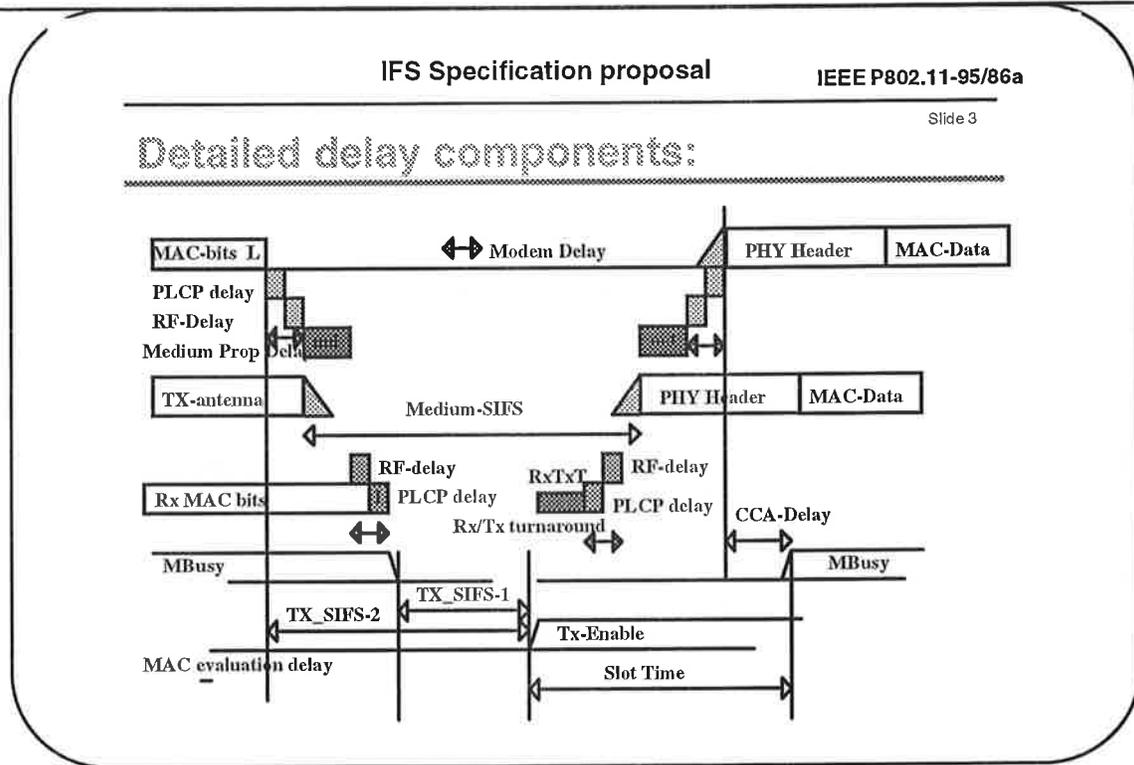

How to specify the IFS timing in the Standard

By: Wim Diepstraten

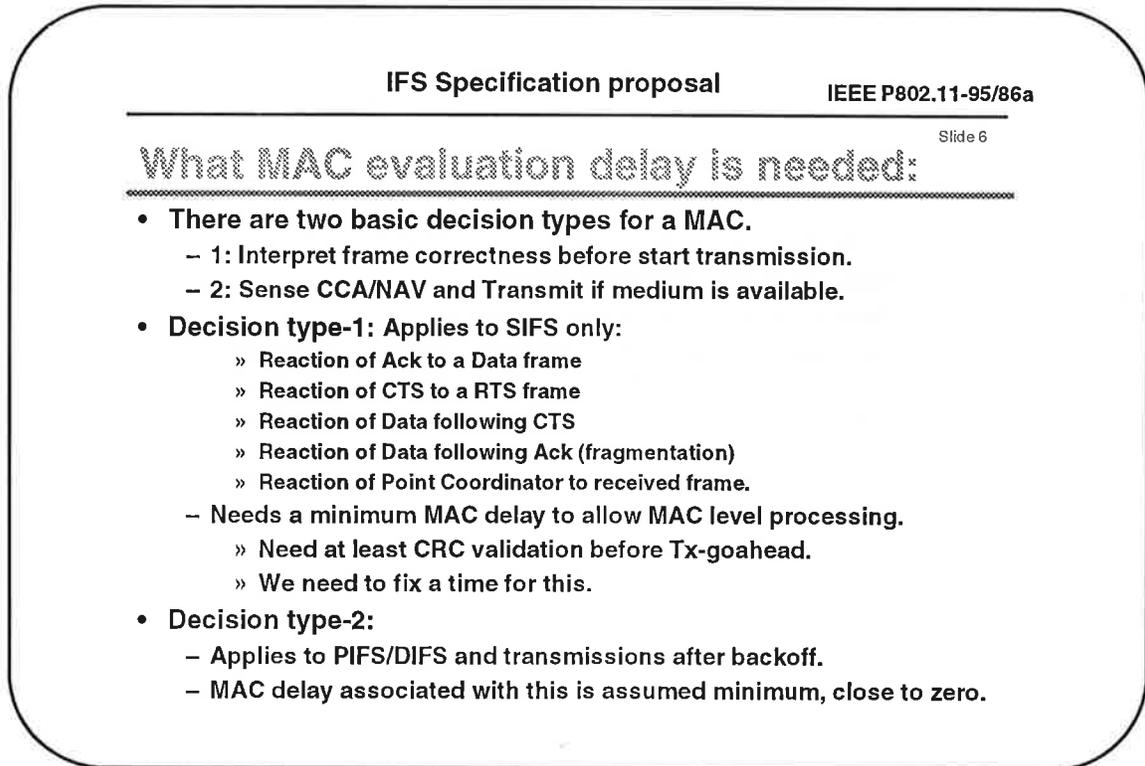
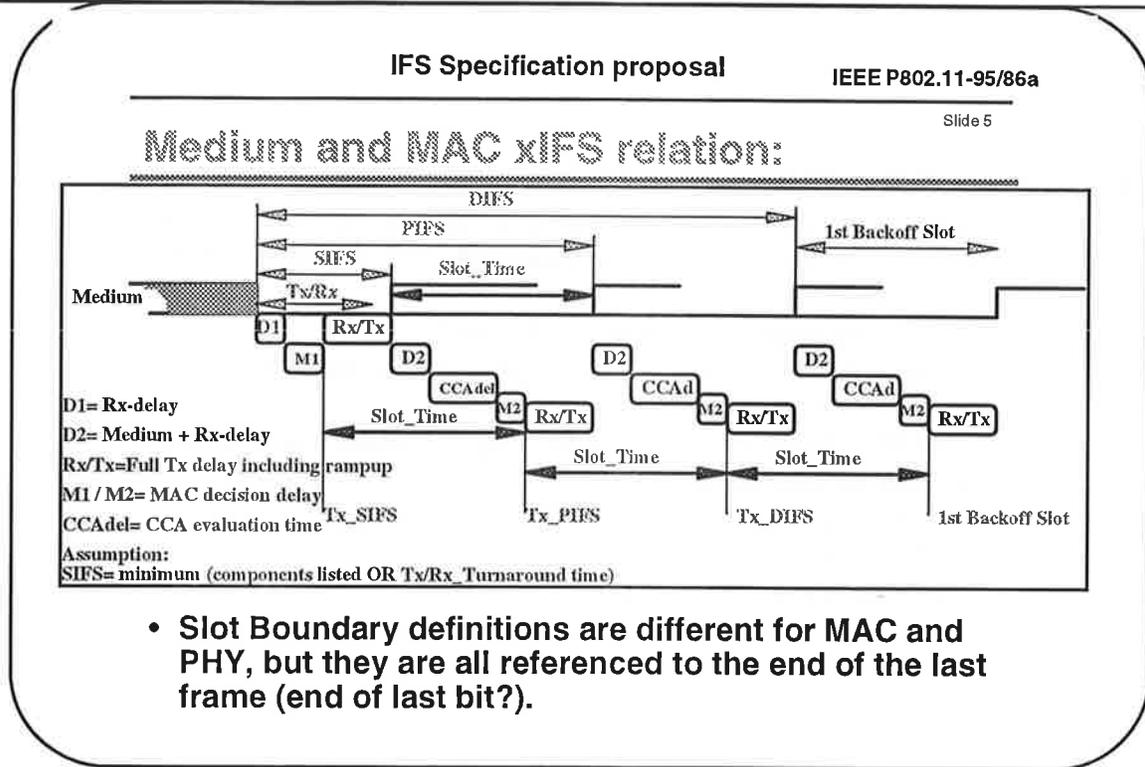
Approach:

- The xIFS's specifications are PHY specific.
- The xIFS's can only be measured on the medium.
- So the specifications apply to time gaps on the medium.
- The reference for these timings are the end of a frame on the medium.

- MIB parameters need to be specified to allow a single MAC to run on multiple PHY's.
- Specification should be such to allow time slotted implementations.



- IFS Specification proposal IEEE P802.11-95/86a
- Slide 4
- Basic parameters:
- **SIFS:**
 - Time it takes a MAC to decide to react on the frame received, and to turnaround the transceiver, until Transmit energy is put on the medium, OR the Tx/Rx turnaround, whichever is larger.
 - **Slot_Time:**
 - Time between a MAC decision to turn the transmitter on, until all stations are aware that the medium is occupied.
 - This relates to the meaning of Slot_Time in the CSMA/CA mechanism.
 - **The PIFS and DIFS are derived from the basic parameters SIFS and Slot_Time by:**
 - $PIFS = SIFS + Slot_Time$
 - $DIFS = SIFS + 2 * Slot_Time$
 - **Tolerance specification: (Assume nominal +/- Tolerance)**



Need MIB specifications to support it:

- Ed Geigers approach in doc 95/039 is a good starting point, but we need to use events on the medium as a reference.
 - Specify nominal values in the standard.
 - Specify MIB variables containing the implementation deviation.
- The MIB needs to specify those parameters that allow a MAC to calculate:
 - Tx_SIFS
 - Tx_PIFS
 - Tx_DIFS and subsequent slots

Timing references:

- There are two different timing references for the MAC.
 - 1: The end of an incoming frame.
 - 2: The end of a previous transmission.
 - » This applies to any subsequent transmission, but requires to execute backoff, in which case it only affects slotting.
 - » This applies to SIFS gaps in fragmented Broadcast frames.
- TX_SIFS timing in the MAC:
 - TX_SIFS-1 = SIFS - Rx_Delay - Tx_Delay. Rx as reference
 - TX_SIFS-2 = SIFS. Tx as reference

MIB parameters needed:

- **PHY dependent MIB parameters:**
 - Slot_Time
 - Rx_Delay
 - Rx_Delay_Delta
 - Tx_Delay
 - Tx_Delay_Delta
- **MAC dependent MIB parameter.**
 - MAC_Delay-1; MAC_Delay-2 as needed
- **Resulting: SIFS = Rx_Delay+MAC_Delay+Tx_Delay (on medium)**
 - This time should be such that Tx/Rx_turnaround time is such that the next frame can be successfully received.
- **Basic Equations:**
 - $Tx_SIFS = SIFS - Rx_Delay + Rx_Delay_Delta - Tx_Delay + Tx_Delay_Delta.$
 - $Tx_PIFS = Tx_SIFS + Slot_Time.$
 - $Tx_DIFS = Tx_IFS + 2 * Slot_Time$

Conclusion-1:

- **Motion:**

To accept the specifications of SIFS, PIFS and DIFS, according to this document to be:

SIFS = Rx_Delay+MAC_Delay+Tx_Delay (PHY specific)

PIFS = SIFS + Slot_Time

DIFS = SIFS + 2 * Slot_Time

As measured on the medium, with:
- **Slot_Time:**
 - Time between a MAC decision to turn the transmitter on, until all stations are aware that the medium is occupied.
- **Text to reflect this decision to be specified in section 5.2.13 (DCF Timing relations).**

Conclusion-2:

- **Motion:**

To specify in the standard the MIB parameters and the equations needed to allow the MAC to generate the necessary timing gaps (SIFS, PIFS, DIFS).

- PHY dependent MIB parameters:

- Slot_Time
- Rx_Delay
- Rx_Delay_Delta
- Tx_Delay
- Tx_Delay_Delta

- MAC dependent MIB parameter.

- MAC_Delay-1; MAC_Delay-2 as needed

- Basic Equations:

- $TX_SIFS = SIFS - Rx_Delay + Rx_Delay_Delta - Tx_Delay + Tx_Delay_Delta.$
- $TX_PIFS = TX_SIFS + Slot_Time.$
- $TX_DIFS = TX_SIFS + 2 * Slot_Time$

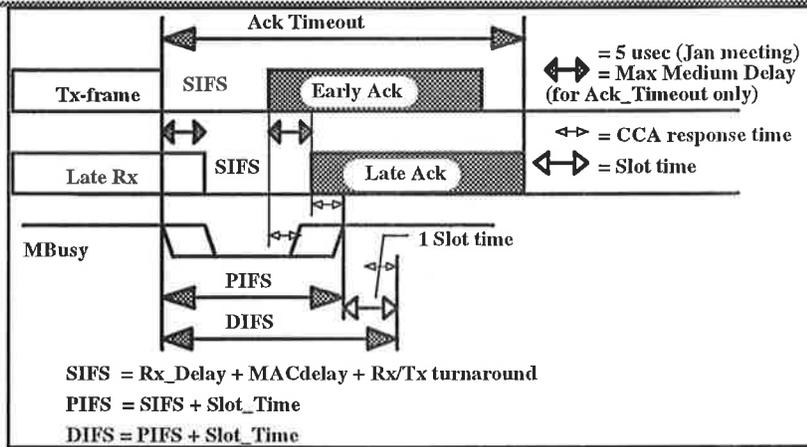
MAC Timing reference issues:

- **There are two different timing references for the MAC.**
 - 1: The end of an incoming frame.
 - 2: The end of a previous transmission.
 - » This applies to any subsequent transmission, but requires to execute backoff, in which case it only affects slotting.
 - » This applies to SIFS gaps in fragmented Broadcast frames.
- **It should be clear what signalling provides the MAC timing reference:**
 - 1: The CCA indication.
 - » How is it derived by the PHY:
 - For a valid reception?
 - For a reception with failing PLCP CRC check?
 - 2: The last bit transmitted:

Other related parameters:

- **Ack_Timeout:**
 - The time after which a MAC can decide whether an expected Ack has failed to return.
- **T3?:**
 - The time following a RTS frame after which a MAC can decide whether subsequent Data has followed a successful RTS / CTS exchange.
- **Retry Limits:**

Ack Timeout specification:



- Max Medium delay (for Ack response) = 5 usec.
– not the medium delay assumed in Time Slot.