IEEE 802.11
Wireless Access Method and Physical Layer Specification

Title: PHY Dependent Elements, Fixes to the frame formats

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Abstract: **This paper proposes additional Elements for the 802.11 MAC to accommodate the different PHY's. There are also a few mistakes and or improvements in the frame format fields that need attention.**

Introduction: **The goal of this paper is to provide a clean up of the existing draft standard. Several areas are addressed. There is the need for additional Element definitions to accommodate the different PHY layers. There are some errors in some fields within the frame formats. There is a need to eliminate the Asynchronous Contention Free references within the current frame formats.**

ITEM 1: PHY SPECIFIC ELEMENTS

Currently, the draft standard does not contain the required Elements to support the PHY's

PROPOSED TEXT FOR STANDARD

0.1. Element Definitions

Defined elements include the following:

11	GEOGRAPHIC LOCATION
12	SET
13	PATTERN
14	CHANNEL
15	HOP TIMING

0.1.1. Geographic Location

One octet, representing a geographic location from the following list:

1	NORTH AMERICA
2	EUROPE (GENERAL)
3	SPAIN
4	JAPAN

0.1.2. Set

One octet. This element selects the set of frequencies or hop patterns.

0.1.3. Pattern

One octet. This element selects the pattern within the set.

0.1.4. Channel

One octet. This element selects the channel within the pattern.

0.1.5. Hop Timing

Eight octets. This element provides a time reference to the a station regarding the current hop sequence. The first field is a 32 bit time in microseconds from the beginning of the hop pattern to the time reference of the frame that includes this element. The second field is a 32 bit time in microseconds for the length of a hop.

ITEM 2: TIME STAMP IN BEACON FRAME

The TimeStamp that is included within the BEACON frame does not provide the correct information. The time stamp is supposed to allow a station to predict when the next BEACON may be transmitted based on the reference time for the arrival of the BEACON frame and the TimeStamp. The known quantity is the distance between BEACON frames.

The current text describes a 32 bit TSFTIMER, but never defines the timer. What is really needed is a delta time from the point when the BEACON should have been sent and when it finally made it out onto the medium. This will allow a station to calculate the start of the BEACON interval, based on its reference time for the frame.

The practical limits for the delta time suggest something much less than 50mS for a 1MBaud channel. This means that the TimeStamp can be a 16 bit entity with timing in microseconds. Note that BEACONS will be transmitted at a rate of 10 to 100mS, so presumably the delta will be allot less.

The proposal is to change the BEACON TimeStamp to a 16 bit delta time in microseconds.

PROPOSED TEXT FOR STANDARD

Timestamp	The timestamp is provided in a Beacon frame to provide a time reference for a BSS. The AP keeps a free running time in units of microseconds. The timestamp field contains the difference between value of the free running time at the point when the last bit of the SFD is transmitted for the Beacon frame and the value of the free running time when the beacon was scheduled to be transmitted. The receiving STA can thus determine the true start of a Beacon interval. The field is 16 bits and the units are micro seconds.

ITEM 3: REMOVAL OF ASYNCHRONOUS CONTENTION FREE REFERENCES

The current draft standard still has many references to the Asynchronous Contention Free method for the Point Coordination Function (PCF). The committee made a technical decision that the only methodology to be used to deliver this type of service is Distributed Time Bounded Service. The Asynchronous Contention Free references were never removed by a vote.

The proposal is to remove all references to Asynchronous Contention Free from the draft standard.

ITEM 4: FRAGMENTATION FIELD ONLY WHEN NEEDED

The fragmentation field takes three bytes in every DATA frame and in every ACK frame. The proposal is to make the field present only when fragmentation is used for the MSDU. There are two methods that can achieve this. The first is to allocate a bit in the CONTROL field that indicates that fragmentation is present, and the second is to make the fragmentation field an Element. The first is more efficient, while the second is more general.

Note: The necessary bit in the control field is not currently present unless the CF bits are removed.

The second proposal is to change the current field that indicates the last fragment into a 4 bit field that indicates the total number of fragments. The fragment number thus becomes a 4 bit field. The maximum MSDU can only be broken into 10 fragments at most without removing the restriction on a 256 byte minimum fragment size (except for last fragment).

PROPOSED TEXT FOR STANDARD

IF AN ELEMENT IS THE CHOICE

0.1.6.Fragmentation

Three octets. This element will appear in DATA and ACK frames when fragmentation is being used to transfer an MSDU. The element consists of three octets of data. The first indicates the fragment number and the total number of fragments. The second two octets provide a duration so that other stations can keep a current NAV. The size of the 2nd through 15th fragment must never be larger than the 1st fragment. This restriction allows a receiving station to allocate memory for the entire MSDU based on the size of the first fragment.

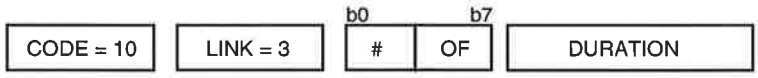

Figure 4-xx: Fragment Element Format

The fields of the Fragment Number of defined as follows:

Fragment Number:	This field is a binary representation of the fragment number of the MSDU (fragment 1 - 0001, fragment 2 - 0010 . . .)
OF:	This field specifies the total number of fragments in the MSDU.
Duration:	This field defines the medium occupancy time to the end of the ACK frame for the next MSDU fragment. The field is set to 'zero' if this is the last fragment of a MSDU.

IF A CONTROL BIT IS THE CHOICE

0.1.7.Fragmentation Field

Three octets. This field will appear in DATA and ACK frames when fragmentation is being used to transfer an MSDU. The field consists of three octets of data. The first indicates the fragment number and the total number of fragments. The second two octets provide a duration so that other stations can keep a current

NAV. The size of the 2nd through 15th fragment must never be larger than the 1st fragment. This restriction allows a receiving station to allocate memory for the entire MSDU based on the size of the first fragment. This places a restriction that no fragment for an MSDU may be larger than the first fragment.

Figure 4-xx: Fragment Field

The fields of the Fragment Field of defined as follows:

Fragment Number: This field is a binary representation of the fragment number of the MSDU (fragment 1 - 0001, fragment 2 - 0010 . . .)

OF: This field specifies the total number of fragments in the MSDU.

Duration: This field defines the medium occupancy time to the end of the ACK frame for the next MSDU fragment. The field is set to 'zero' if this is the last fragment of a MSDU.

ITEM 5: A NEW ELEMENT - LOAD

The LOAD Element is provided by an Access Point to aid the process of roaming. It is a single byte that represents the load on a given Access Point. A value of 0 means no load, while 256 would mean that packets are not being delivered due to load problems. A station that had a choice between Access Points may wish to Associate with the one that has the lighter load. The actual values assigned between 0 and 256 to define a specific load are left to the system implementation. A station looking at the values would look at the relative value.

The definition thus is a one octet Element.

PROPOSED TEXT FOR STANDARD

0.1.8. Load

One octet. The data represents the relative load on an Access Point between the extremes of 0 for no load and 256 meaning MSDU's are being lost due to load problems. A station will use the relative values to help determine the 'best' Access Point with which to associate.

ITEM 6: THE RETRY BIT IN THE CONTROL FIELD

The RETRY bit in the control frame is truly redundant. It does however help with quickly processing a frame. If there is room in the control field then the ease of processing is well worth it. This proposal suggests putting the bit back in the definition if possible.

PROPOSED TEXT FOR STANDARD

RETRY: 1 = this is a retransmitted frame, 0 = new frame.