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) |
| Date: 2019-05-14 |
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**Abstract**

This submission proposes resolutions to the following LB240 CIDs 1106, 1119, 1120, 1399, 1626, 1589, 1639, 1667, 1668, 1674, 1759, 1760, 1901 and 2485.

History:

R0: Initial Version – iInitial version

R1: discussed in the ad hoc (CIDs 1106,1399); 1119 and 1667 need more discussion/work

R2: Updated based on discussions in the Monday PM1 meeting

R3: Updated based on discussions in the Tuesday AM2 meeting

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| 1106 | Alfred Asterjadhi | 9.4.2.26 | 44.22 | Extended Capabilities element is used by several existing amendments. Define an independent capabilities element for this amendment as is done for other amendments. | As in comment. | REJECT. There are bits in the Extended Capabilities element related to ranging in the baseline. The number of new bits added (8) does not warrant a 3-byte overhead incurred when a new element is defined/added to the Beacon/Probe Response. |

Discussion:

TGaz reuses two bits from the Extended Capabilities element that were added to the Extended Capabilities element when Fine Timing Measurement was added to the specification. These bits cannot be moved as moving them will impact current implementations. In addition, defining an amendment-specific capabilities element has an overhead of 3-bytes (Element ID, Length and Element ID Extension). It makes sense to define a TGaz-specific Capabilities element if and only if the information contained in the element is more than 3-bytes (to justify the 3-byte overhead in Beacons).At this point (where the TGaz specification is considered feature-complete) there are 12 new bits defined in the Extended Capabilities element that are pertinent to TGaz (of these 2 bits are redundant, the Single User Range Measurement and Multi User Range Measurement bits are the same as non-TB Ranging Responder and TB Ranging Responder respectively, and should be removed). Since the information contained is far less than the overhead incurred in defining an amendment-specific Capabilities element, it is prudent to add bits to the Extended Capabilities element.

Resolution: Reject. The overhead in defining an amendment-specific Capabilities element is much bigger than the information contained in such an element. Hence the information is directly added to the Extended Capabilities element.

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| 1119 | Alireza Raissinia | 9.4.2.26 | 35.00 | LTF Required bit is useful for BSS Policy as it provide frame exchange efficiency | Add "Secure LTF Required" bit to the Extended Capability field and also describe it in the section Annex C | REJECT. The existing bits ‘Secure LTF Support’ and ‘Protection of Range Measurement and Management frames Required’ together provide the functionality of the proposed ‘Secure LTF Required’ |

Discussion: There are two bits in the Extended Capabilities element namely Secure LTF Support (which indicates that the STA implements support for Secure LTF) and Protection of Range Measurement and Management Frames Required (which indicates that the STA requires PASN authentication and subsequent PTKSA derivation to protect all exchanges with the STA). An ISTA can determine if a RSTA is a potential ranging candidate based on these two bits without explicitly exchanging IFTMR/IFTM with the RSTA (achieving frame exchange efficiency).

Proposed Resolution: REJECT. The existing bits Secure LTF Support (which indicates that the STA implements support for Secure LTF) and Protection of Range Measurement and Management Frames Required (which indicates that the STA requires PASN authentication and subsequent PTKSA derivation to protect all exchanges with the STA) can provide the frame exchange efficiency identified in the comment.

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| 1120 | Alireza Raissinia | 9.4.2.26 | 35.23 | Use of "Multi User Ranging Measurement" information maybe unnecessary. | Specify TB ranging information support implies the support for Multi User Ranging measurement which allows removing this field? | Accept |
| 1399 | Christian Berger | 9.4.2.26 | 36.00 | Table 9-153 - duplicate entries, seems "Single User Range Measurement" and Multi User Range Measurement are identical to "non-TB Ranging Responder" and "TB Ranging Responder" | Remove duplicates | Accept |
| 1626 | Ganesh Venkatesan | 9.4.2.26 | 36.00 | Redundant (vestiges from earlier draft?) bits in Table 9-153. Single User Range (now termed nTB) and Multi User Range (now termed TB) Measurement bits are redundant in Table 9-153. | Delete the rows corresponding to Sungle User Range Measurement and Multi User Range Measurement. | Accept |

Discussion: Single User Ranging Measurement and Multi User Ranging Measurement bits in the Extended Capabilities element are the same as non-TB Ranging Responder and TB Ranging Responder. Hence both Single User Ranging Measurement and Multi User Ranging Measurement bits can be deleted from Table 9-153; and in the draft all references to Single User Ranging Measurement and Multi User Ranging Measurement should either be

1. replaced with non-TB Ranging Responder and TB Ranging Responder resprectively. Or
2. deleted (only one occurrence).

