IEEE 802.11
Wireless Access Method and Physical Layer Specifications

Title: **Improved Frame Format for the Foundation MAC**

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Abstract: In the Foundation MAC, the fixed header of a frame does not include all of the information that is required in most of the frame types. It is the author's belief that fields that are required in most frame types should be part of the fixed header. This reduces the variability of the header, therefore reducing complexity of implementation. The author will also make a case that a duration field be added to the fixed header and that the header should be protected by a CRC.

Introduction

As stated in [1], the Foundation MAC defines a frame format that has a fixed header and a frame body. Some of the fields that are used in most of the frame types are not part of the fixed header but are part of the frame body. The author would like to proposed that the fields that are use in most of the frame types be part of the fixed header. The Foundation MAC frame format is shown in Figure 1.

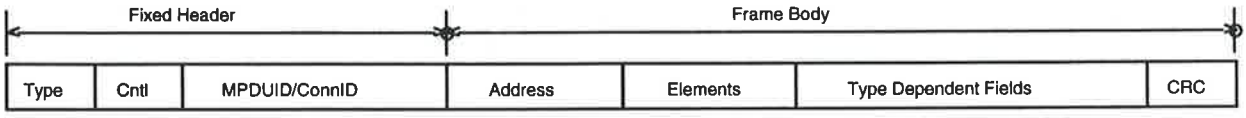

Figure 1: Foundation MAC Frame Format

The address field in the frame body can consist of the NID, the source address and the destination address. When the different frame type are examined, all of the frames except for RTS, CTS, and Ack contain the NID, source address and destination address. The RTS frame contains the NID and destination address. It is the author's proposal that the NID, source address and destination

address become part of the fixed header. This helps reduce the variability in the frame formats which will lead to reduced complexity in implementation.

The author would also like to propose that a duration field and a CRC be added to the fixed header. The duration field identifies the length of the frame. This can be used to determine the end of the frame and therefore an end delimiter is not required. The duration field can also be used as an aid to clear channel assessment. The CRC at the end of the fixed header allows the information in the header to be validated. If the fixed header CRC is invalid, the receiving station would abort the reception of the frame. Since the fixed header is validated independently of the rest of the packet, the receiving station can use the fixed header information to process the rest of the packet, knowing that the information in the header is valid.

The format of the proposed frame is shown in Figure 2.

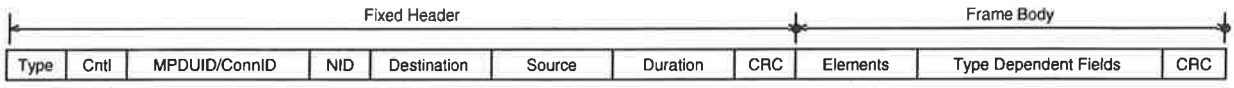

Figure 5: Proposed Frame Format

Negative Acknowledgment

The idea of a 'negative acknowledgment was introduce in [2]. The acknowledgment frame following a window of data frames contains information to define which of the frames were received without error. Only one of the frames in a window needs to be received in order for a acknowledgment to be transmitted. This implies that a data frame(s) that contained errors is 'negatively acknowledged' due to the absence on a positive acknowledgment in the acknowledgment frame. The source station needs only to retransmit packets that were 'negatively acknowledged'.

Assuming the proposed frame format shown in Figure 2, a negative acknowledgment could be used for single data frame transmissions. If the MAC header is received without error (valid fixed header CRC) but the entire packet is received in error (invalid CRC at end of packet), a negative acknowledgment can be sent to the source station. Since the fixed header was valid, the destination station knows it should receive the frame, it knows duration of the frame, and it knows the source station. Therefore, the destination station can send a negative acknowledgment to the source at the appropriate time because it knows the duration of the frame. Since the radio header and fixed header were received without error, the frame error is not likely due to a collision but an anomaly in the radio channel. It then follows that the source station should contend for the channel and not execute the backoff algorithm. This will help reduce packet delay due to the fact that the source station does not execute the backoff algorithm if the data frame was received in error due to a radio channel anomaly instead of a collision.

Conclusion

The author believes that the fixed header of the frame should be modified as shown above, addition of NID, source, destination, duration and CRC, to assist in the processing of an

incoming frame. This reduces the variability of the frame header which leads to reduced complexity and simpler implementation. The addition of a duration field eliminates the need for an end delimiter which may require bit stuffing. The addition of a fixed header CRC allows the receiving station to validate the header independently of the rest of the packet.

Assuming the proposed frame, a negative acknowledgment can be used to reduce packet delay due to radio channel anomalies.

Therefore the following motions are to be made:

> Move that the frame format be modified to add NID, source, destination to the fixed header.
>
> Move that the frame format be modified to add a duration and CRC to the fixed header.
>
> Move that a negative acknowledgment be defined that allows a destination station to respond to a source station if the fixed header CRC is valid but the frame CRC is not and that the retransmitted data frame contend for the channel but not execute the backoff algorithm.

References

[1] Wim Diepstraten - NCR, Greg Ennis - Symbol Technologies, & Phil Belanger - Xircom, "DFWMAC - Distributed Foundation Wireless Medium Access Control", Doc IEEE P802.11-93/190 Nov. 1993.

[2] Rick White - Motorola, "Frame Windowing at the MAC Layer", Doc IEEE P802.11-94/38 March. 1994.