P802.1ASds
Consideration about PTP over 10BASE-T1S

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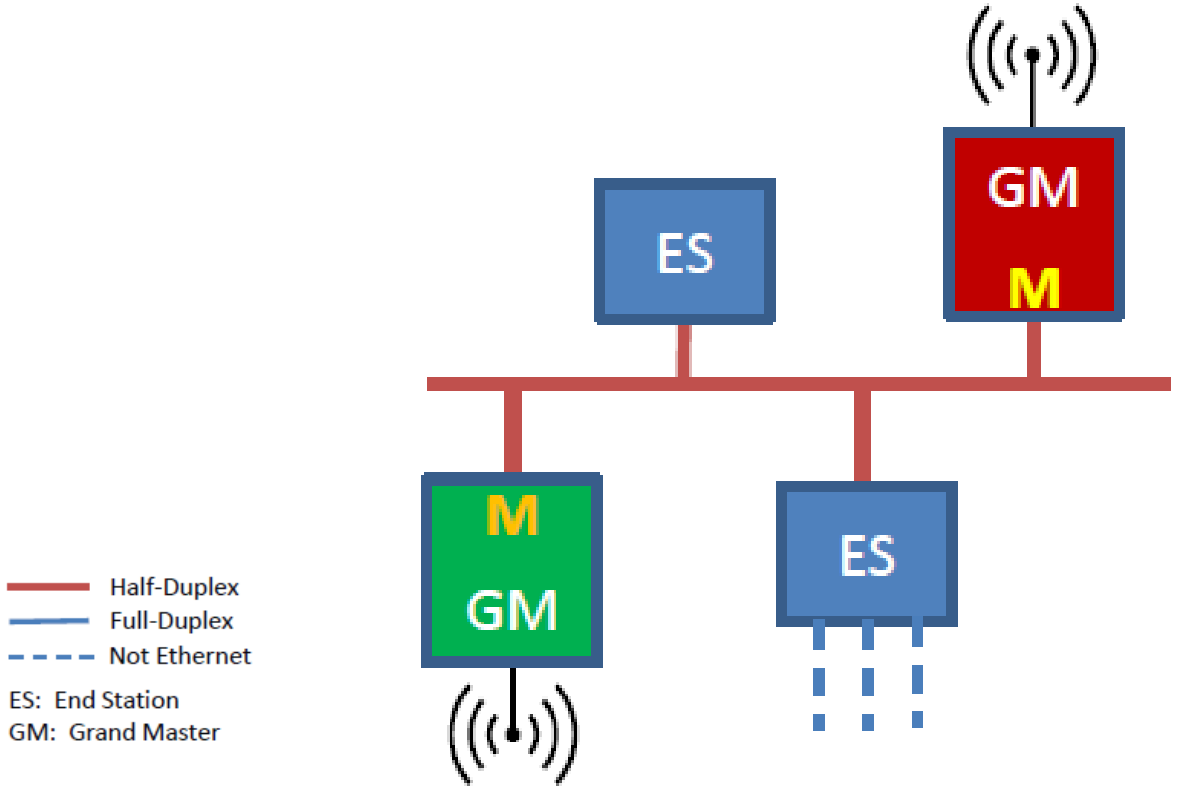
Agenda

- 10BASE-T1S topology
- 10BASE-T1S Pdelay Messages Re-cap
- 10BASE-T1S Pdelay Messages Proposed Solutions
- 10BASE-T1S Pdelay Messages using clockID

