IEEE P802.11
Wireless LANs

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| 802.11[Resolutions to a few LB240 comments(relative to IEEE 802.11 REVmd D2.0 and P802.11az D1.0) |
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**Abstract**

This submission proposes resolutions to the following LB240 CIDs 1238, 1241, 1661, 1775, 1776, 2227, 2322, 1761, 1902 and 2448.

History:

R0: Initial Version

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| 1238 | Assaf Kasher | 11.22.6.1 | 79.19 | "legacy" - what does that mean? | replace "legacy FTM" with FTM (see 11.22.6.4) | REVISE |
| 1241 | Assaf Kasher | 11.22.6.1.1 | 80.10 | "legacy FTM, by DMGz and EDMGz STAs" - Legacy? DMGz? EDMGz? | Replace "legacy FTM, by DMGz and EDMGz STAs" with "FTM as described in 11.22.6.4, by PDMG and PEDMG STAs," | REVISE |

Discussion: D1.0 is inconsistent in renaming what used to be Fine Timing Measurement in the baseline (REVmd D2.0). In describing the session negotiation, the term ‘EDCA-based ranging session negotiation’ is used while in describing the measurement exchange, the term ‘FTM measurement exchange overview’ is used. In addition, ‘legacy’ is used in the following locations (in D1.0):

1. P79L19-20: RSTA centric scheduling is supported by legacy FTM, TB, PDMG and PEDMG ranging. ISTA centric scheduling is supported by non-TB ranging.
2. P80L10-11: EDCA based channel access is used by legacy FTM, by DMGz and EDMGz STAs, TB Ranging Measurement Exchange is used by HE STAs capable of TB Ranging Measurement Exchange.
3. P93L8-9: — RSTA centric EDCA based legacy Ranging mode (including PDMG and PEDMG) described in section 11.22.6.4.7 and 11.22.6.4.8
4. P127L9: (11.22.6.4.2 RSTA Centric EDCA basic legacy scheduling Measurement exchange),
5. P69L23-33: The FTM Synchronization Information field is present in the initial Fine Timing Measurement frame and its retransmissions if any, and in the first Fine Timing Measurement frame within each burst and its retransmissions if any; if the responder selects Fine Timing Measurement (11.22.6.4.2 RSTA Centric EDCA basic legacy scheduling Measurement) for the ranging phase, and in an A-MPDU aggregated with an LMR frame if the responder selects TB Ranging for the ranging phase; otherwise it is not present. If present, and the selected ranging phase is Fine Timing Measurement (11.22.6.4.2 RSTA Centric EDCA basic legacy scheduling Measurement), the FTM Synchronization Information field contains an FTM Synchronization Information element with a TSF Sync Info field containing the 4 least significant octets of the TSF at the responding STA corresponding to the time the responding STA received the last Fine Timing Measurement Request frame with the Trigger field equal to 1.

Also, there is some confusion/inconsistency on how best to interpret RSTA Centric versus ISTA Centric. The value of qualifying the protocol as ISTA Centric and RSTA Centric is not clear (and seems irrelevant to the protocol). Hence the proposal is to name the three variants as follows:

1. EDCA based FTM Session Negotiation and EDCA based FTM Measurement Exchange: applies to ‘legacy’ FTM, PDMG and PEDMG.
2. Trigger based FTM Session Negotiation and Trigger based FTM Measurement Exchange: applies to the Cl. 11.22.6.3.3 and 11.22.6.4.3
3. Non-Trigger based FTM Session Negotiation and non-Trigger based FTM Measurement Exchange: applies to Cl. 11.22.6.3.3 and 11.22.6.4.4.

Proposal: Rename the baseline Fine Timing Measurement protocol as [RSTA Centric] EDCA based FTM Session. The corresponding negotiation is hence [RSTA Centric] EDCA based FTM Session Negotiation. The corresponding Measurement Exchange is hence [RSTA Centric] EDCA based FTM Measurement Exchange.

<< if there is an agreement on this terminology, corresponding editor instructions to make appropriate changes to the TGaz draft needs to be enumerated here >>

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| 1661 | Ganesh Venkatesan | 9.4.2.280 | 53.00 | "The Secure LTF Parameters element is optionally included in the initial Fine Timing Measurement frame, ...". The Secure LTF Parameters element applies only to non-TB and TB Ranging and hence logically belongs (as an optional subelement) in the Ranging Parameters element. | Move the Secure LTF Parameters to be a Ranging Subelement of the Ranging Parameters element. Note that the Secure LTF Parameters element can still be part of the Location Measurement Report frame. |  |

Discussion: Secure LTF applies to DMG/EDMG, TB and non-TB Ranging modes (and not to the FTM protocol defined in IEEE802.11-2016). It is a lot cleaner to move the Secure LTF Parameters element as an optional subelement to Ranging Parameters element to address TB and non-TB Ranging; and to Fine Timing Measurement Parameters element to address DMG/EDMG Ranging.

Resolution: REVISE

<<render Secure LTF Parameters element as an optional subelement of Ranging Parameters element and Fine Timing Measurement Parameters element based on the outcome of the discussion in TGaz>>

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| 1775 | Jarkko Kneckt | 11.22.6.1.1 | 80.01 | The figure 11-33 shows that there is no ranging if the two or more concurrent FTM Sessions overlap in time. There is no need for such restriction. An FTM session may perform ranging, even if there is an overlapping FTM session. | Modify the figure 11-33 to show that FTM session may perform ranging even if there is an overlapping session. | Reject |

Discussion: from an ISTA perspective there cannot be two concurrent FTM sessions (with different RSTAs) overlapping in time. Propose to reject thjs comment with the following response.