Resolution: Accept.

**9.4.2.26 Extended Capabilities element**

***TGaz Editor: Delete the rows with the entry ‘Single User Range Measurement’ and ‘Multi User Range Measurement’ in the information column in Table 9-153 Extended Capabilities element.***

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| 1593 | Ganesh Venkatesan | 6.3.5.3.3 | 10.00 | The description corresponding to Contents of the PASN Authentication Frame is incorrect. Note that .confirm is generated by the MAC layer and sent to the SME. So, the contents of the .confirm primitive are derived from a Authentication frame received from the peer. So, 'the set of elements and fields to be included in PASN authentication frames' is incorrect.This comment applies to .indication primitive as well. | Replace with "The set of elements and fields relevant to PASN authentication from the received Authentication frame from the peer", or something to that effect. The key here is that the parameters that make up the .confirm primitive are derived from the frame received from the peer (and not received from the SME to populate a frame to be sent to the peer). | ACCEPT |

***Discussion: The Indication and Confirm primitives are generated at the MAC layer and sent to the SME. So, the contents of these primitives are derived respectively from the received***

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| 1601 | Ganesh Venkatesan | 6.3.56.4 | 19.14 | it is not clear when the .indication primitive will be generated in the TB and nTB exchange. | Add additional conditions to the baseline (Cl. 6.3.56.4.3 When generated): This primitive is generated by the MLME when a Fine Timing Measurement frame is received the peer STA when the ranging protocol is RSTA Centric EDCA based measurement exchange (11.22.6.4.2) or when a RSTA to ISTA LMR Feedback or a ISTA to RSTA LMR Feedback is received from the peer when the ranging protocol is either a TB or a nTB measurement exchange. | Accept |

Discussion: With TB and nTB ranging, Fine Timing Measurement frames are used only during the negotiation phase. The .indication primitive delivers the measurement results (ToA, ToD in the legacy case, for instance) to the SME. In the TB and nTB case, we expect the .indication primitive to be generated by the MLME when

1. a Fine Timing Measurement is received from the RSTA in response to a Fine Timing Measurement Request that the ISTA sent to the RSTA; or a Fine Timing Measurement Request frame was received from an ISTA by an RSTA. The Ranging Parameters element is part of this indication; or
2. a Location Measurement Report is received at a ISTA or at a RSTA. The Ranging Parameters element is not part of this indication. Note that the LMR may have additional data that is not covered by the parameters that are currently part of the .indication primitive.

Resolution: REVISE

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| 1639 | Ganesh Venkatesan | 9.4.2.187 | 44.00 | Impact of renaming FILS Wrapped Data to Wrapped Data is not completed addressed. | FILS Wrapped Data is used in clauses 12.12.2.3.1 (P2674L65), (P2675L1) (P2675L5), 12.12.2.3.3 (P2676L16) -- twice, (P2676L60) -- twice, and more). This change has to be reflected through all usages in the baseline. | REVISE |

Discussion: Clause 9.4.2.187 titled FILS Wrapped Data (defined in .11ai was changed to Wrapped Data in .11az. This change is not reflected as changes to the baseline in .11az D1.0.

