Ethernet Preamble Transparency for OAM capability

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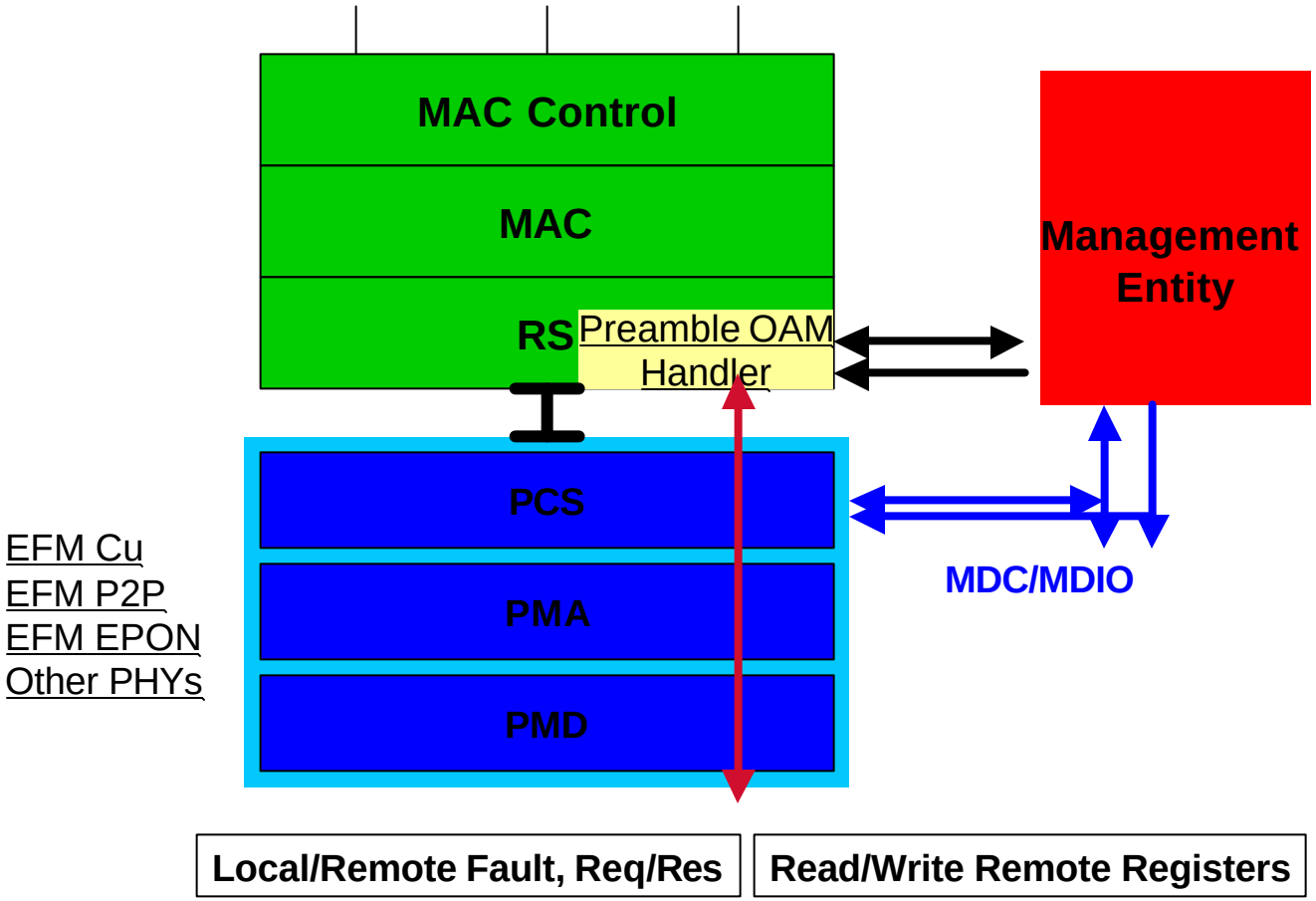
Issues addressed

