IEEE P802.11
Wireless LANs

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| PDT – non-DMG report timestamp generation |
| Date: 2023-01-03 |
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Abstract

This submission includes the proposed draft text on the non-DMG PHY report timestamp generation for P802.11bf D0.5.

Revision history:

R0 – initial version

**Discussion and SPs from 22/2065:**

* Member feedback and discussion from 22/2064r0 presentation on December 6, 2022 pointed to more details on timestamp resolution requirements.
* Extra detail on timestamp resolution length added into 22/2064r1 and presented on December 22, 2022.
* Member feedback and discussion pointed to making timestamp optional and negotiating its inclusion into the report for the following reasons:
	+ Some applications/scenarios may not require timestamp
	+ Overhead could be significant when considering minimum report size

**SP1:**

**Do you agree to the following design approach:**

* Timestamp is always present in Sensing Report
* Timestamp is generated by Sensing Receiver
	+ Timestamp corresponds to start of the SI2SR or SR2SI NDP preamble
* Timestamp is generated from local clock of STA:
	+ Same resolution, and accuracy/drift requirements as TSF
		- 1us resolution (+/- 100ppm accuracy)
	+ Same width as DMG reported timestamp (4 bytes)
	+ Associated STAs may synchronize their timestamp relative to the AP’s clock by using the TSF mechanisms
	+ Non-Associated STAs may synchronize their timestamp relative to the AP’s clock by using the Partial TSF in the Trigger/NDPA

**Yes/No/Abstain = 7/2/8**

**SP2:**

**Do you agree to the following design approach:**

* Timestamp is always present in Sensing Report

**Yes/No/Abstain = 7/4/6**

**Design Approach**

* Timestamp parameter always present in MLME-SENSTBREPORT.indication and MLME-SENSNTBREPORT.indication primitives, which correspond to reception of NDPs.
	+ As a result, SME will have the timestamp for all received SI2SR, SR2SI, and SR2SR NDPs through the corresponding .indication primitives.
* There are three reporting cases to consider:
	1. OTA report from responder/receiver with "Sensing Measurement Report Requested" = 1
	2. Local report from responder/receiver with "Sensing Measurement Report Requested" = 0
	3. Local report from initiator/receiver
* For local reporting cases 2 and 3, since timestamp is provided to SME via .indication primitives, no additional logic required.
* Case 1 requires signaling to the SME on the responder/receiver by the initiator to include timestamp into report.
* As initially outlined in 22/1579, timestamp may be optionally added to Report Control field.

**Additional Notes:**

* As currently defined in P802.11bf D0.5, the Report Control field is **4 bytes**.
* Using equation 9-5f and details from P802.11bf D0.5:



The minimum CSI Size (Sensing Measurement Report field) is **42 bytes** when:

NTX = NRX = 1

Nb = 8-bits (Minimum size indicated in Table 9-127g)

NSC = 20 (from Table 9-127i, 20 MHz, Ng = 16)

* Currently, the Report Control field and Sensing Measurement Report field have a total minimum size of **4+42=46 bytes**.
* If a 4 byte timestamp were to be included, the minimum Report Control field size would increase from **4 bytes** to **8 bytes**, for a total minimum size of **50 bytes.**
	+ The timestamp would occupy **8%** of the total for the minimum case.

***TGbf editor: Please append sub clause 6.3.136.11.2 as follows:***

The primitive parameters are as follows:

MLME-SENSTBREPORT.indication(

PeerSTAAddressList,

CSI\_ESTIMATE,

Timestamp

)

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Type | Valid range | Description |
| PeerSTAAddressList | MAC address | Any valid individual MAC address | Specifies the MAC address of the peer STA(s) from which the sensing PPDU was received. |
| CSI\_ESTIMATE | As defined in 27.2.2 (TXVECTOR and RXVECTOR parameters) and 36.2.2 (TXVECTOR and RXVECTOR parameters). | As defined in 27.2.2 (TXVECTOR and RXVECTOR parameters) and 36.2.2 (TXVECTOR and RXVECTOR parameters). | As defined in 27.2.2 (TXVECTOR and RXVECTOR parameters) and 36.2.2 (TXVECTOR and RXVECTOR parameters). |
| Timestamp | Integer | N/A | The value of the local STA’s TSF timer at the start of reception of the SI2SR, SR2SI, or SR2SR NDP preamble. |

***TGbf editor: Please append sub clause 6.3.136.16 as follows:***

The primitive parameters are as follows:

MLME-SENSNTBREPORT.indication(

PeerSTAAddressList,

CSI\_ESTIMATE,

Timestamp

)

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Type | Valid range | Description |
| PeerSTAAddressList | MAC address | Any valid individual MAC address | Specifies the MAC address of the peer STA from which the sensing PPDU was received. |
| CSI\_ESTIMATE | As defined in 27.2.2 (TXVECTOR and RXVECTOR parameters) and 36.2.2 (TXVECTOR and RXVECTOR parameters). | As defined in 27.2.2 (TXVECTOR and RXVECTOR parameters) and 36.2.2 (TXVECTOR and RXVECTOR parameters). | As defined in 27.2.2 (TXVECTOR and RXVECTOR parameters) and 36.2.2 (TXVECTOR and RXVECTOR parameters). |
| Timestamp | Integer | N/A | The value of the local STA’s TSF timer at the start of reception of the SI2SR, or SR2SI NDP preamble. |

***TGbf editor: Please append sub clause 9.4.1.75.1 as follows:***

The Sensing Measurement Report Control field is defined in 9.4.1.75.3 (Sensing Measurement Report Control field(Motion 125)) and the Sensing Measurement Report field is defined in 9.4.1.75.4 (Sensing Measurement Report field(Motion 125)). The processes of encoding and decoding the CSI sent within a Sensing Measurement Report field is described in 9.4.1.75.2 (CSI encoding and decoding(Motion 125))(Motion 125).

