AV Time Synchronization Model

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GOALS

- Define interoperability features
  - Bridging “Time” from one LAN to another
    - Interoperation between LANs
  - Define extension to MAC Service Interface to get timestamps

- Measurement:
  - Define timestamp snapshot precisely across various PHYs (.3, .11)
  - Define measurement accuracy options

- Protocol:
  - Define “Generic Messages” example
    - Would be used for 802.3 networks
  - Non 802.3 media would use the “Generic Messages” or define their own

802.1as will extend the service interface with timestamp. We must ensure the extension is generic enough to work for .11
802.3 architecture and timestamps

Clause 6 – Physical Signalling Service

Defined for 10Mb/s speeds

Clauses 22, 35, and 46 define mappings
To Clause 6 for 100Mb/s, 1Gb/s, and 10Gb/s, respectively

Delay tolerance

802.3-2005
Table 35-5 GMII
(48bits from TX_EN)

MAC PLS service
(Std 802.3-2005 6 – 10Mb/s)

PLS_DATA.request (OUTPUT_UNIT) [6.3.1.1.2]: MAC request to transmit a single data bit.
OUTPUT_UNIT can have values of ONE, ZERO, or DATA_COMPLETE

PLS_DATA.indication (INPUT_UNIT) [6.3.1.2.2]: Generated to all MAC sublayers after a PLS_DATA.request is issued.
INPUT_UNIT can have ONE or ZERO values.

ISSUES:
- Not clear what a PLS data_unit is – 802.3 frame/bit?
  BIT
- Not clear when PLS_DATA.indicate is issued as related to an incoming data/frame.
  PLS_CATA.indicate is generated for each bit received.
Proposal for Time/sync in 802.3 architecture

GMII Reconciliation sublayer (Std 802.3-2005 35.2.1)

MAC PLS service (Std 802.3-2005 35 – 1Gb/s)

PLS_DATA.request (OUTPUT_UNIT) [35.2.1.1.2] : MAC request to transmit a single data bit.
  OUTPUT_UNIT allowed values: ONE, ZERO, TRANSMIT_COMPLETE, EXTEND, EXTEND_ERROR

PLS_DATA.indication (INPUT_UNIT) [35.2.1.2.2]: Generated to all MAC sublayers after a PLS_DATA request is issued.
  INPUT_UNIT allowed values: ONE, ZERO, EXTEND.

PLS_DATA_VALID.indication (DATA_VALID_STATUS) [35.2.1.7]: Generated when DATA_VALID_STATUS change occurs.
  DATA_VALID_STATUS allowed values: DATA_VALID, DATA_NOT_VALID.

PLS_DATA.StrTx: marking beginning of transmission on PHY.
PLS_DATA.EndTx: marking end of successful transmission on PHY.
Proposal for Time/sync in 802.3 architecture

**Proposals:**

1. RS supports additional timing signals
   - MAC client implements PTP protocol
   - Timestamp handled at PTP (LLC) sublayer.
   - MAC sublayer needs to generate MAC_DATA.StrTx, MAC_DATA.EndTx, MAC_DATA.ErrTx
   - MAC sublayer needs to receive PLS_DATA.StrTx and PLS_Data.EndTx
   - Issues:
     - Preamble shrinkage – SFD jitter
     - TX and RX clock mismatch – SFD jitter

2. MAC layer assumes transmission happens instantly upon PLS_DATA.request(OUTPUT_DATA)
Time/sync in 802.11 architecture

Proposal:
- Timestamping
- Sync/Followup
- Pdelay/Resp

**PLS_DATA.indicate**: used for reception timestamp

**PLS_DATA.tx**: new primitive, for transmission timestamp

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**Figure 18**—MAC data plane architecture

**Figure 155**—Fragmentation