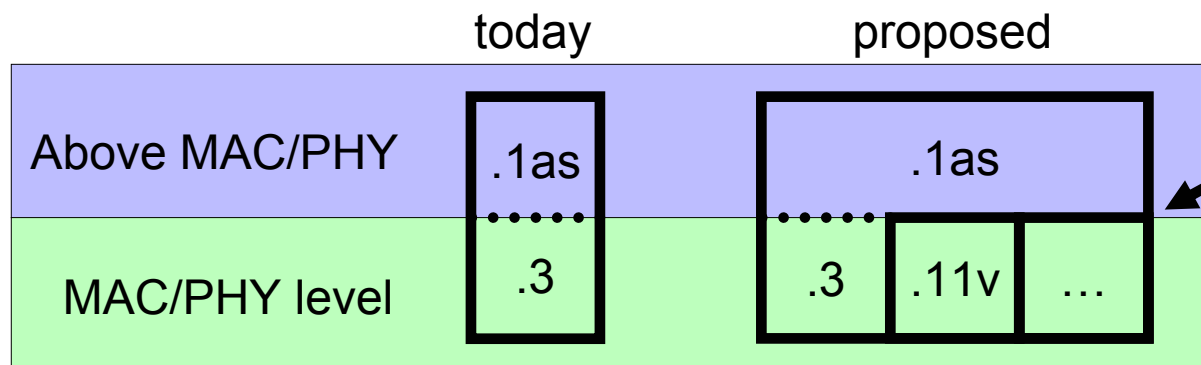


AV Time Synchronization Model

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NEC Labs

GOALS



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

- 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

802.3 architecture and timestamps

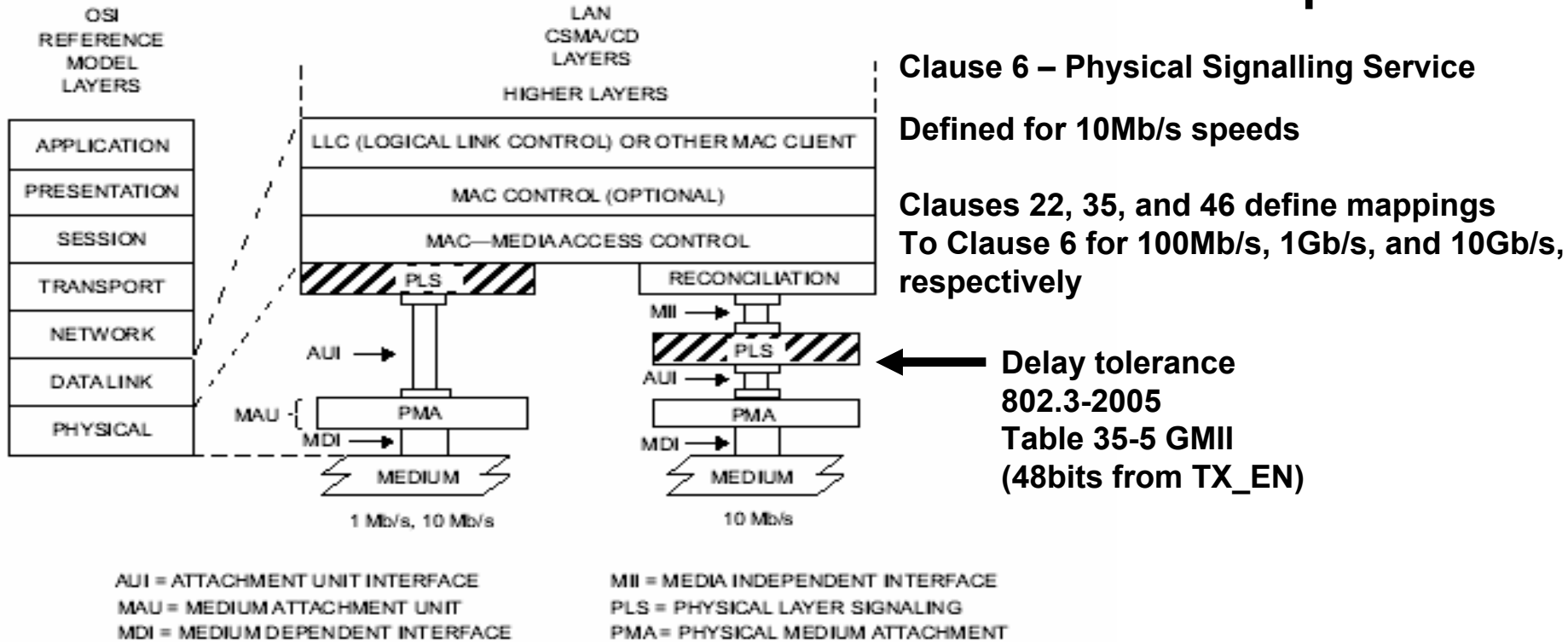


Figure 6–1—PLS service specification relationship to the ISO/IEC Open Systems Interconnection (OSI) reference model and the IEEE 802.3 CSMA/CD LAN model

