Reference 10GbE Implementation

Device A includes XGMII + XAUI , Device B includes XGMII

Device A — PHY — MAC — RS — TXC, TXD (36), XGMII, RXC, RXD (36) — XGXS — XAUI — X G X S P C S P M A P M D — MDI

Device B — PHY — MAC — RS — TXC, TXD (36), XGMII, RXC, RXD (36) — P C S P M A P M D — MDI

Transceiver Modules
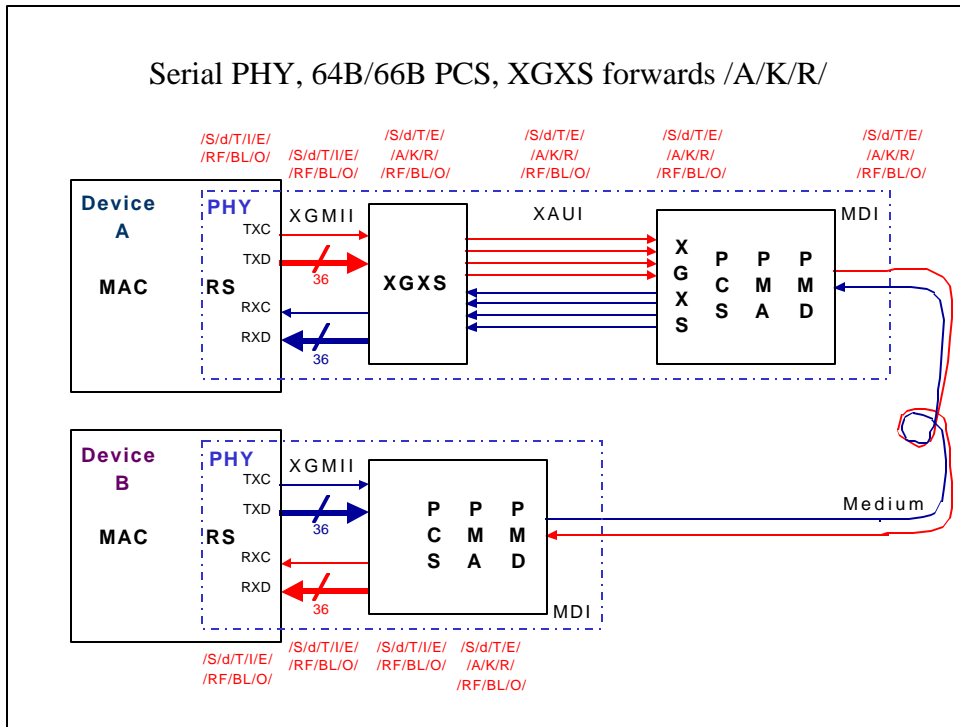Initial 10 GbE Form Factor: Daughter Card

Medium

- XAUI/XGXS and XGMII are both optional physical instantiations of the PCS Service Interface.

- An Ethernet device implementation may contain either, neither, both, or multiple instances of either XAUI/XGXS and XGMII.

- For purposes of data and code transport, Device A represents the case of either XAUI/XGXS + XGMII or XAUI alone since the XGMII does not perform code translation.

- For purposes of data and code transport, Device B represents the case of either XGMII alone, neither XAUI/XGXS nor XGMII, or XAUI/XGXS with XGMII on both sides since the XGMII does not perform code translation.

