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Transmitter Priority in the MAC Layer

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Mechanism for Efficient Transmission of Multiple Data Frames

- Transmitter priority provides an efficient method for transmitting multiple data frames with minimal delay.
- Built on existing Foundation
- No new interframe spaces defined.
- Straight forward implementation.
- No out of order frames.
- RTS/CTS can be used to provide protection from hidden stations.

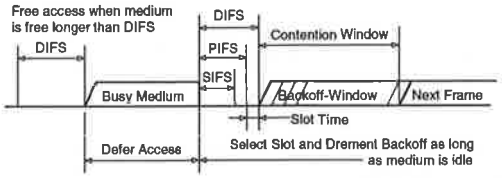
Windowing

- Windowing has been discussed in previous papers.
- Two key elements.
  - Maintain priority of the medium for a specified amount of time.
  - Receive a single acknowledgment for multiple frames.
- Transmitter priority addresses the first element.

Transmitter Priority

- Allows a station to send multiple asynchronous frames without being preempted by another station.
- Fairness requires the number of consecutive• frames be limited.
- Station will only contend for the channel for the first data frame of a MSDU.
- Each frame is acknowledged.

Foundation CSMA/CA Access Method

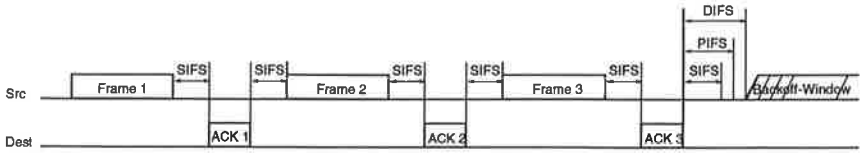


- **Short Inter Frame Space (SIFS)**
  - **This priority level is used for all immediate response actions.**
- **Point Coordination Function Inter Frame Space (PIFS)**
  - **This priority level is used by the PCF in the AP to send any of the Contention Free Period (CFP) frames.**
- **Distributed Coordination Function Inter Frame Space (DIFS)**
  - **This priority level is used by the DCF to transmit Asynchronous frames in the Contention Period.**

Transmitter Priority in the Foundation MAC

- **Transmitter priority is used to provide a efficient MSDU delivery mechanism.**
- **Each frame is acknowledged.**
- **Once a station has contended for the channel, it can maintain control of the channel until it has sent all of the data frames of a MSDU or an acknowledgment is not received.**
- **If an acknowledgment is not received, the station will backoff and contend for the channel again.**
- **After all frames have been transmitted, the station will relinquish control of the channel.**

Multiple Frame MSDU using Transmitter Priority



- The source station transmits a data frame then waits for an acknowledgment.
- The destination will send an acknowledgment after SIFS.
- The SIFS following the acknowledgment is reserved for the source station to send another data frame (if necessary).
- If the source station does not receive an acknowledgment frame, it will attempt to retransmit the data frame at a later time (according to the backoff algorithm).

Transmitter Priority Rules

- A station will transmit after the SIFS only under the following conditions (for transmitter priority):
  - The station has just received a frame that requires acknowledging.
  - The source station has received an acknowledgment to a previous frame and has more data frame(s) for the same MSDU to transmit.

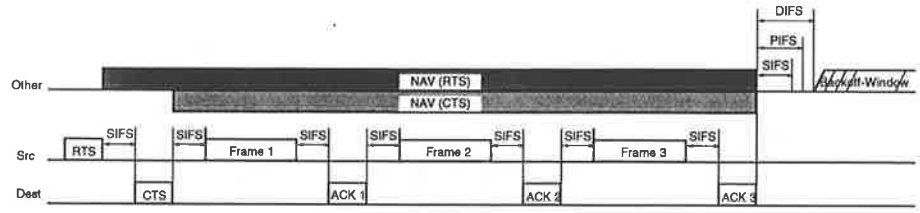
Transmitter Priority Guidelines

- When a station has transmitted a frame other than a data frame, it does not have priority to transmit on the channel following the acknowledgment for that frame.
- When a MSDU has been successfully delivered, the device does not have priority to transmit on the channel following the last acknowledgment of the last data frame.
- Only unacknowledged data frames need to be retransmitted.