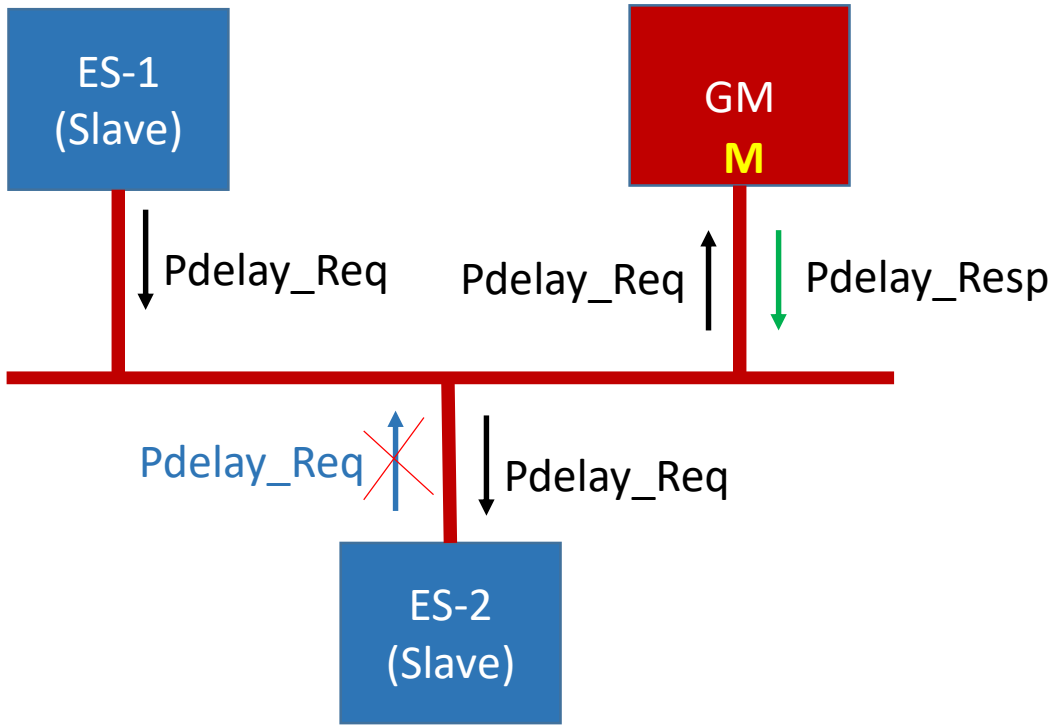
10BASE-T1S topology

- The following is typical 10BASE-T1S topology as presented in [1]
  - It is copied below to facilitate the discussion



- It is assumed that one GM is active and the second GM is a backup
- End stations (ES) only need to exchange messages with the active GM, and therefore the next slides simplifies this figure

10BASE-T1S Pdelay Messages Re-cap



- ES-1 sends Pdelay_Req
- Only GM should respond with Pdelay_Resp/Follow_Up
- ES-2 also receives the Pdelay_Req, but it should ignore it
  - Currently there is no mechanism in 802.1AS to allow ES-2 to ignore it

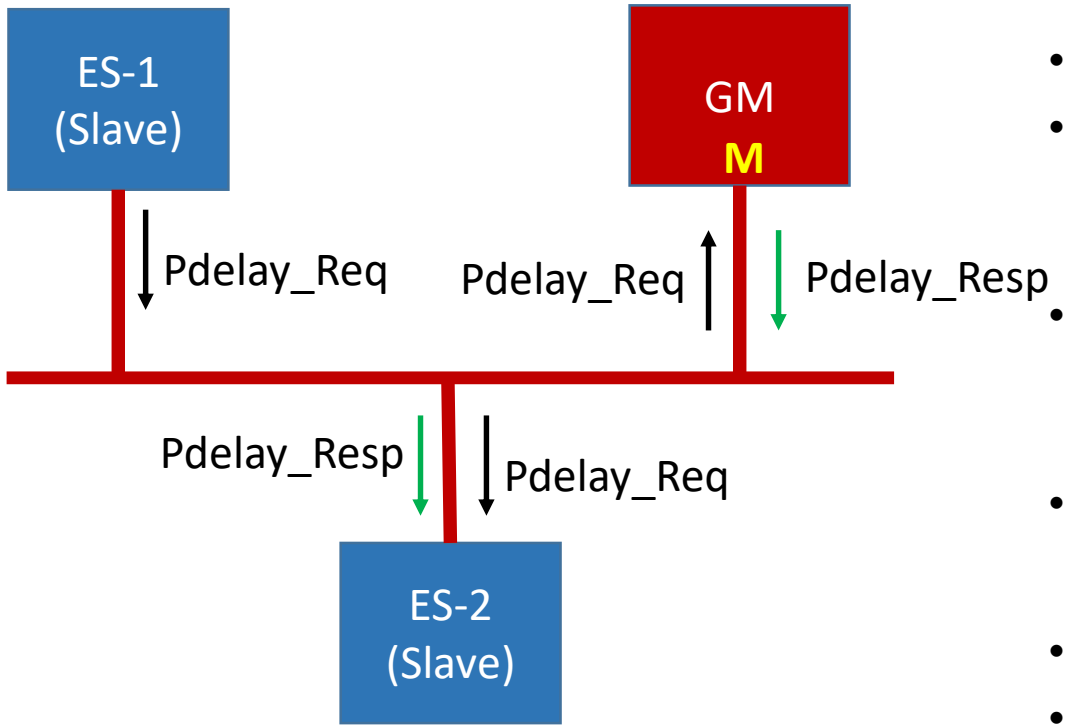
10BASE-T1S Pdelay Messages Proposed Solutions