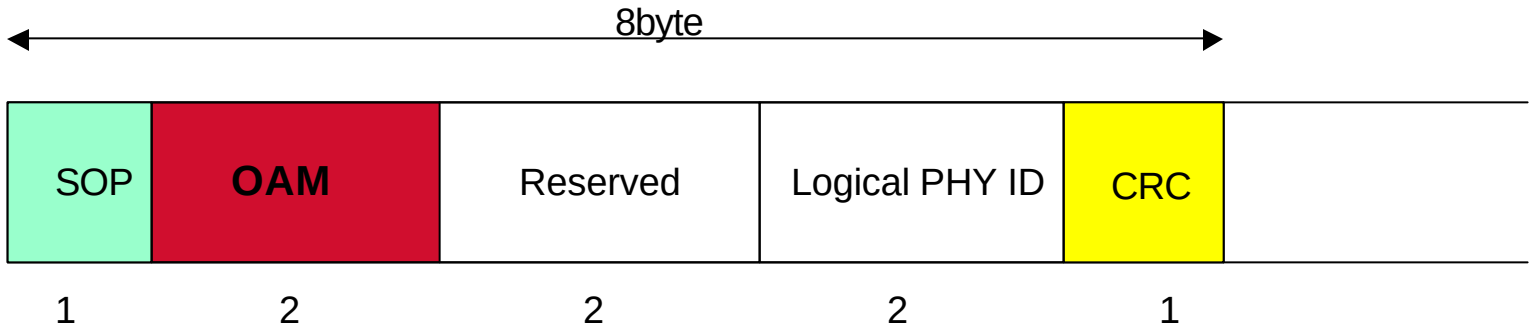
- OAM on Preamble
- Preamble Transparency for Full Duplex
- 2 Byte Symbol Idle Sequence Alignment in 8B/10B PCS
- Affected Clause List
- Detecting Frames

Where is OAM Preamble Handler : RS



OAM on Preamble

- **8 byte Preamble to carry:**
  - **2 bytes: OAM**
  - **2 bytes: Reserved (for e.g. extended use of OAM)**
  - **2 bytes: For Logical PHY ID**
  - **1 byte: HEC**
- **If there is no data frame, generate a dummy frame.**
- **When passing a frame to MAC, convert back to the normal preamble.**



Preamble Transparency

- **Limit to the OAM scope to "Full Duplex: Ethernet**
  - **No Half duplex; CSMA/CD undesirably limits distance in EFM**
  - **Full duplex does not have any arbitrary preamble shrinkage**
- **100BaseX Full duplex: 4B5B PCS preserves preamble**
- **1000BaseT Full duplex: PAM5 PCS preserves preamble**
- **1000BaseCX/SXLX:**
  - **8B/10B idle sequence pair imposed two byte alignment**
  - **Choice was between shrink/stretch IPG or shrink Preamble**
  - **Decision was made to shrink Preamble due to half-duplex operation considerations**
- **10GBaseX:**
  - **Had similar alignment issues (SOP and lane alignment)**
  - **Chose not to shrink Preamble; varied IPG as there was no half-duplex operation considerations**