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

GMI Reconciliation sublayer (Std 802.3-2005 35.2.1)

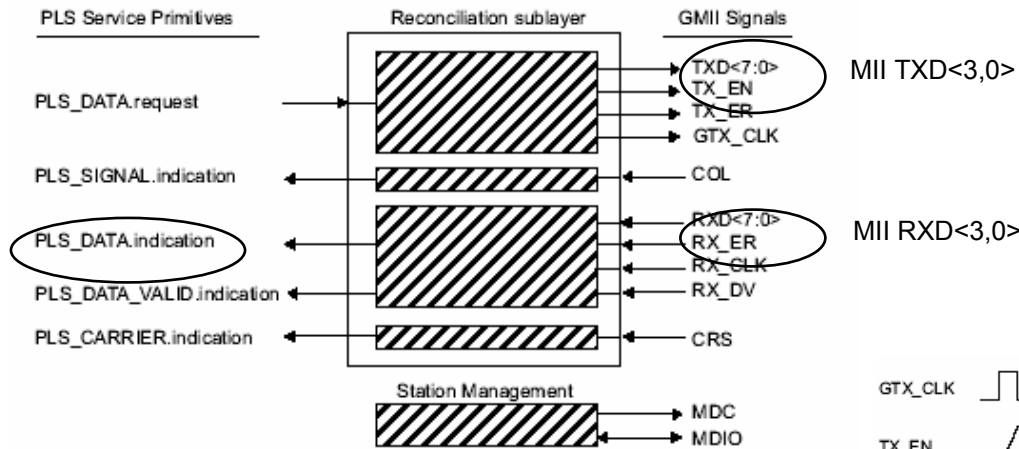


Figure 35-2—Reconciliation Sublayer (RS) inputs and outputs and STA connections to GMII

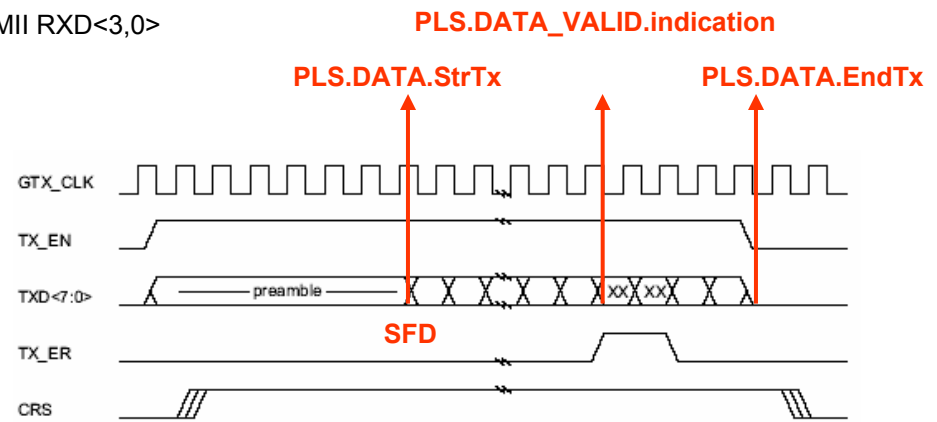


Figure 35-4—Propagating an error within a frame

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.