The Reference Timestamp field contains the lower 4 octets of the TSF timer value, TSF[31:0], sampled at the instant the SI2SR, SR2SI, or SR2SR NDP preamble was received by the sensing receiver.

***TGbf editor: Please append sub clause 9.4.1.75.3 as follows:***

The Sensing Measurement Report Control field provides the information needed to process the Sensing

Measurement Report field. The Sensing Measurement Report Control field signals the channel width (CW), the number of transmit antennas(Ntx), the number of receive antennas(Nrx), the number of bits (Nb) used for each encoded CSI value, ~~and~~ an indicator (Ing) of the subcarrier grouping and an optional reference timestamp.

|  |
| --- |
| * Sensing Measurement Report Control field definition
 |
| Field | Size (bits) | Definition | Meaning |
| Report Control Length | 8 | Indicates the number of octets in the Sensing Measurement Report Control field, including the one octet for the Report Control Length subfield | Set to the number of octets in the Sensing Measurement Report Control field. |
| Presence & Control Bitmap | 8 | Includes fields to indicate presence of optional subfields in the Sensing Measurement Report Control field, or other control bits | The fields of the Presence and Control Bitmap field are specified in Figure 9-144m (Presence & Control Bitmap field format) |
| CW | 4 | Channel width | (Encoding of CW subfield is TBD) |
|  | 3 | Indicates the number of transmit antennas | Set to the number of transmit antennas minus 1. |
|  | 3 | Indicates the number of receive antennas | Set to the number of receive antennas minus 1. |
|  | 1 | Indicates the number of bits for each CSI value | Set to 0 for an 8-bit word size. Set to 1 for a 10-bit word size. |
|  | 1 | Indicates the subcarrier grouping setting | Set to 0 to indicate a subcarrier grouping of  if there are less than or equal to four transmit antennas.Set to 0 to indicate a subcarrier grouping of  if there are five or more transmit antennas and the channel width is 80 MHz or less.Set to 0 to indicate a subcarrier grouping  if there are five or more transmit antennas and the channel width is 160 MHz.Set to 1 to indicate a subcarrier grouping of .NOTE:  is optionally supported. |
| Reserved | 4 |  |  |
| Reference Timestamp | 0 or 32 | Optionally present, inclusion signaled by the Timestamp Present subfield within the Presence & Control Bitmap field. | When included, set to TSF[31:0] of the receiver’s local clock corresponding to the instance at which the SI2SR, SR2SI, or SR2SR NDP preamble was received. |

|  |  |  |  |
| --- | --- | --- | --- |
|  | Last SBP Report | Timestamp Present | Reserved |
| Bits: | 1 | 1 | ~~7~~6 |
|  | * Presence & Control Bitmap field format
 |

The Last SBP Report subfield indicates the last SBP report in the current availability window. The Last SBP Report subfield is set to 1 in an SBP Report frame sent in the SBP reporting procedure, if there is no more SBP Report frame to be sent in the current sensing availability window. Otherwise, it is set to 0. This subfield is reserved if sent in a Sensing Measurement Report frame.

The Timestamp Present subfield indicates the presence of the Reference Timestamp within the Sensing Measurement Report Control field. The Timestamp Present subfield is set to 1 when the Reference Timestamp is present. Otherwise, it is set to 0.

***TGbf editor: Please append sub clause 9.4.2.319 as follows:***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| SensingTransmitter | SensingReceiver | SensingMeasurementReportRequested | Report Timestamp | MeasurementSetup ExpiryExponent | BW |

Bits: 1 1 1 1 4 3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Tx Repetition | Rx Repetition | Tx STS  | Rx STS | Reserved | BSS Color Information |

Bits: 3 3 3 3 ~~6~~9 8

Figure 9-1002ax—Sensing Measurement Parameters field format

The Sensing Measurement Report Requested(#183) subfield is reserved if the Sensing Receiver subfield is set to 0(#199). If the Sensing Receiver subfield is set to 1,(#199)

* the Sensing Measurement Report Requested(#183) subfield is set to 1 to indicate that the sensing responder sends Sensing Measurement Report frames in sensing measurement instances that result from the sensing measurement setup.
* the Sensing Measurement Report Requested(#183) subfield is set to 0 to indicate that the sensing responder does not send Sensing Measurement Report frames in sensing measurement instances that result from the sensing measurement setup.

The Report Timestamp subfield is reserved if the Sensing Receiver subfield is set to 0, or if the Sensing Measurement Report Requested subfield is set to 0. If the Sensing Receiver subfield is set to 1 and the Sensing Measurement Report Requested subfield is set to 1,

* the Report Timestamp subfield is set to 1 to indicate that the Reference Timestamp is to be included in the Sensing Measurement Report Control field.
* the Report Timestamp subfield is set to 0 to indicate that the Reference Timestamp is not to be included in the Sensing Measurement Report Control field.

***TGbf editor: Please append the following rules to section 11.55.1.5.4 as follows:***

**11.55.1.5.4 Common rules**

A sensing responder which is a sensing receiver shall include the Reference Timestamp subfield in the Sensing Measurement Report Control field and indicate its presence by setting the Timestamp Present subfield in the Presence & Control Bitmap field to 1 when the sensing initiator set the Report Timestamp subfield to 1 in the Measurement Setup Request frame.

In the Segmentation Control field, the Report Control Present subfield shall be set to 1 when the First Report Segment subfield is 1. Otherwise, the Report Control Present subfield shall be set to 0.