- It is assumed that the Reconciliation Sublayer is required to transport the following data and control information:
  - Start of Packet /S/
  - Data /d/
  - End of Packet /T/
  - Idle /I/
  - Error /E/
  - Remote Fault /RF/ (used in Fast/Gigabit Ethernet)
  - Break Link /BL/ (used in Fast/Gigabit Ethernet)
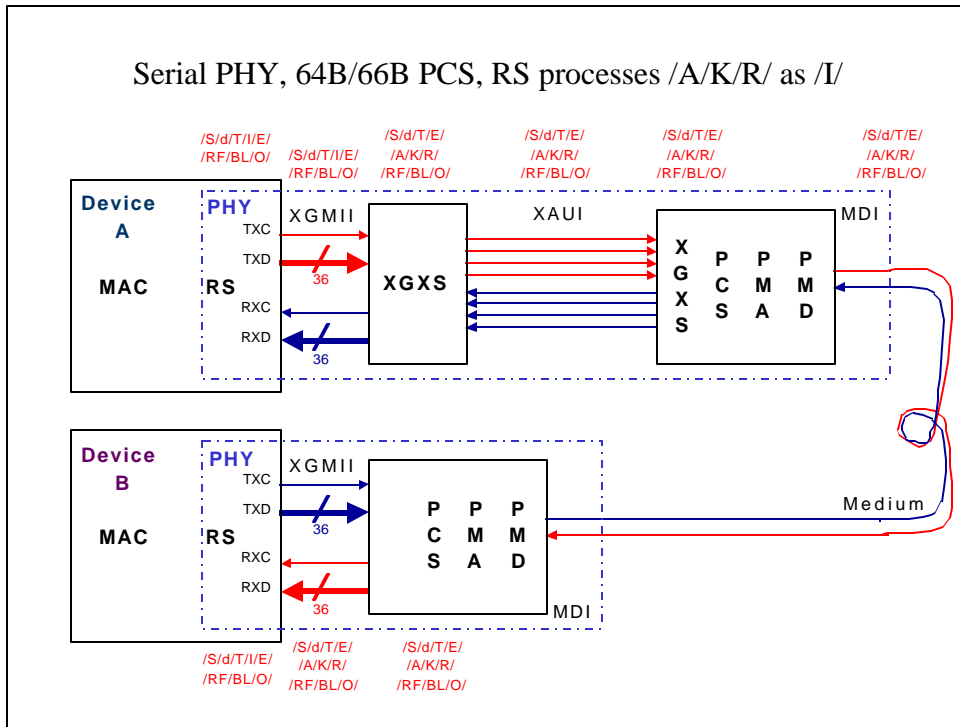 - Other /O/ (reserved or for other standards, OAM&P, etc.)

Serial PHY, 64B/66B PCS, XGXS never forwards /A/K/R/
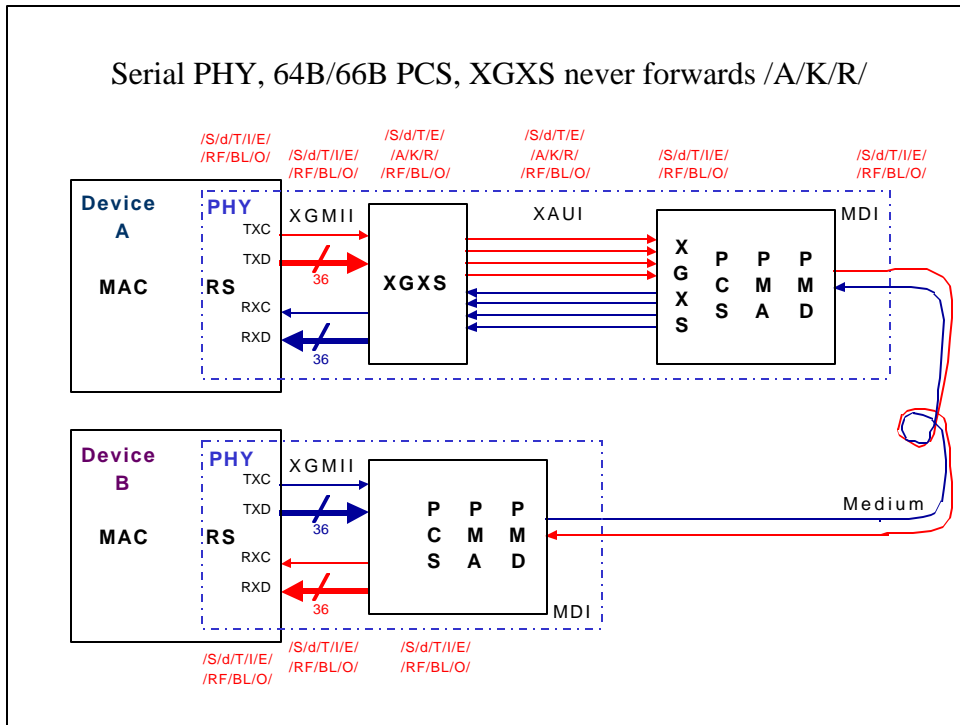
Device A to Device B data and control transport

- XGXS adjacent to Device A XGMII translates Idle /I/ to XAUI Idle /A/K/R/.