- Use Unicast mode for Pdelay messages between the master and the slave
  - This method is proposed in [1] and [2]
- Modification of the MDPdelayReq state machine
  - This method is proposed in [3]
- Another option is to use the ClockID available in the sourcePortIdentity field of the PTP message header
  - This method is addressed in the following slide

Table 10-7—PTP message header

Bits								Octets	Offset
7	6	5	4	3	2	1	0		
majorSdoId				messageType				1	0
minorVersionPTP				versionPTP				1	1
messageLength								2	2
domainNumber								1	4
minorSdoId								1	5
flags								2	6
correctionField								8	8
messageTypeSpecific								4	16
sourcePortIdentity								10	20
sequenceId								2	30
controlField								1	32
logMessageInterval								1	33

10BASE-T1S Pdelay Messages using clockID



- GM sends Announce and sync messages to ES-1 and ES-2
  - ES-1 and ES-2 learns the GM clockID from Announce or Sync
- ES-1 sends Pdelay_Req
- ES-2 receives Pdelay_Req from ES-1 and checks the clockID. The clockID does not match the GM clocID, and therefore ES-2 does not reply Pdelay_Resp corresponding to the Pdelay_Req message
- GM receives the Pdealy_Req and replies with Pdelay_Resp and set the requestingPortIdentity of Pdelay_Resp to the sourcePortIdentity field of the corresponding Pdelay_Req message from ES-1
- ES-2 receives Pdelay_Resp from GM and it does not act on it, as the requestingPortIdentity field of Pdelay_Resp does not correspond to its PortIdentity
- Finally ES-2 ignores Pdelay messages associated with ES-1
- Similarly, ES-1 ignores Pdelay messages associated with ES-2, using the same principle

Note that if Announce message is not used, then Sync message can still be used to identity the GM clockID, even though sourcePortIdentity field of the PTP common header identifies the upstream master port, which, in this case, is the GM.

References

[1] Don Pannel et al., *P802.1ASds Use Cases & Requirements*, IEEE 802.1 TSN Presentation, September 2022 (available at https://www.ieee802.org/1/files/public/docs2022/ds-pannell-Avnu-Automotive-UseCase-Requirements-0922-v01.pdf)

[2] Craig Gunther, *802.1 Time-sensitive Networking (TSN) mn 802.3cg Multidrop Networks, September 2017*, (available at https://www.ieee802.org/1/files/public/docs2017/tsn-cgunther-802-3cg-multidrop-0917-v01.pdf)

[3] Georg Janker et al., *Pdelay mechanism in multidrop topology (updated version),* IEEE 802.1 TSN Presentation, May 2021 (available at https://www.ieee802.org/1/files/public/docs2021/dg-janker-timesync-in-10BASE-T1S-networks-0521.pdf)

Thank you!