Resolution: REVISE

***Editor: Change FILS Wrapped Data to Wrapped Data the following listed below:***

4.10.3.6.2 AKM operations using FILS Shared Key authentication (1 occurrence)

**4.10.3.6.2 AKM operations using FILS Shared Key authentication**

A non-AP STA and an Authentication Server (AS) using FILS Shared Key authentication verify mutual possession of a shared key (rRK) (as defined in IETF RFC 5295 and IETF RFC 6696) using Extensible Authentication Protocol (EAP) reauthentication protocol (EAP-RP) signaling. EAP-RP signaling is encapsulated using wrapped data in an Authentication frame as shown in Figure 4-35 (FILS authentication using Authentication Server(11ai)). A valid rRK is derived using a prior full authentication using the full EAP as defined in 4.10.3.2 (AKM operations with AS). This rRK can be used for multiple runs of EAP-RP authentications as specified in IETF RFC 5295 and IETF RFC 6696.

6.3.5.2.2 Semantics of the service primitive (1 occurrence)

6.3.5.3.2 Semantics of the service primitive (1 occurrence)

6.3.5.4.2 Semantics of the service primitive (1 occurrence)

6.3.5.5.3 When generated (1 occurrence)

Table 9-42—Authentication frame body (2 occurrences)

Table 9-43--Presence of fields and elements in Authentication frames (6 occurrences)

Table 9-94—Element IDs (2 occurrences)

Clause 9.4.2.187 Caption associated with Figure 9-657 (1 occurrence)

12.12.2.3.1 Overview (3 occurrences)

12.12.2.3.2 Non-AP STA construction of Authentication frame (2 occurrences)

12.12.2.3.3 AP processing of Authentication frame (2 occurrences)

12.12.2.3.4 AP construction of Authentication frame (1 occurrence)

B.4.27 FILS Features (2 occurrences)

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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. | 14/0/3 |

Discussion: The RSTA includes a Secure LTF Parameters element in the initial Fine Timing Measurement frame defining the parameters that governs the Secure Ranging Session between the ISTA and the RSTA when operating non-TB or TB mode. This does not apply to secure [E]DMG since the corresponding parameters are in the Secure Ranging Parameters field that is part of the P[E]DMG Specific Parameters element. To keep non-TB and TB related parameters separate it is better to include them (as an optional subelement) in the Ranging Parameters element.

Resolution: Revise (need discussion in TGaz)

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| 1667 | Ganesh Venkatesan | 9.4.2.282, 9.4.2.283 | 56.00 | What is an "FTM exchange ISTA" and "an FTM exchange RSTA". ISTA and RSTA definitions are in the context of FTM exchanges; and hence FTM exchange ISTA is equivalent to ISTA , and FTM exchange RSTA is equivalent to RSTA. | delete "FTM exhange" | REVISE. Delete 4 occurrences of “FTM Exchange” |

Resolution: REVISE.

**9.4.2.282 Multiple Best AWV ID element**

 ***TGaz Editor: Change the first statement in Cl. 9.4.2.282 Multiple Best AWV ID element as shown below:***

The Multiple Best AWV ID element is used to send multiple TRN subfields indices/AWV IDs from an ISTA to a RSTA.

**9.4.2.283 Multiple AOD Feedback element**

***TGaz Editor: Change the first statement in Cl. 9.4.2.283 Multiple Best AoD Feedback element as shown below:***

The Multiple AOD Feedback element is used to send multiple AOD (Angle of Departure) results from an RSTA to a ISTA.

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| 1668 | Ganesh Venkatesan | 9.4.2.282 | 56.04 | ISTA to RSTA exchange happens in Fine Timing Measurement Request frames (and not in Fine Timing Measurement frames). Is the Multiple Best AWV ID element sent from ISTA to RSTA? If so, the frame carrying this information has to be Fine Timing Measurement frame; or from RSTA to ISTA? | Either state that the exchange is from ISTA to RSTA and the information is carried in Fine Timing Measurement Request frame; or state that the exchange is from RSTA to ISTA and the information is carried in Fine Timing Measurement frame(s). | REJECT. This is a case where the ISTA sends information back to the RSTA in order for the RSTA to estimate Angle of Departure. This information is sent by the ISTA to the RSTA using Fine Timing Measurement frames. Note the use of Fine Timing Measurement frames by an ISTA is new (and needs to be explicitly noted in Clause-11). |

Discussion: This is a case where the ISTA sends information back to the RSTA in order for the RSTA to estimate Angle of Departure. This information is sent by the ISTA to the RSTA using Fine Timing Measurement frames. Note the use of Fine Timing Measurement frames by an ISTA is new (and needs to be explicitly noted in Clause-11).