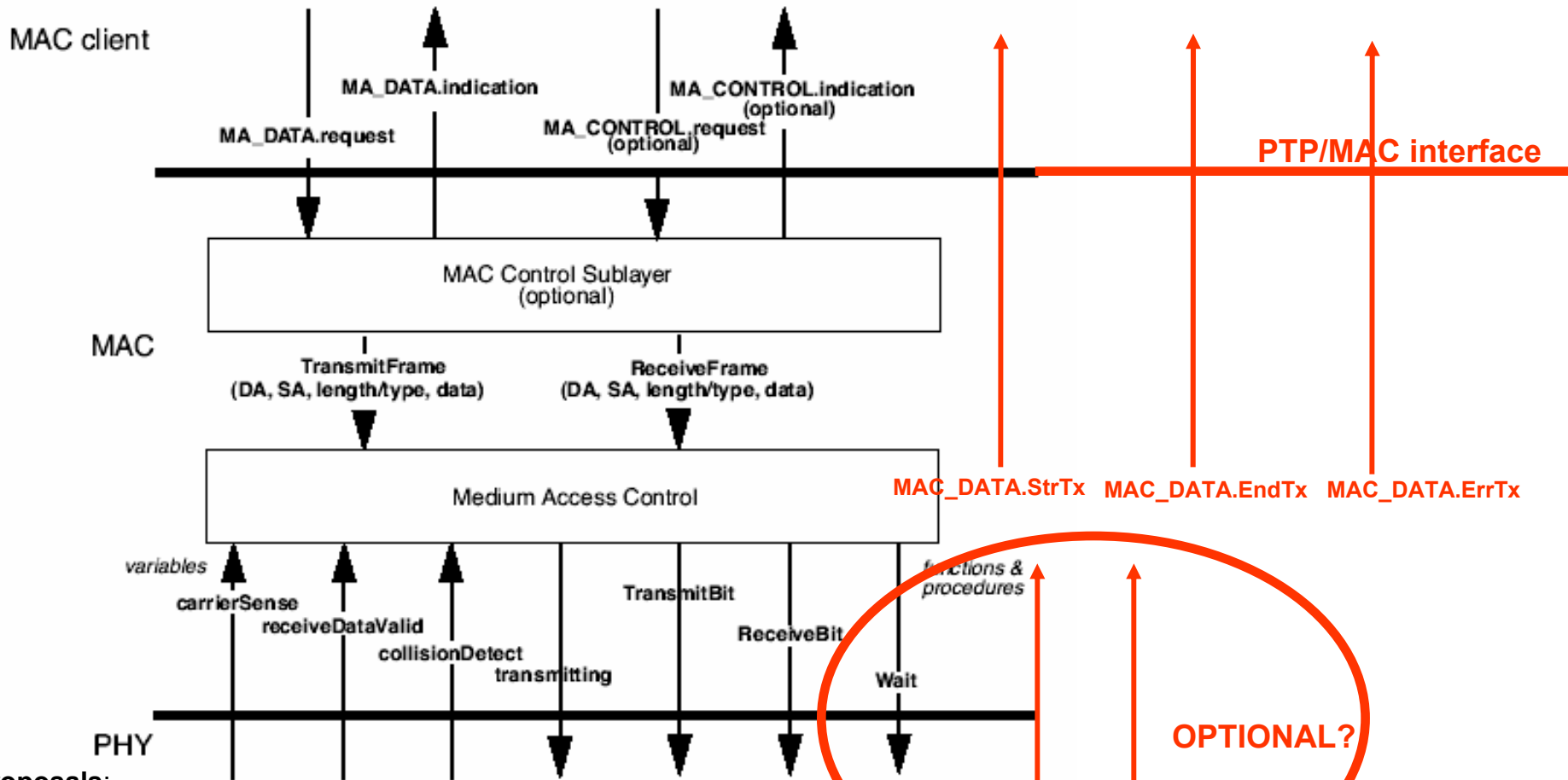
PLS_DATA_VALID.indication (DATA_VALID_STATUS) [35.2.1.7]: Generated when DATA_VALID_STATUS change occurs.