Resolution: Reject. An ISTA can establish only one FTM session with an RSTA. At a given point in time there can only be one measurement exchange between an ISTA and a RSTA. There is no mechanism defined in IEEE802.11 for a non-AP STA to exchange frames with more than one AP at the same time (and hence measurement exchanges with more than one RSTA at the same time is not possible). As a result from an ISTA perspective there cannot be FTM sessions overlapping in time.

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| 1776 | Jarkko Kneckt | 11.22.6.1.1 | 81.01 | It is unclear whether the all FTM messages of a ranging exchange needs to be performed within the availability window, or whether the FTM ranging needs to be initiated within the availability window. The question is: What happens if all ranging operations are not finished within an availability window and the STA is not avaialble at the next availability window. | Please clarify whether the ranging needs to be done within the Availability Window, i.e. what happens if the ranging does not fit within an availability window. | Reject |

Discussion: The protocol design takes into account the time it takes to complete all the exchanges corresponding to the negotiated FTM session. The ranging operation therefore is expected to complete within the Availability Window. However there could be error conditions which may lead to one or more frames in the ranging exchange being lost. This will result is an error condition and recovery mechanisms are built into the protocol design.

Resolution: Reject. The protocol design defines Availability Window to accommodate the time it takes to complete corresponding measurement exchange(s). When there are no errors, the measurement exchange completes within an Availability Window. If there are errors, the measurement exchange is incomplete and the specification has mechanisms to detect such failures and recover in order to perform a new measurement exchange in a future Availability Window. No changes are required in the specification.

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| 2227 | Minyoung Park | 4.3.19.19 | 6.23 | Probably a short paragraph is needed to describe how the positioning is enhanced by this amendment. | As shown in the comment. | REVISE |
| 2322 | Song-Haur An | 4.3.19.19 | 6.20 | What is the technical enabler for the "enhancements" being amended in this version? It's not clear that the added paragraph illustrates any "new" idea for amendment since the fine timing measurement is not a new feature. | Please provide a summary of new (FTM) features in this amendment project. | REVISE |
| 1761 | Jarkko Kneckt | 4.3.19.19 | 6.21 | Unclear text:"An HE STA may poll other HE STAs using the TB ranging sequence, whether they request range measurement and then schedule times for concurrent range measurements to several HE STAs" | Please change to: "An HE STA may range other HE STAs using the TB ranging sequence and schedule times for concurrent range measurements to several HE STAs." | REVISE |
| 1902 | Mark Hamilton | 4.3.19.19 | 6.21 | The second sentence of 4.3.19.19 seems to be completely separate concept from the first sentence. This second sentence seems to be discussing how to get a scheduled window in which FTM can be done, right? If that's correct, then this seems like a detail of how to do FTM when combined with HE scheduling, not a new high level concept of what FTM does (which is what clause 4 is intended for). | Delete the second sentence of the paragraph | ACCEPT |
| 2488 | Xiaofei Wang | 4.3.19.19 | 14.22 | Not sure what it is means "whether they request range", is that word supposed to be "in which"? Also "they" is a grammer mistake. | change "whether they request range measurement and then schedule times for concurrent range measurements to several HE STAs." into "in which it requests range measurement and then schedules times for concurrent range measurements to several HE STAs." | REVISE |

Discussion: Clause 4 needs to be updated highlighting the enhancements that TGaz brings to 802.11. Enabling Management Frame protection using PASN, PHY layer security with LTF repetitions, optimized measurement exchange(s) based on (i) the .11ax Sounding Protocol, (ii) completing measurement exchanges within a TXOP, (iii) allowing for the use of multiple Tx/Rx chains for better LoS estimation and (iv) Passive Ranging.

Resolution: REVISE

**4.3.19.19 Fine timing measurement**

***TGaz Editor: 11-19-704r5 modifies the new paragraph added to Cl. 4.3.19.19. The text shown below is part of the new paragraph. Delete the text (in D1.0) and add the new paragraphs as shown below:***

The Pre-association Security Negotiation protocol enables setting up the required security context to protect the frames exchanged in order to establish a FTM session between two peers and on successful establishmnent of a FTM session to perform the measurement exchanges.

A FTM session is negotiated to determine range estimates by executing one of the measurement exchanges listed below:

* EDCA based exchange of Fine Timing Measurement frames where location estimates are based on Time of Departure and Time of Arrival of the exchanged FTM frames and their corresponding acknowledgements. Optionally Angle of Arrival and Angle of Departure estimates can be used to improve the accuracy of the location estimate. When the negotiated FTM session is over DMG/EDMG, security parameters can be negotiated to ensure that the measurement exchange is exectuted with the intended peer.
* Trigger based measurement where location estimates are based on the execution of the the trigger based measurement exchange, Optionally, the FTM session can be negotiated to enable security parameters enabling mechanisms to ensure that the measurement exchange is executed with the intended peer.
* Non-Trigger based measurement where location estimates are based on the execution of the non-trigger based measurement echange. Optionally, the FTM session can be negotiated to enable security parameters enabling mechanisms to ensure that the measurement exchange is executed with the intended peer.

A Passive Ranging protocol is defined where a STA can determine its location based on reports received by the STA from other STAs that execute the Passive Ranging Protocol amongst them and send periodic reports.