Resolution: REJECT

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| 1674 | Ganesh Venkatesan | 9.4.2.284 | 58.00 | Why do we need a Ephemeral Public Key Length field, if the Key if present is only 1 octet long? | Edit the size of the Ephemeral Public Key field to be variable (not 0 or 1). | REJECT. The figure depicts the fields correctly but due to an offset in the row labelled Octets, the size of the fields, appear incorrect. |

Discussion: The figure depicts the fields correctly but due to an offset in the row labelled Octets, the size of the fields, appear incorrect.

Resolution: REJECT

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| 1759 | Jarkko Kneckt | 4.3.19.19 | 6.20 | Unclear text. The directions in case of RX operation and in case of TX operation should be clarified in more details. | Please change to: "... the direction to which the frames are transmitted and the direction from which the received frames were received." | REVISE |
| 1760 | Jarkko Kneckt | 4.3.19.19 | 6.21 | The term: "single link positioning" is unclear. What does single link positioning mean? | Please clarify "a single link positioning" and add this term to definitions. | REVISE |
| 1901 | Mark Hamilton | 4.3.19.19 | 6.20 | If we're going to talk about "single link positioning" it would be good to first introduce the concept of multi-link positioning (I assume this is so-called 'triangulation' , as oppsoed to azimuth/range positioning with a single link?). | Modify the paragraph before the new text (in the last sentence, or perhaps add a new sentence before the last sentence), stating that using FTM to/from multiple other STAs, a STA can determine its position with respect to these other STAs. Then, in the new text, mention that [E]DMG STAs have an additional ability to do some positioning with only a single link, due to the direction information. | REVISE. Extend the first paragraph to include a description of ranging with multiple responders to determine location. Expand the description of how over DMG/EDMG links it is possible to combine timestamp measurements and angular measurements and determine location of a STA by executing the Fine Timing Measuremenr procedure with a single peer. |
| 2485 | Xiaofei Wang | 4.3.19.19 | 14.21 | Please clarify what "a single link positioning: is. It is not a concept that was defined elsewhere or used anywhere in the spec. | as in comment. Provide the definition if necessary. | REVISE |
| 1589 | Ganesh Venkatesan | 4.3.19.19 | 6.00 | "With the regular transfer of Fine Timing Measurement frames it is possible for the recipient STA to track changes in its relative location with other STAs in the environment." Not true if the measurement exchange is non-Trigger based or Trigger based | The statement in the baseline needs to be modified to include exchanges corresponding to nTB abd TB as means for estimating position/location. Replace with "With the regular transfer of Fine Timing Measurement frames or with regular execution of ranging sounding exchanges, it is possible for the recipient STA to track changes in its relative location with other STAs in the environment." | REVISE. Replace “regular transfer of Fine Timing Mesurement frames” with “the execution of Fine Timing Measurement procedure” |

Discussion: Agree that the statement is cryptic and hard to parse. The intent was to state that with DMG and EDMG, AoD and AoA estimates can be obtained for transmissions to STA and receptions from a STA; and augmented with ToD and ToA in order to be able to estimate relative position of the STA by exchanging frames with just a peer.

Resolution: REVISE

***TGaz Editor: Change the following in Cl. 4.3.19.19***

**4.3.19.19 Fine timing measurement**

Fine timing measurement allows a STA to accurately measure the round trip time (RTT) between it and another STA. With the execution of the Fine Timing Measurement procedure (#1589) it is possible for a STA to track changes in its relative location with other STAs in the environment. A STA executes the Fine Timing Measurement procedure with multiple peers and uses the resulting relative location estimates along with the absolute position of each of the peers to determine its position in geo-spatial coordinates (#1759, #1769, #1901, #2485).

DMG and EDMG devices can also estimate the direction of the transmission (Angle of Departure) of frames transmitted to and reception (Angle of Arrival) of frames received from a peer, allowing for estimating position using measurements obtained from frame exchanges with a single peer (#1759, #1760, #1901, #2485)..