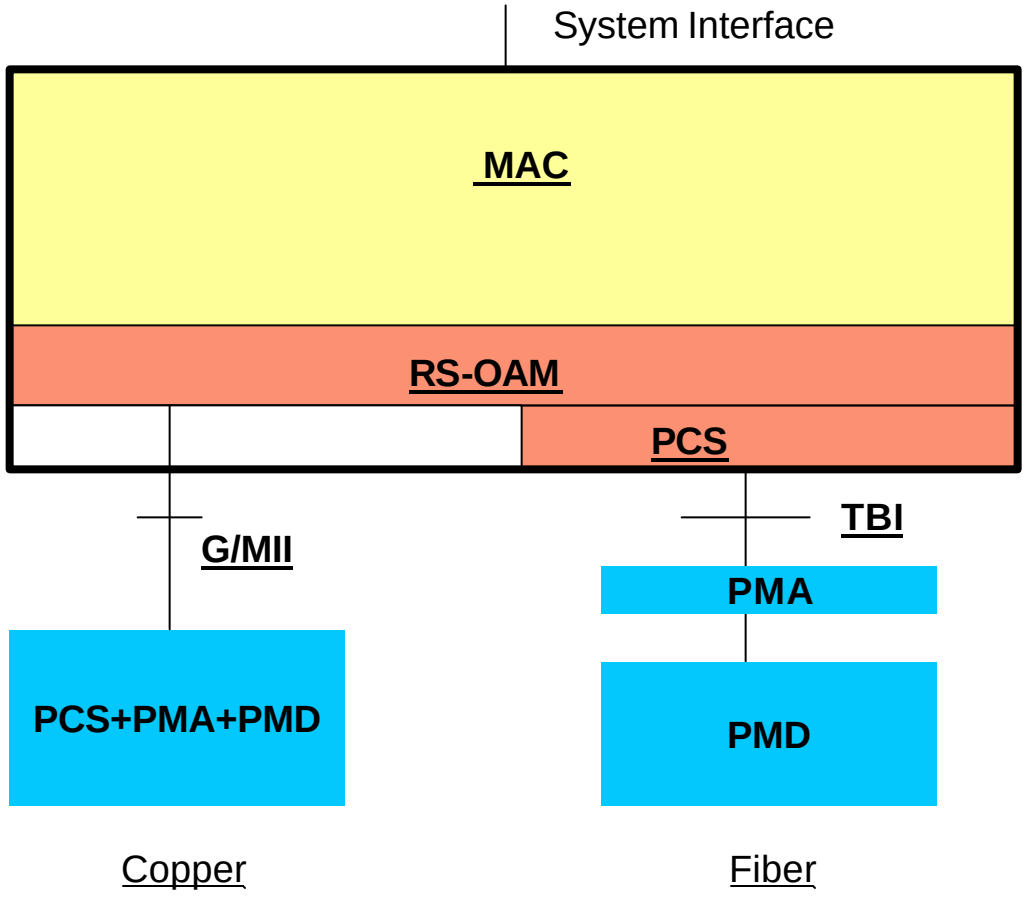
Preamble Transparency Table

Media (Full Duplex)	Current Spec scope	Action to PHY /GMII	Action to RS
802.3ah P2P Cupper	New PHY (10M ~ 100M)	New PHY specs make sure Preamble to be carried transparently to RS	New RS layer Spec to Handle OAM on Preamble
802.3ah EPON	New PHY (1GE)	New PHY specs make sure Preamble to be carried transparently to RS	
802.3ah P2P Fiber	New PHY (1GE, PMD only ?) Existing PCS/RS may have 1byte preamble shrinkage.	Have to add amendment on PCS/GMII	
100Base TX 100base FX	Existing 4B5B PCS preserves 7Byte preamble + SFD to RS	No	
1000base Tx (802.3ab)	Existing PAM5 PCS preserves 7Byte preamble + SFD to RS	No	
1000Base X (802.3z)	Existing 8B10B PHY/RS may have 1byte preamble shrinkage.	Have to add amendment on PCS/GMII	
10Gbase (802.3ae)	Existing preserves 7Byte preamble + SFD to RS	No	

802.3z PCS - Maintain 2 Idle Byte Alignment and 8 Byte Preamble

- Minimum transmit IPG of 12 byte times (MAC specification)
- RS does not modify the minimum transmit IPG of 12 byte times of MAC
- Allow variation in minimum IPG at the Transmit PCS
  - Hold packet until 2 byte alignment is achieved and make it up by shrinking following IPG
  - This would cause minimum IPG variation between 11 and 13 bytes, but it would always be average 12
  - No Preamble Compression
  - No significant change in PCS except do not chop one byte of preamble

Typical EFM-OAM Implementation



What sub-layer affected to support preamble transparency ?

- **RS sub-layer: for all Full duplex Ethernet**
  - **A new Clause on RS-OAM sub layer**
- **PCS sub-layer to make sure Preamble to be transparent for EFM-OAM**
  - **EFM New PCS Clauses (P2P Cu, P2P Fiber, EPON)**
  - **Add Clause 36 (802.3z PCS) or annex: Transmit PCS does not shrink MAC Preamble and at transmit PCS minimum allowed IPG is 11 byte times**

Detecting Start of Frame at RS

- **We can rely on "DataEnable" on GMII to detect start of frame, once Preamble length is preserved.**
  - **-Step 1: Detect DataEnable from GMII**
  - **-Step 2: Convert first 7 bytes to (55) to MAC**
  - **-Step 3: Convert 8th byte to SFD (D5) to MAC**
  - **-Step 4: it is the start of MAC Frame (DA + SA + …..)**

Summary

- **RS Layer to handle OAM over Preamble**
- **Only Full Duplex PHYs**
- **Proposal of a small correction to 802.3z PCS TX to support Preamble transparency for EFM-OAM**