Closing the gap between preemption and T1L

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IEEE 802.1 Virtual Interim

Jordon Woods, Analog Devices

Problem Statement

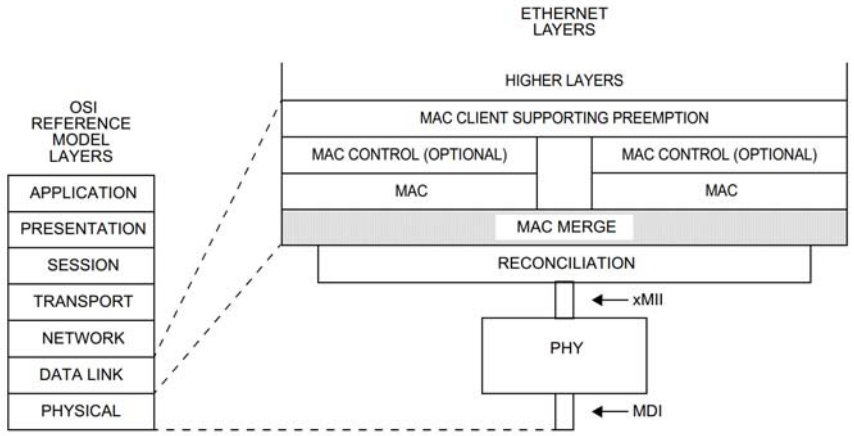
- Some members of the 60802 Joint Project have expressed a desire to support links speeds from “10 Mb/s to 10 Gb/s.

- It is the opinion of this contributor that not all 10 Mb/s MAU types are compatible with Interspersing Express Traffic/Preemption.

- It is incumbent upon the 60802 Joint Project to determine which MAU types are of interest and to work with 802.1 and 802.3 leadership to fill any gaps.

MAC Merge Sublayer and SMD

- Clause 99.1 in IEEE Std 802.3-2018 “specifies an optional MAC Merge sublayer for use with a pair of full-duplex MACs and a single PHY operating at 100 Mb/s or higher on a point-to-point link” (clause 99.1).
- Clause 99.3 in IEEE Std 802.3-2018 defines a specific packet format (MAC Merge Packet or mPacket), and the mPacket format is indicated by the value of the SMD which is the Start of Mpacket Delimiter
- The requirement for 100 Mb/s or higher link is not a mere formality. The situation is more complex.



NOTE—In this figure, the xMII is used as a generic term for the Media Independent Interfaces for implementations of 100 Mb/s and above. For example: for 100 Mb/s implementations this interface is called MII; for 1 Gb/s implementations it is called GMII; for 10 Gb/s implementations it is called XGMII; etc.

MAC = MEDIA ACCESS CONTROL
xMII = MEDIA INDEPENDENT INTERFACE
MDI = MEDIUM DEPENDENT INTERFACE
PHY = PHYSICAL LAYER DEVICE

Figure 99–1—Relationship of MAC Merge sublayer to the ISO/IEC Open Systems Interconnection (OSI) reference model and the IEEE 802.3 Ethernet model

SMD vs. SFD

- It is this contributor's opinion that the mPacket format is NOT compatible with the one in Clause 3.1.1 of the standard
- The fact that the Clause 99 and Clause 3.1.1 packet format, which is the one on which older PHY technologies were developed, are not compatible, will cause problems for some of those PHY technologies.