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`

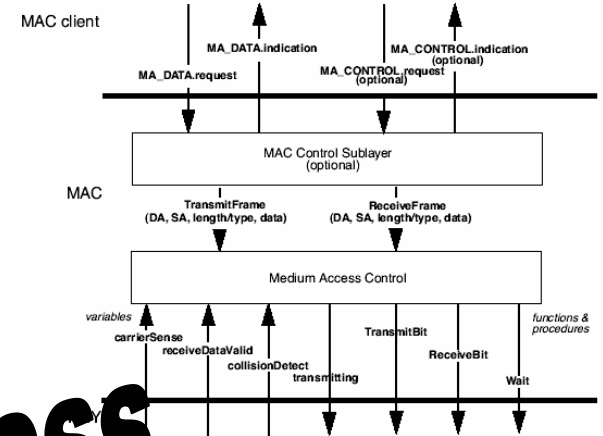
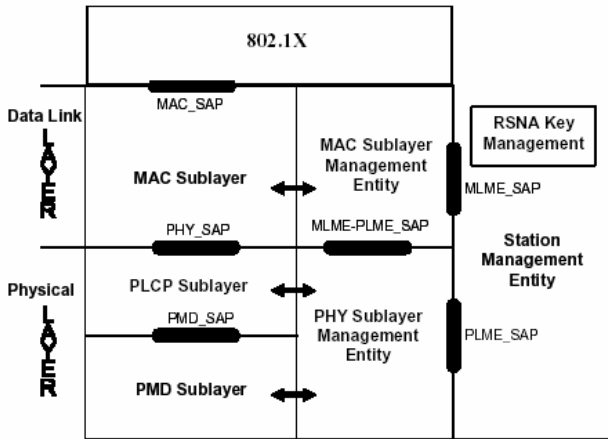
-Issues:

-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



Work In Progress

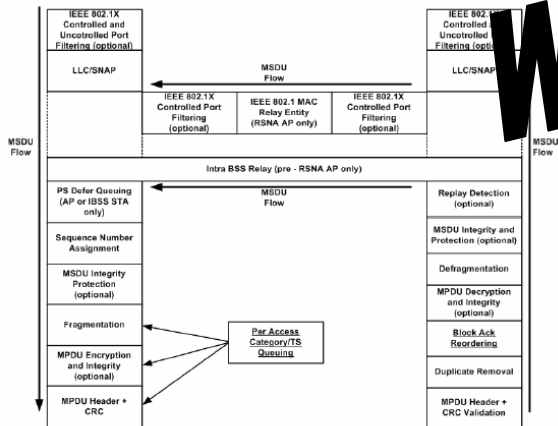


Figure 18—MAC data plane architecture

PLS_DATA.indicate : used for reception timestamp
 PLS_DATA.tx : new primitive, for transmission timestamp

Proposal:
 -Sync/Followup
 -Pdelay/Resp

Proposal:
 - Timestamping

dataTx

dataTx

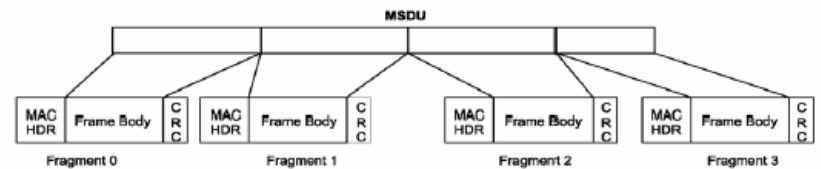


Figure 155—Fragmentation