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Time Synchronization Service Interface and Preemption

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Overview

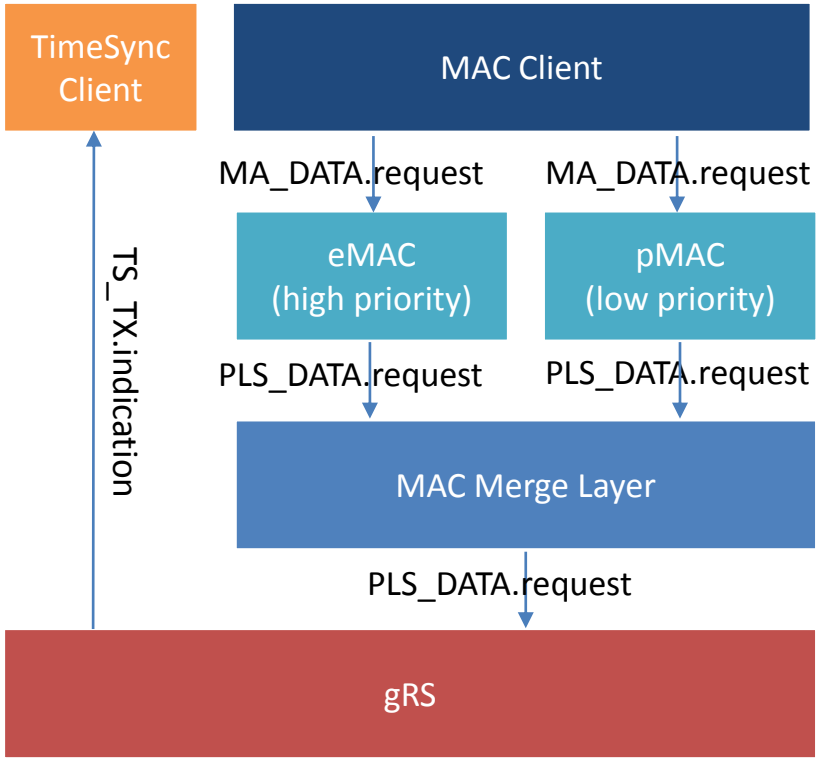
- The Time Synchronization Service Interface (TSSI) was defined in IEEE 802.3bf.
- IEEE 802.1AS is currently not using the TSSI features.
- It was explicitly mentioned in the IEEE 802.1ASbt PAR to add this interface to IEEE 802.1AS („Incorporation of the interfaces specified in IEEE Std 802.3bf into the IEEE 802.3 full-duplex media-dependent layer model.”)
- TSSI indicates the reception or transmission of a SFD to the higher layer.
- It is currently not defined how this indication is exactly used by IEEE 802.1AS.
- It seems to be necessary to modify the TSSI specification in order to support preemption.
- As Preemption and time synchronization will be used in the same network they need to interoperate.

Assumptions

- TSSI currently seems to indicate only the reception of “normal” SFDs. In order to interoperate with preemption, TSSI would need to indicate IET SMDs.

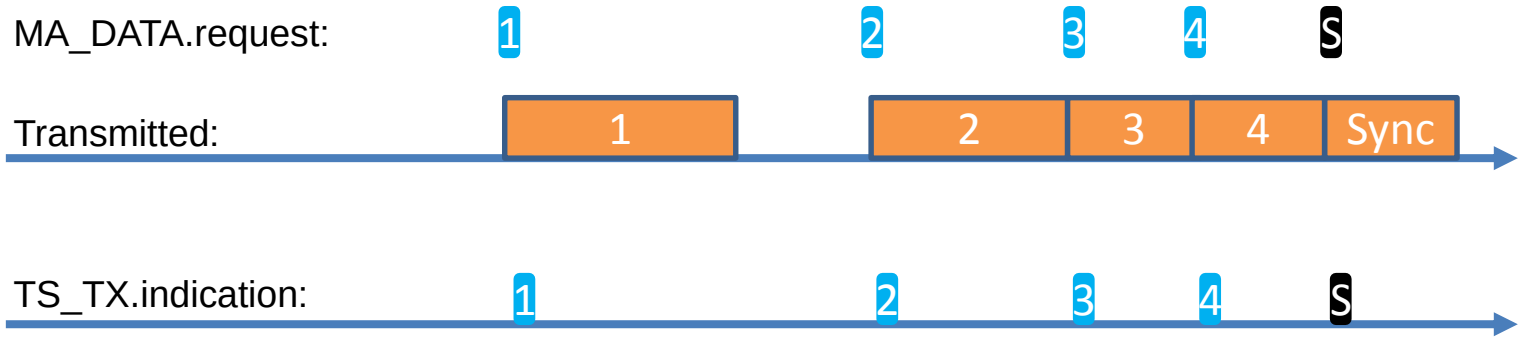
- The IET SMDs also include non initial fragment SMDs (SMD-Cx). There seems to be no need to indicate the start of non initial fragments, therefore this presentation assumes that non initial fragments are not indicated by the TSSI