RTS/CTS Usage with Transmitter Priority

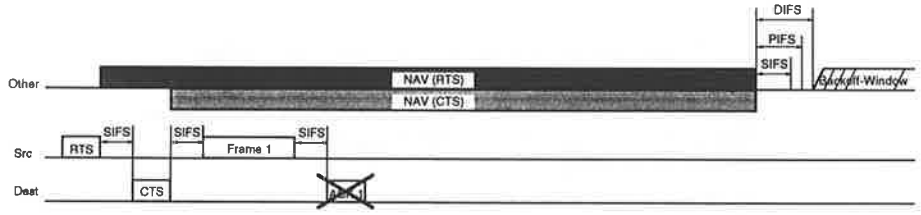
- RTS / CTS can be implemented in two ways when using transmitter priority.
  - Approach 1, the RTS / CTS packets contain the duration of the entire transfer of the MSDU including acknowledgments.
  - Approach 2, the RTS / CTS packets contain the duration of the transmission for the first frame and define an element for the data frame and acknowledgment that specifies the duration of the next frame.
- Author recommends Approach 2, discussion follows.

RTS/CTS Approach 1



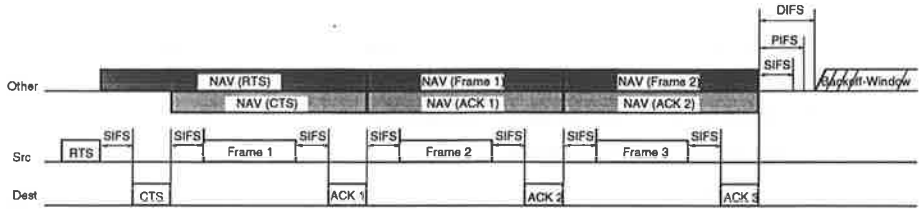
- **RTS / CTS packets contain the duration of the entire transfer of the MSDU including acknowledgments.**

RTS/CTS Approach 1 - Missed Acknowledgment



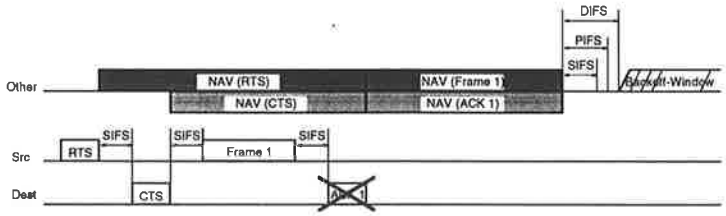
- **If the source station does not receive an acknowledgment for a data frame, it will stop sending and execute the backoff algorithm.**
- **If the data frame that did not get acknowledged was not the last fragment of the MSDU, the channel will be marked busy for a considerable amount of time when it is not.**

RTS/CTS Approach 2



- Each frame contains information that defines duration of the next transmission.
- The RTS will update the NAV to indicate busy until the end of ACK 1. The CTS will also update the NAV to indicate busy until the end of ACK 1.
- Both Frame 1 and ACK 1 will update the NAV to indicate busy until the end of ACK 2. This will continue until the last Frame and ACK which will indicate no update to the NAV.

RTS/CTS Approach 2 - Missed Acknowledgment



- When an acknowledgment is not received by the source station, the NAV will be marked busy for next frame exchange and is the worst case situation.
- If the acknowledgment is not sent by the destination station, stations that can only hear the destination station will not update their NAV and be free to access the channel.

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Conclusion

- Provides an efficient method for transmitting multiple data frames with minimal delay.
- No new interframe spaces defined.
- Straight forward implementation.
- Data frames received in order.
- RTS/CTS can be used to provide protection from hidden stations.
- The author would like to have transmitter priority with the second RTS/CTS approach added to the Foundation MAC.