- XGXS adjacent to Device A PCS must be "PCS aware" and reverse translate XAUI Idle /A/K/R/ back to Idle /I/.

  - This reverse translation is not required for WWDM;

  - PCS transport of /A/K/R/ vs. /I/ requires no additional (64B/66B) subframes or logic if it is assumed that RS code space = XGMII code space = XGXS code space = XAUI code space = PCS code space = codes space available for transport over the medium.

 - PCS must still transport /S/d/I/E/RF/BL/O/.

Serial PHY, 64B/66B PCS, XGXS forwards /A/K/R/

/S/d/T/I/E/ /RF/BL/O/ /S/d/T/I/E/ /RF/BL/O/ /S/d/T/E/ /A/K/R/ /RF/BL/O/ /S/d/T/E/ /A/K/R/ /RF/BL/O/ /S/d/T/E/ /A/K/R/ /RF/BL/O/ /S/d/T/E/ /A/K/R/ /RF/BL/O/

Device A **PHY** XGMII XAUI MDI

MAC **RS** TXC TXD RXC RXD 36 36

XGXS

X G X S P C S P M A P M D

Device B **PHY** XGMII

MAC **RS** TXC TXD RXC RXD 36 36

P C S P M A P M D

Medium

MDI

/S/d/T/I/E/ /RF/BL/O/ /S/d/T/I/E/ /RF/BL/O/ /S/d/T/I/E/ /RF/BL/O/ /S/d/T/E/ /A/K/R/ /RF/BL/O/

Device A to Device B data and control transport

- PCS adjacent to Device A XGXS forwards XAUI Idle /A/K/R/ to Device B.
- Device B PCS must be "XAUI aware" and reverse translate XAUI Idle /A/K/R/ back to Idle /I/ if XAUI is not present, as is the case with Device B.
- Current Reconciliation Sublayer (RS) proposal does process /A/K/R/ as /I/.
    - However, RS must handle multiple codes /S/d/I/E/RF/BL/O/.
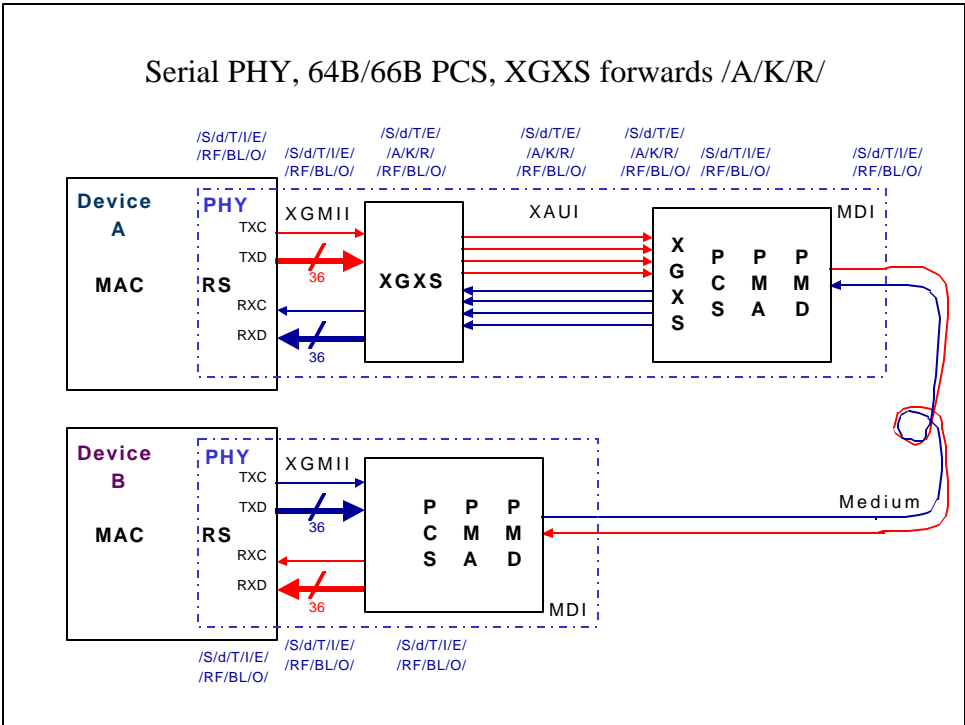   - Alternative proposal is to modify RS to treat /A/K/R/ as /I/.

