

Assessment Of Larger Frame Impact On 10Gig MAC IFS Stretch Function And 10Gig WAN PHY

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Agenda

- **Review of the IFS Stretch Function**
- **Larger Frame Impact**
- **Conclusions**

What is the IFS Stretch Function?

➤ IFS = Inter-Frame Spacing

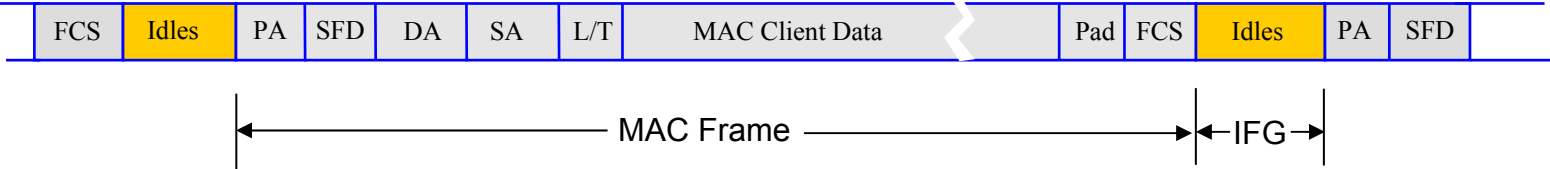
- The “dead time” provided by the MAC Deference process in between MAC frames (`interFrameSpacing = interFrameGap`, see 4.2.7.2)
- One use is by the remote receiving PCS for clock rate compensation
 - The PCS deletes /I/s when data based on the recovered receive clock would overrun the local clock

➤ IFS Stretch Function

- The Deference process continues enforcement of the IFS beyond the required clause 4.4.2 value by a certain amount, calculated dynamically
- Used for 10GBASE-W applications (and EFM copper – see separate presentation)

Frame Example

IFS Stretch function results in more //s inserted here, where the quantity is related to the length of the previous frame + Idles



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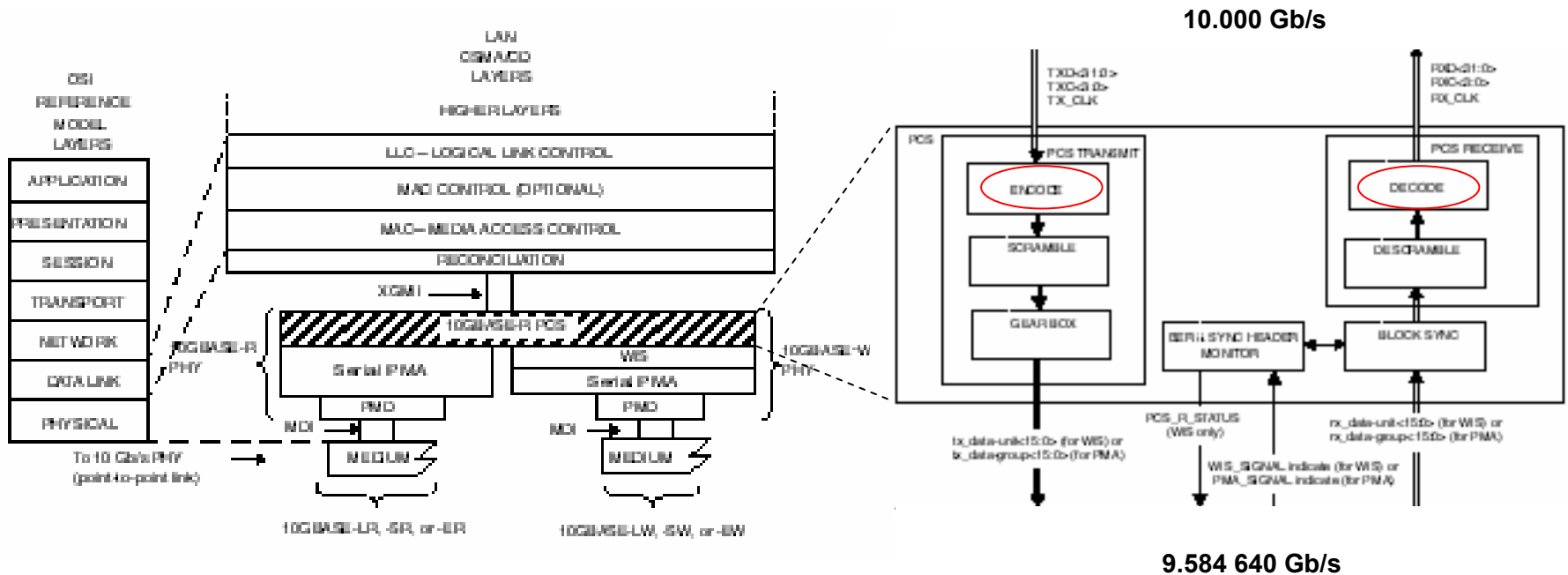
IFG = interFrameGap (12 bytes per clause 4.4.2)

