IEEE P802.11
Wireless LANs

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| LMR Time Stamps |
| Date: 2020-09-30 |
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Abstract

This document proposes resolutions to TGaz LB249 comments related to the LMR timestamps.

The TGaz LB249 CIDs addressed in this document are CIDs:

3277, 3278, 3273,

3274, and 3275, and

3224.

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| **CID** | **P.L** | **Clause** | **Comment** | **Proposed change** | **Proposed resolution** |
| 3277 | 85.22 | 9.4.2.302 | The RSTA Passive Location LMR is likely transmitted with low MCS as it is used to broadcast LMR information. For this reason the 'RSTA Passive Location Measurement Report Element' should have a very small byte count. | Given that a STA doing passive locationing does only require the time difference of a TOA and TOD timestamp, the proposal is: Introduce another Type "time difference" in which case the time stamp field holds a time difference of TOA and subsequent TOD. The error field would need to be multiplied by 2 in this case, i.e. 2Emax. When implemented this saves signaling of N/2 time stamps. Also consider allowing fewer bits for this time of time stamp as it does not need to span as large a time interval. | Revised. TGaz editor, make the changes as shown below in document 11/20-1501. |
| 3278 | 85.22 | 9.4.2.302 | The ISTA Passive Location LMR is likely transmitted with low MCS as it is used to broadcast LMR information. For this reason the 'RSTA Passive Location Measurement Report Element' should have a very small byte count. | Given that a STA doing passive locationing does only require the time difference of a TOA and TOD timestamp, the proposal is: Introduce another Type "time difference" in which case the time stamp field holds a time difference of TOA and subsequent TOD. The error field would need to be multiplied by 2 in this case, i.e. 2Emax. When implemented this saves signaling of N/2 time stamps. Also consider allowing fewer bits for this time of time stamp as it does not need to span as large a time interval. | Revised. TGaz editor, make the changes as shown below in document 11/20-1501. |
| 3273 | 86.24 | 9.4.2.302 | The definition of the Time-Stamp Error subfield does not seem very efficient or appropriate. We should consider improving on this. | Revisit the definition of the Time-Stamp Error subfield and improve on it by making it use less bits. | Revised. TGaz editor, make the changes as shown below in document 11/20-1501. |

**Discussion for CIDs 3277 and 3278:**

Reporting only the time difference of a TOA and TOD timestamp is not the best way to reduce the number of bits used to report the timestamps for Passive TB Ranging. A reason for thi sis that in Passive TB Ranging we in general have multiple TOA timestamps for each reported TOA timestamp.

A better way to reduce the number of bits is to reduce the resolution from the current 1 ps to 128 ps (=3.84 cm propagation distance) and use only 16 bits to represent the timestamp.

The max timestamp that can be represented before it wraps to zero now becomes 8.38848 us. This corresponds to a propagation distance of about 2.5 km. The distances involved in any practical Passive TB Ranging scenario much less than 2.5 km, or even half of 2.5 km = 1.25 km which is the range ambiguity that enters in the the differential range calculations.

The PSTA can therefore, with the support of its own TOA timestamps corresponding to the TOD and TOA time stamps reported by the RSTA and ISTAs participating in the Passive TB Ranging, uniquely resolve the range ambiguities involved and determine the true, ambiguity free, differential ranges.

In order to allow for still using 48 bits to represent the timestamps, with a resolution of 1 ps, an unused bit in the Dialog Token field in the ISTA/RSTA Passive TB Ranging Measurement Report elements can be put to use to distinguish between using timestamps that are 48 bits long with a unit of 1 ps and timestamps that are 16 bits long with a unit of 128 ps.

We propose to make this change in both the ISTA Passive TB Ranging Measurement Report element and the RSTA Passive TB Ranging Measurement Report element.

**Discussion for CIDs 3873:** The Timestamp Error subfield in the ISTA/RSTA Passive TB Ranging Measurement Report element is 16 bits long but contains 11 reserved bits. We propose to reduce it to have only 3 reserved bits and a thus a total length of 8 bits. This also harmonizes this Timestamp Error subfield with the TOA/TOA Error fields in the Location Measurement Report frame.