Serial PHY, 64B/66B PCS, RS processes /A/K/R/ as /I/

/S/d/T/I/E/
/RF/BL/O/ /S/d/T/I/E/
/RF/BL/O/ /S/d/T/E/
/A/K/R/
/RF/BL/O/ /S/d/T/E/
/A/K/R/
/RF/BL/O/ /S/d/T/E/
/A/K/R/
/RF/BL/O/

Device A

PHY

MAC

RS

TXC
TXD
RXC
RXD

XGMII

36

36

XGXS

XAUI

X
G
X
S

P
C
S

P
M
A

P
M
D

MDI

Device B

PHY

MAC

RS

TXC
TXD
RXC
RXD

XGMII

36

36

P
C
S

P
M
A

P
M
D

MDI

Medium

/S/d/T/I/E/
/RF/BL/O/ /S/d/T/E/
/A/K/R/
/RF/BL/O/ /S/d/T/E/
/A/K/R/
/RF/BL/O/

Device A to Device B data and control transport

- PCS adjacent to Device A XGXS forwards XAUI Idle /A/K/R/ to Device B.
- Neither Device A nor B need to be PCS or XAUI aware.
- XGXS transmitter translates Idle /I/ to XAUI Idle /A/K/R/.
  - Exact Idle pattern is XGXS specific, includes only /A/K/R/ code-groups and may be specified to be "EMI friendly".
- RS receiver translates /A/K/R/ to /I/.
  - Translation is by individual code-group, not column basis.
  - /A/K/R/ code-groups cannot be used to form code-words, whether column-based or in any other combination of multiple code-groups for sake of translation simplicity.
  - RS receiver action is analogous to that of GbE 1000BASE-X PCS where any data code present in the /K/d/ Idle stream is considered to be an Idle /I/.
    - PCS transmitter generates:
      /K28.5/D5.6/ - Correcting Idle
      /K28.5/D16.2/ - Preserving Idle
    - PCS receiver translates:
      /K28.5/Dxx.y/ - Idle
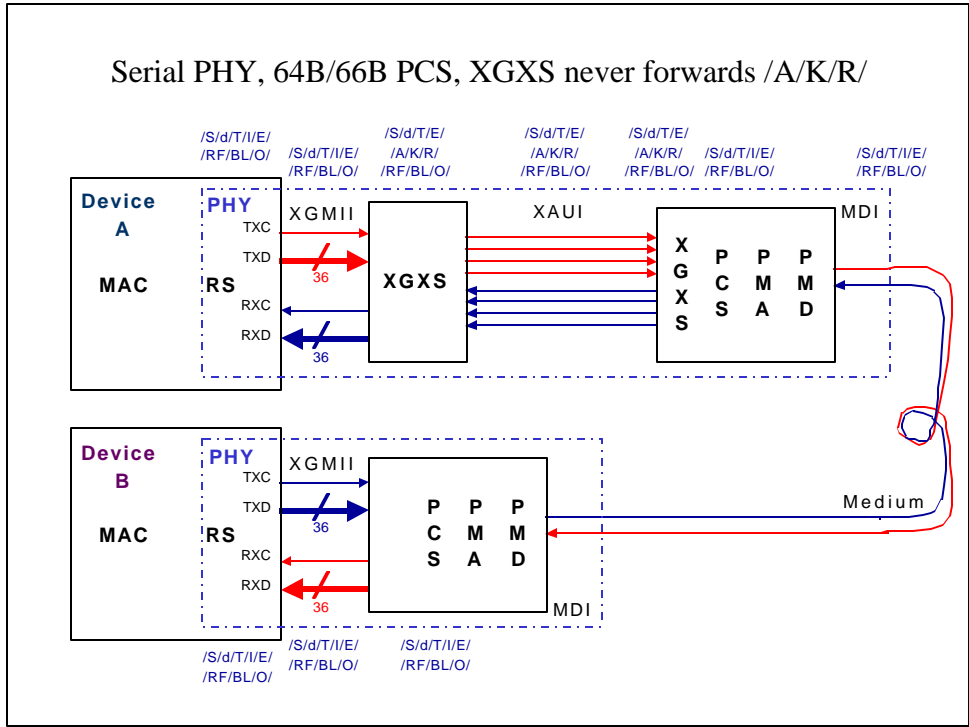
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Serial PHY, 64B/66B PCS, XGXS never forwards /A/K/R/