Why is there an IFS Stretch Function?

➤ For rate compensation

- In 10GBASE-W, the data rate between RS and PCS is 10.000 Gb/s (which includes minimum IFG, PA, SFD), but the data rate between the PCS and the WIS is 9.584 640 Gb/s
- 9.584 640 Gb/s is the payload capacity rate for a SONET STS-192c
- The IFS Stretch function results in enough /I/s in the 10.000 Gb/s data stream so the PCS can safely delete some /I/s in order to rate match its output to the WIS
- In the receive direction, the PCS inserts /I/s into the data stream to the RS in order to rate match

10GBASE-R PCS Location



- The Encode block deletes /I/s in order to rate match its output to the WIS
- The Decode block inserts /I/s in order to rate match its output to the RS

IFS Stretch Function

➤ **ifsStretchMode**

- Enables the function
- Linked to Clause 30 **aRateControlStatus**

➤ **ifsStretchRatio**

- A constant, the scale factor required to scale from 9.584 640 to 10.000
- For 10GBASE-W it is 104 (i.e., the scale factor of 1.04 raised to an integer)

➤ **ifsStretchCount**

- A running counter of bits during frame transmission used to calculate the number of idle byte times to insert

➤ **ifsStretchSize**

- A running counter of how many idle byte times to insert following the IFG (one per every 104 bits of MAC frame+idle time)

Impact of Longer Frame to C4 and C49

- **ifsStretchRatio and ifsStretchCount are not dependent on frame length**
- **ifsStretchSize is dependent on the length of the frame**
- **The longer the previous frame, the more idle time will be forced prior to transmission of the next frame**
- **However, no need to change any description in Clause 4**
- **The PCS would have more /I/s to delete in the TX direction and more to insert in the RX direction**
- **However, no need to change any description in Clause 49**

Implementation Considerations

- **The MAC counter for ifsStretchSize may now increment to a higher value:**
 - $(1522+8+12)/13 \sim 119$ max extra /I/s; $2^7 = 128 > 119$
 - $(2048+8+12)/13 \sim 159$ max extra /I/s; $2^8 = 256 > 159$
- **Would need an 8-bit counter rather than 7-bit for ifsStretchSize**
- **The 10GBASE-R PCS Transmit block must be able to buffer a portion of a frame, related to the data rate difference: for a larger frame, say 526 bytes, needs $526/13 \sim 40$ bytes more buffer**
- **Similar impact to the PCS Receive block**

Note: Using a 2048 byte frame here for the sake of argument at this time. The final length is still TBD.

Conclusions

- **No change to IFS Stretch function in Clause 4**
- **No change to 10GBASE-R PCS in Clause 49**
- **10Gig MAC implementations which only support a maxFrameSize of 1522 bytes (i.e., no Jumbo frames), might require a larger counter for ifsStretchSize**
- **10GBASE-R PCS Encode/Decode buffers which only support a maxFrameSize of 1522 bytes would need to be proportionally larger**