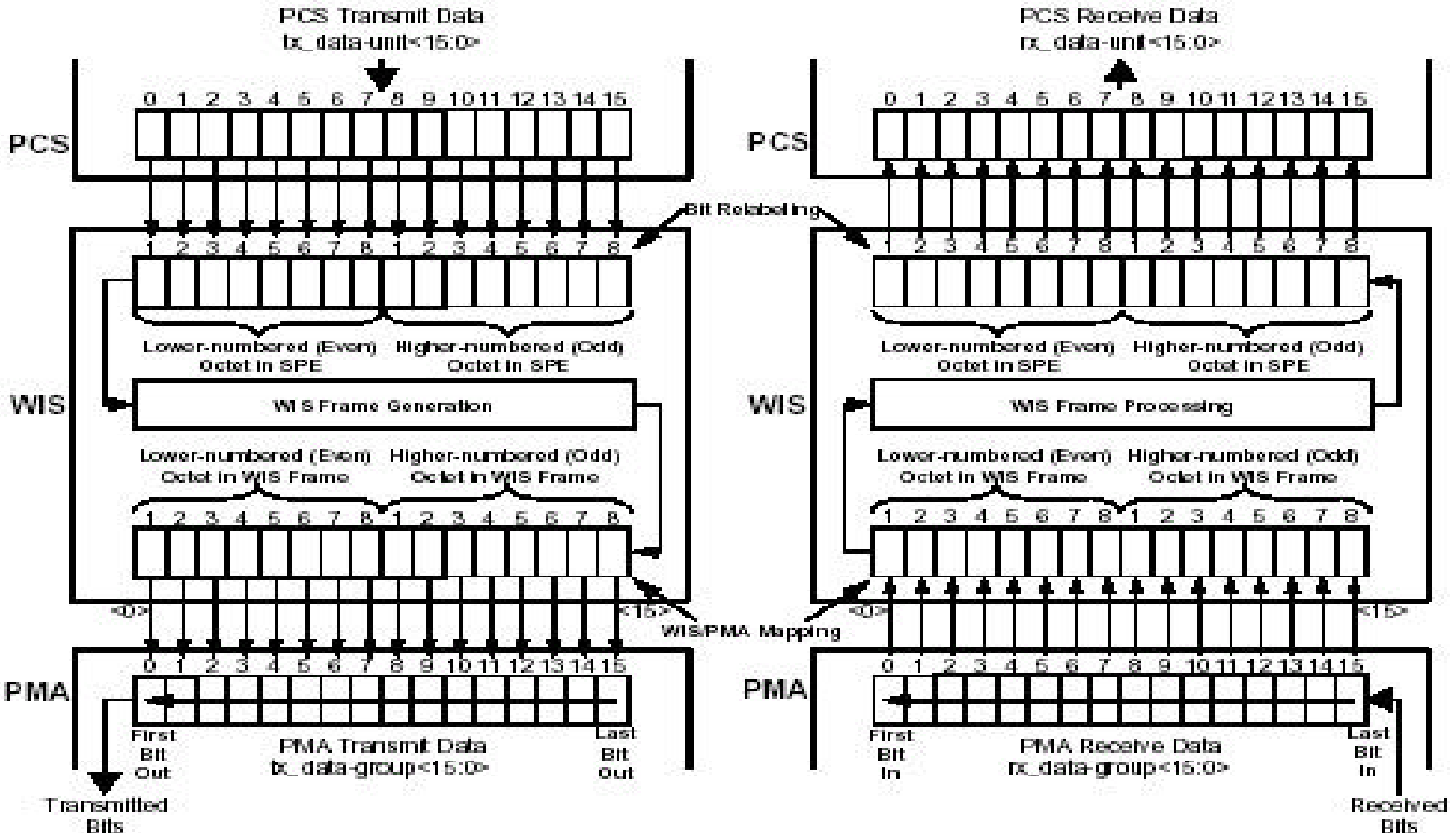
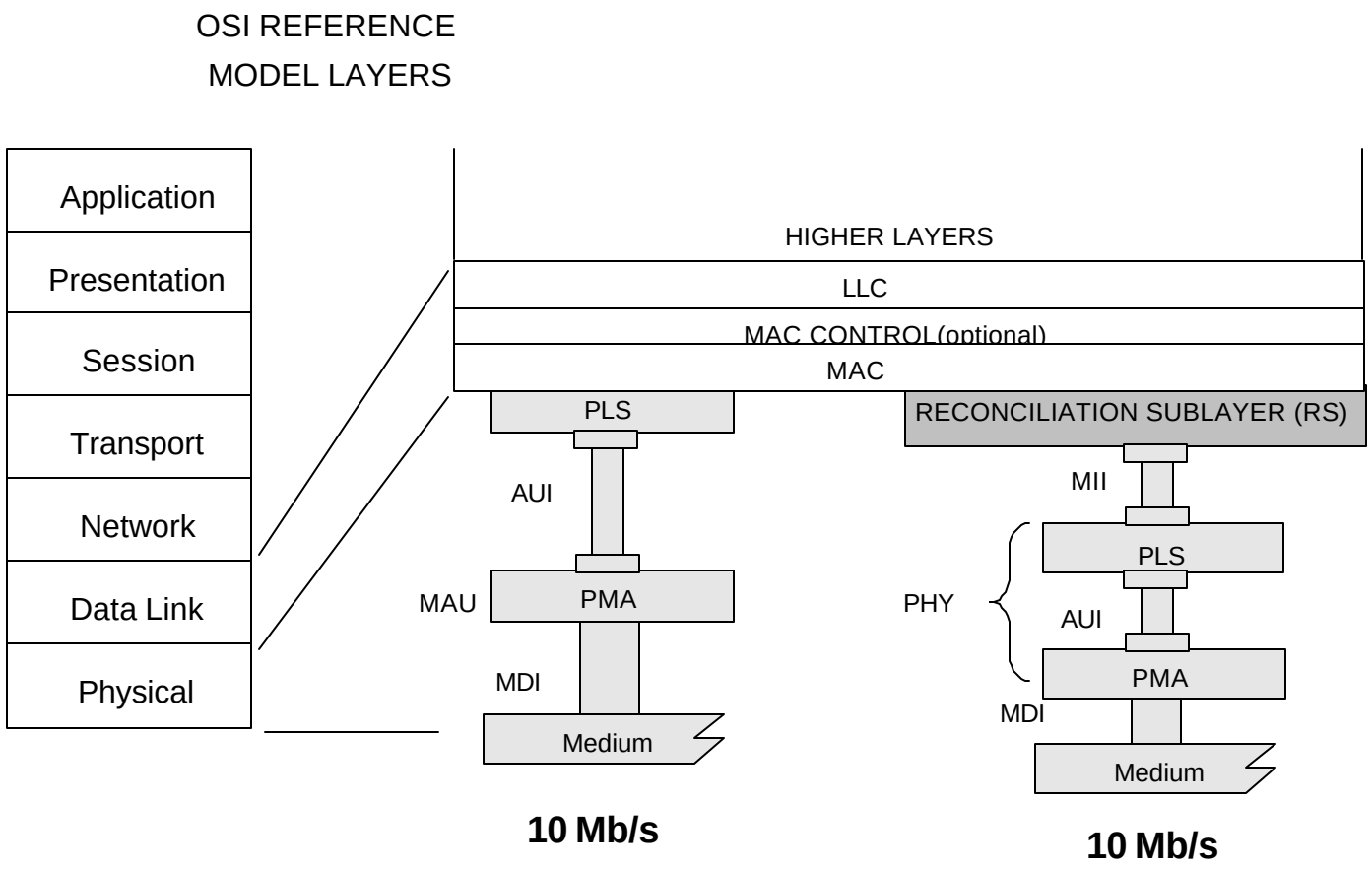


Figure 49–3—Transmission order - 10GBASE-W PHY


OSI REFERENCE
MODEL LAYERS
Application
Presentation
Session
Transport
Network
Data Link
Physical
HIGHER LAYERS
LLC
MAC CONTROL (optional)
MAC
PLS
AUI
MAU
PMA
MDI
Medium
10 Mb/s
RECONCILIATION SUBLAYER (RS)
MII
PLS
PHY
AUI
PMA
MDI
Medium
10 Mb/s