Device B to Device A data and control transport

- XGXS adjacent to Device A XGMII is required to translates XAUI Idle /A/K/R/ to Idle /I/.

- Alternative proposal is to modify RS to treat /A/K/R/ as /I/.

  - Removes requirement for /A/K/R/ to Idle /I/ translation in XGXS receiver.

  - Simplifies XGXS receiver logic.

Serial PHY, 64B/66B PCS, XGXS forwards /A/K/R/

Device B to Device A data and control transport

- No additional impact in this data direction than indicated in prior slide:

- XGXS adjacent to Device A XGMII is required to translates XAUI Idle /A/K/R/ to Idle /I/.

- Alternative proposal is to modify RS to treat /A/K/R/ as /I/.

    - Removes requirement for /A/K/R/ to Idle /I/ translation in XGXS receiver.

    - Simplifies XGXS receiver logic.

Serial PHY, 64B/66B PCS, RS processes /A/K/R/ as /I/
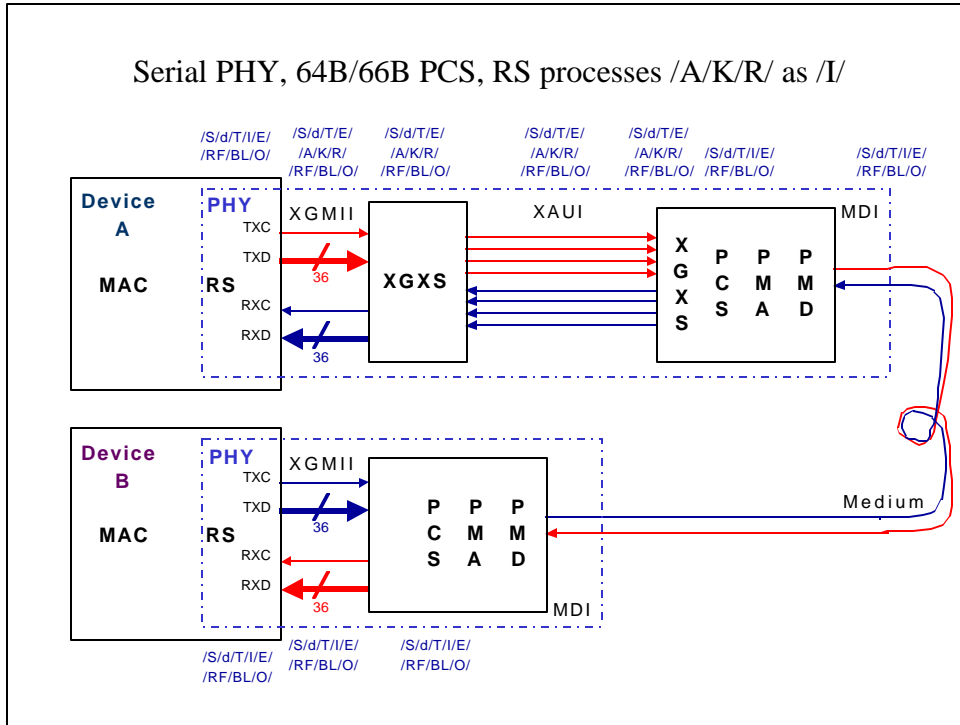
Device B to Device A data and control transport

- XGXS adjacent to Device A XGMII forwards XAUI Idle /A/K/R/ to Device A Reconciliation Sublayer (RS).

- Neither Device A nor B need to be PCS or XAUI aware.

  - XGXS transmitter translates Idle /I/ to XAUI Idle /A/K/R/.

  - RS receiver translates /A/K/R/ to /I/.