802.11
PHYSICAL DEFINITIONS FOR THE INTERFRAME SPACINGS

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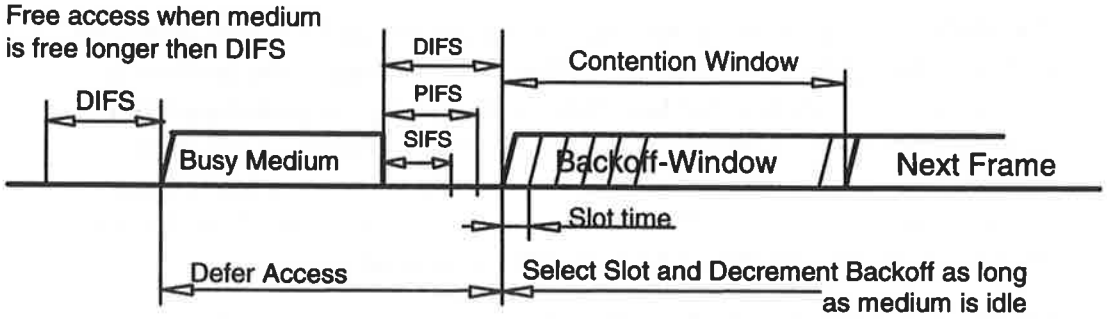
The current draft standard does not yet translate the inter frame timings into physical terms. There are three specific timings that are used: the SIFS or Short IFS, the PIFS or Point Coordination IFS, and the DIFS or Distributed Coordination IFS. The current draft standard begins to define when each of the inter frame timings should be used and this can be found in section 5.2.4 with a drawing showing the Basic Access Method in section 5.2.6.1 (Included below). This document is intended to clarify the definition and use of the Interframe timings.



SIFS:

The SIFS is used between frames that are linked together as part of a message transfer. An example is the spacing between the following:

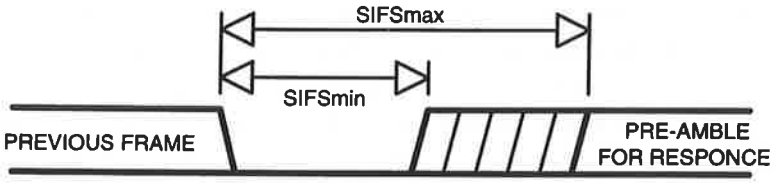
RTS : CTS : DATA : ACK
POLL : DATA : ACK

or any other case where an immediate response is desirable. Failing to respond within the SIFS interval will allow another STA to try and arbitrate for the medium.

The SIFS has both a minimum and maximum specification. The maximum (SIFSmax) prevents another STA from claiming the medium and in physical terms is the maximum receive to transmit (R2T) turn around time allowed by the specific PHY. The transmit to receive (T2R) time need not be specified because it is only related to the stability of a specific radio implimentation. Clearly T2R must be less than or equal to SIFSmax.

The minimum time (SIFSmin) prevents a STA from getting onto the airwaves too soon for another STA to process the transition. This minimum time may be very short. It is related to the need by a STA to see a minimum number of pre-amble bytes, so the length of the pre-amble needs to accommodate the difference between the minimum and maximum allowable SIFS timing. The assumption on the minimum is that the number of pre-amble bytes is fixed for a given PHY.

An uncertainty factor is introduced for the PIFS interval. That uncertainty (ENDu) is not applicable to the SIFS because the STA that will respond within the SIFS will have no uncertainty as to when it can respond.



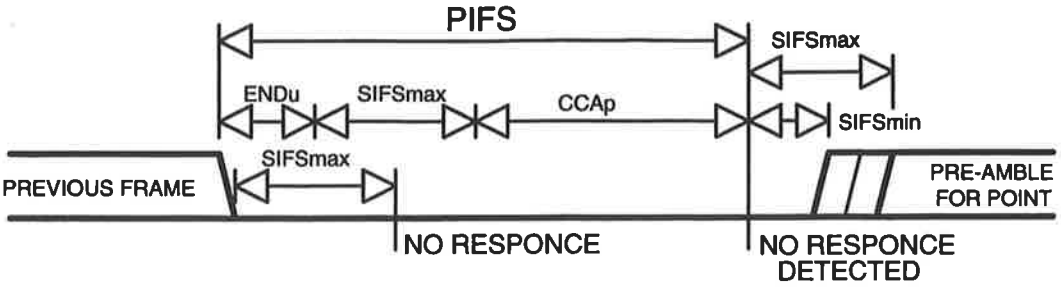
PIFS:

The PIFS time is the point at which a Point Coordinator STA may access the medium. During the PIFS time the STA will be listening to the medium to determine if a response to the last frame will occur by the maximum SIFS interval. The ability of the Point Coordinator to sense the medium at the end of the SIFS interval is mollified by two factors. The first is the CCA processing or capture time, and the second is the uncertainty with which the Point Coordinator determined the precise end of the previous transmission.

It is very important that the Point Coordinator accurately assess the medium, otherwise a large number of frames will be lost to collisions. The timings must provide for a worst case assessment time for the PIFS interval.

The PIFS interval thus has three physical components: The maximum SIFS interval (SIFSmax), the CCA processing time (CCAp) and the uncertainty factor (ENDu).

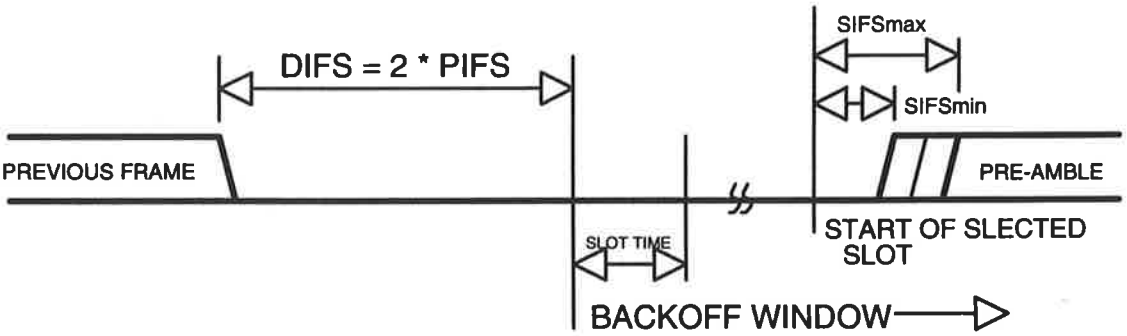
A Point Coordinator must follow the SIFS timing as it claims the medium. Thus it will begin to transmit after SIFSmin and before SIFSmax from the end of the PIFS interval.



DIFS:

The DIFS interval has similar requirements to the PIFS interval in that the DIFS STA must accurately sense the medium so as not to collide with a Point Coordinator. In simple terms the DIFS interval is twice the PIFS interval. The second uncertainty (ENDu) could be removed in a precise definition but this should be a small factor compared to the CCAp time.

The activity of a STA after the DIFS interval is dictated by the Backoff algorithm. A STA will have selected a backoff slot within the Backoff Window and it will observe and defer to the medium till its selected slot time. The STA will then use the SIFS timing to begin its transmission.



ENDu and CCAp:

The uncertainty factor (ENDu) comes from several real situations. The first is that a STA may have heard the CTS frame but not the RTS or DATA frames. The STA is then relying on the NAV to specify the end of the DATA frame and thus when to anticipate that an ACK should occur. The uncertainty will be the delta between the minimum and maximum SIFS interval (SIFSmax - SIFSmin). Another form of uncertainty is due to stations that were not actively listening to the medium during the start of the previous frame. These STA must determine the end of that frame from the CCA logic. The time to process that event is not the CCAp time. The CCA logic should have a mode where it is able to rapidly detect a sharp drop in energy on the medium as the frame transmission ends.

The CCA processing time will be the time that a STA needs to determine that a transmission has started. When a STA uses antenna diversity, the CCAp time will

need to accommodate the diversity so that both antennas will have the opportunity to sense the medium. This effort requires only a carrier sense, not a choice of the best antenna to actually receive the frame. Given that a STA will have an uncertainty as to its knowledge of the end of the previous frame (ENDu), it would be difficult to require that the antenna selection be synchronous to the end of that frame.