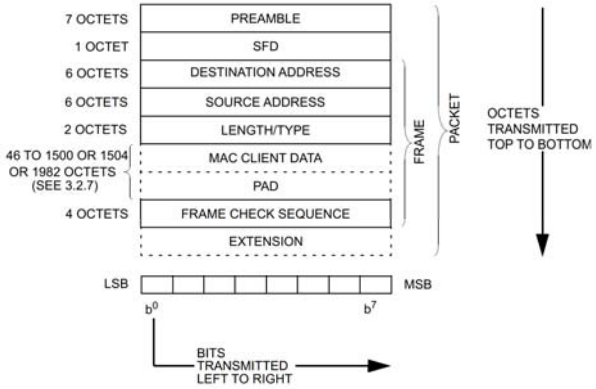


Figure 3–1—Packet format

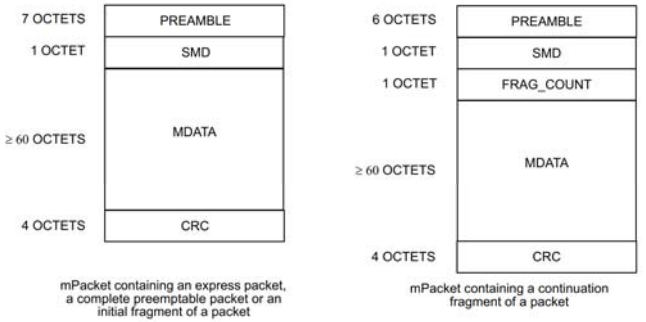


Figure 99–4—mPacket format

Architectual differences between 10 Mb/s PHY

- For instance, 10BASE-T will not support mPackets, because it does not have a PCS layer.
- Therefore, if you change the SFD (Start of Frame Delimiter, in the clause 3.1.1 MAC frame) with a SMD, the PHY will not detect the start of the frame, and that frame will be missed/incorrect when passed on to the MAC reconciliation sub-layer.
- The 10BASE-T1L standard has a PCS layer and should therefore work like 1000BASE-T and 100BASE-TX regarding pre-emption. However, older PHY technologies, like 10BASE-T, likely will not.

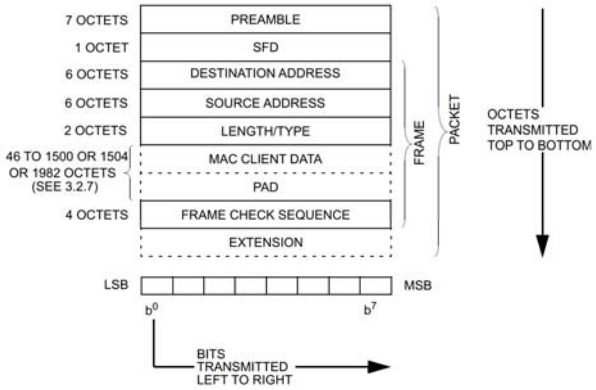


Figure 3–1—Packet format

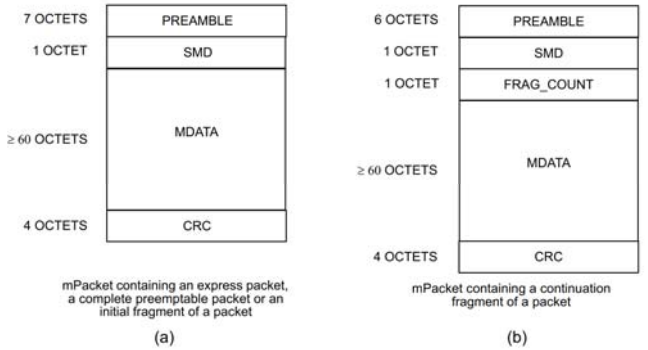


Figure 99–4—mPacket format

Summary

- 100BASE-TX and 1000BASE-T PHYs have a PCS (physical coding sublayer), so they basically replace the first bytes of the preamble with some Start of Stream Delimiter (SSD) PCS codes, and then just sent the reminder of the bytes of the packet (including the rest of the Preamble and SFD) unmodified.
- But 10BASE-T is different, as it does not have a PCS layer (it just uses a Manchester encoded PLS), therefore
  - When A frame is received, the clock is recovered from the Preamble bytes, so many bytes of the Preamble are “consumed” just to recover the clock.
  - The only way to detect the Start of the frame data is to detect the Start of Frame Delimiter (0xD5), so if you replace it with something different the start of the Frame will likely not be detected or will be detected incorrectly (and that will be the case for all the SMD codes) so the frame data will be misaligned and therefore received incorrectly.
- So, in summary, 802.1Q frame pre-emption will work in all 100BASE-TX and 1000BASE-T IEEE Std 802.3 compliant PHYs.
- It should also work with 10BASE-T1L PHYs as the PCS is present.
- For 10BASE-T, it is not likely to work in today’s commercially available PHYs.

Recommendations

- Identify all 10 Mb/s MAU types of interest to the 60802 profile.

- Present the resulting requirements to 802.3 leadership with a request for specific actions.

Thank you