***TGaz Editor: Change the text in Subclause 9.4.2.302 (ISTA Passive TB Ranging Measurement Report element) as follows:***

**9.4.2.302 ISTA Passive TB Ranging Measurement Report element (#2340)**

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | ElementID | ElementLength | Element ID Extension | Long Timestamp & SoundingDialog Token | CFO | More & N Timestamp Measurement Reports | Timestamp Measurement Reports |
| Octets: | 1 | 1 | 1 | 1 | 2 | 1 | variable |

**Figure 9-1023—ISTA Passive TB Ranging Measurement Report element (#1510, #3277, #3278)**

The Element ID, Length and Element ID Extension fields are defined in 9.4.2.1.

The Long Timestamp & Sound Dialog Token fieldis defined in Figure 9-1023a and contains the Long Timestamp subfield and the Sounding Dialog Token Number subfield. (**#3277, #3278)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Long Timestamp | Reserved | Sounding Dialog Token Number |
| Bits: | 1 | 1 | 6 |

**Figure 9-1023a – Long Timestamp & Sounding Dialog Token field (#3277, #3278)**

The Long Timestamp subfield is used to indicate representation of the reported time stamps with 48 or 16 bits. See the description of the Time Stamp Measurement Report subfield, depicted in Figure 9-1024. (**#3277, #3278)**

The Sounding Dialog Token Number is the value of Sounding Dialog Token Number subfield in the Ranging NDP Announcement frame of the corresponding to the measurement sounding phase in which

the reported timestamps were measured; see 11.22.6.4.3 (TB Ranging measurement 21 exchange) and 11.22.6.4.8 (Measurement exchange in Passive TB Ranging mode). (**#3277, #3278)**

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The Timestamp Measurement Reports field contains one or more Timestamp Measurement Report subfields defined as in Figure 9-1024.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Type | Valid | Timestamp | Timestamp Error | AID12/RSID12 | Variable |
| Bits: | 2 | 1 | variable | 8 | 12 | 1 |

**Figure 9-1024—Time Stamp Measurement Report subfield (#1515, #3277, #3278)**

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The Timestamp subfield contains a TOD, TOA, or PSTOA timestamp. If the Long Timestamp subfield in the Long Timestamp & Sound Dialog Token field is 1 then the timestamp is represented with 48 bits in units of 1ps, else if it is 0 it is represented with 16 bits in units of 128 ps.

***TGaz Editor: Change the text in Subclause 9.4.2.303 (RSTA Passive TB Ranging Measurement Report element) as follows:***

**9.4.2.303 RSTA Passive TB Ranging Measurement Report element (#2340)**

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | ElementID | ElementLength | Element ID Extension | Long Timestamp & Sounding Dialog Token | N Timestamp Measurement Reports | Timestamp Measurement Reports |
| Octets: | 1 | 1 | 1 | 1 | 1 | variable |

**Figure 9-1026—RSTA Passive TB Ranging Measurement Report element**

The Element ID, Length and Element ID Extension fields are defined in 9.4.2.1.

The Long Timestamp & Sound Dialog Token field is defined in Figure 9-1023a with definitions as detailed in 9.4.2.302 (ISTA Passive TB Ranging Measurement Report element). **(#1103,** **#3277, #3278)**

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| **CID** | **P.L** | **Clause** | **Comment** | **Proposed change** | **Proposed resolution** |
| 3274 | 95.21 | 9.6.7.48 | The definition of the Time-Stamp Error subfield does not seem very efficient or appropriate. We should consider imprioving on this. | Revisit the definition of the Time-Stamp Error subfield and improve on it by making it use less bits. | Reject.This is an invalid comment. It fails to identify changes in sufficient detail so that the specific proposed wording of the changes can be determined. |
| 3275 | 96.05 | 9.6.7.48 | The definition of the Time-Stamp Error subfield does not seem very efficient or appropriate. We should consider improving on this. | Revisit the definition of the Time-Stamp Error subfield and improve on it by making it use less bits. | Reject.This is an invalid comment. It fails to identify changes in sufficient detail so that the specific proposed wording of the changes can be determined. |

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| --- | --- | --- | --- | --- | --- |
| **CID** | **P.L** | **Clause** | **Comment** | **Proposed change** | **Proposed resolution** |
| 3234 | 95.01 | 9.4.6.7.48 | Move the ToA/ToD and associated Error fields into an optional subelement. This will make various privacy concerns easier as the element needs not to be included in the ISTA2RSTA LMR | As per comment | Do we want to do this? |

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**References:**

**[1] Draft P802.11az\_D2.3**