Transmit

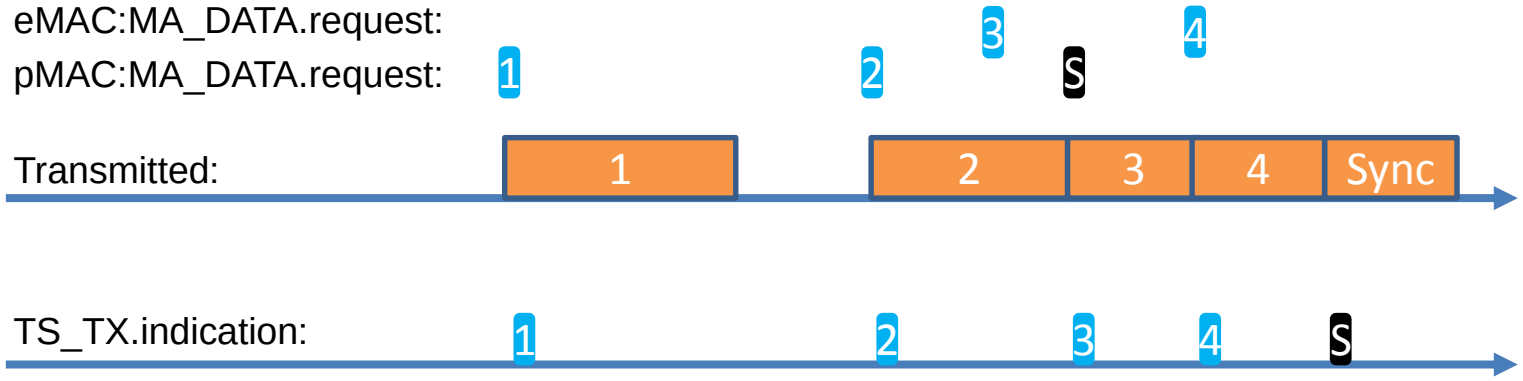

TimeSync Client
MAC Client
MA_DATA.request
MA_DATA.request
eMAC (high priority)
pMAC (low priority)
PLS_DATA.request
PLS_DATA.request
TS_TX.indication
MAC Merge Layer
PLS_DATA.request
gRS

Transmit Example

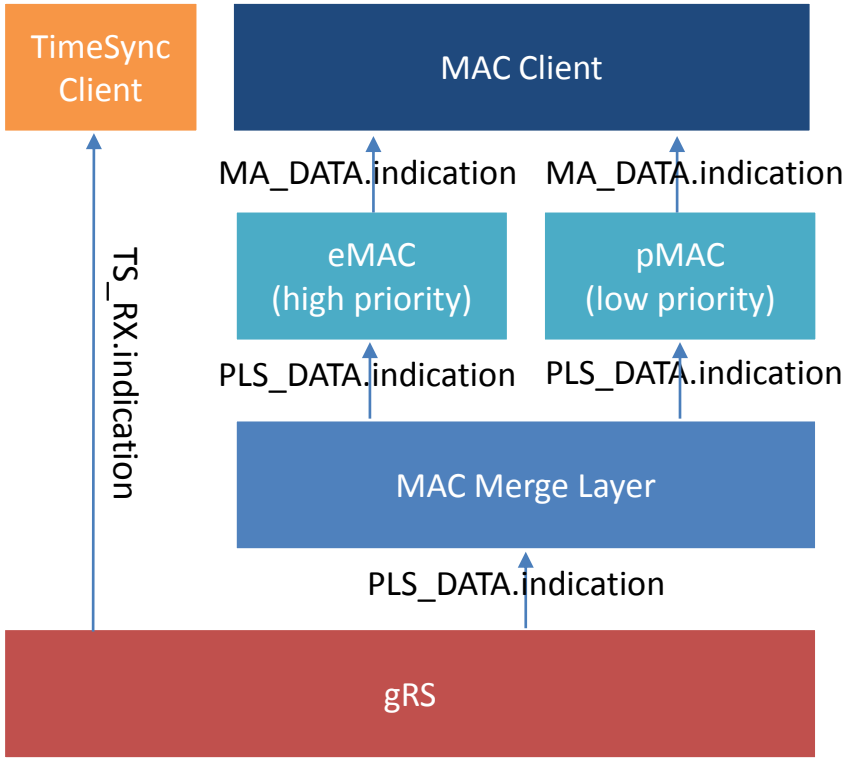
Without Preemption:



With Preemption:

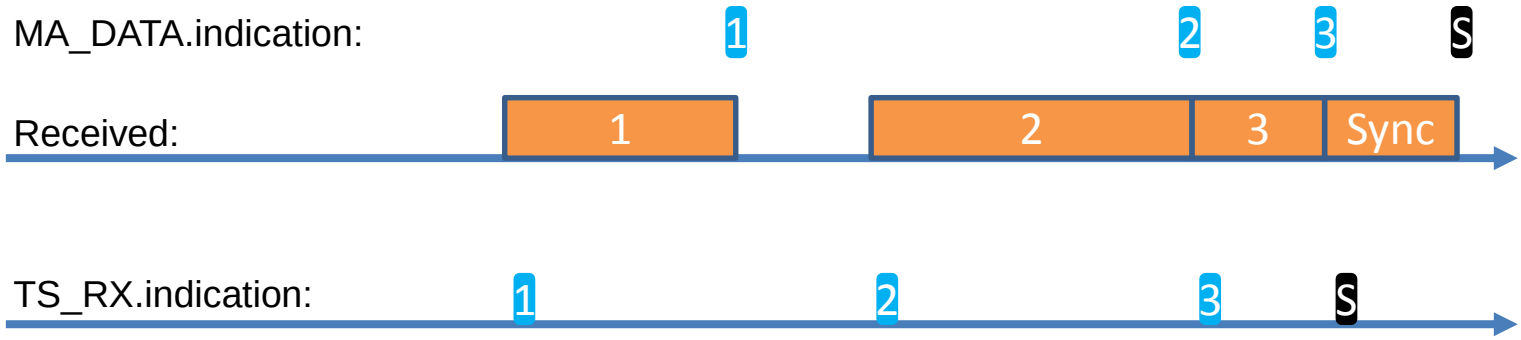


Receive

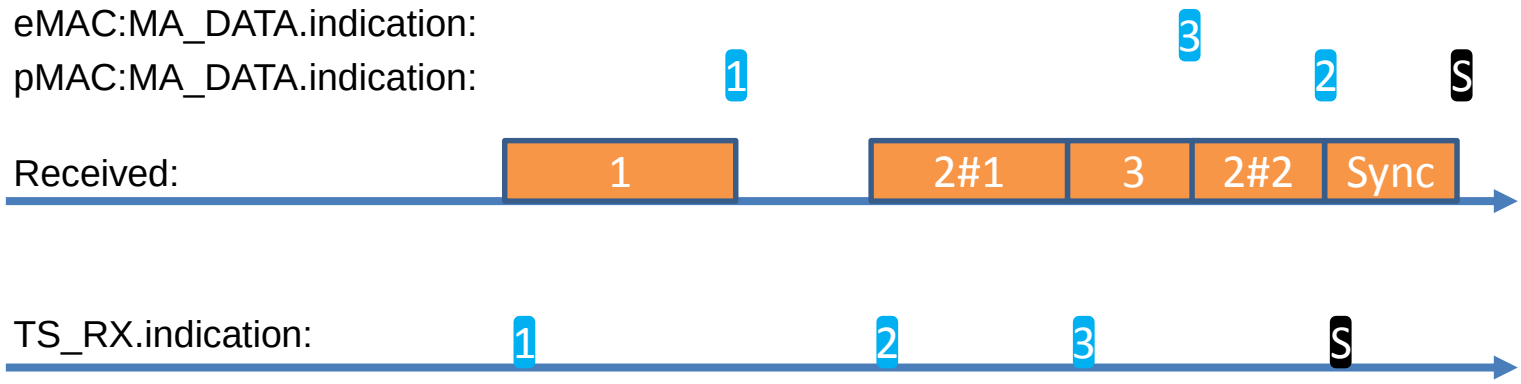

TimeSync Client
MAC Client
MA_DATA.indication
MA_DATA.indication
eMAC (high priority)
pMAC (low priority)
PLS_DATA.indication
PLS_DATA.indication
TS_RX.indication
MAC Merge Layer
PLS_DATA.indication
gRS

Receive Example

Without Preemption:



With Preemption:



Issue

- IET provides two MAC interfaces, but TSSI provides only one set of TSSI indications. This makes the TSSI indications ambiguous.

- Indications of frames transmitted by the pMAC might arrive after one or more indications of eMAC frames.

  In order to match the corresponding frames and indications, it would be necessary to check if the pMAC has finished its transmission and is ready to transmit another frame. In that case the last indication would correspond with this frame (as long as the pMAC frame is not preempted)

- Indications of frames received by the eMAC (and pMAC if the frames get preempted) cannot be associated with each other.

- The solution to this might not be within our scope, if we decide that this is a real issue, we might need to talk to 802.3.

Possible Solutions

- It is guaranteed that PTP event frames
  - are never preempted,
  - use only the pMAC and
  - the knowledge of the status of the transmission (transmission finished) is available.
- TSSI only indicates the transmission of SMDs of one MAC (configurable or only pMAC?)
- There are two sets of TSSI indications, one for each MAC
- Other?

Thank You