IEEE P802.11
Wireless LANs

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| Normative text for LB198 active scanning comments |
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Abstract

The submission provides normative text as a resolution to the LB198 comments to 802.11ai D1.0.

The resolutions follow the presentation 1165r1 in which the group had strawpolls on several topics.

The following CIDs are included: 2762, 3197, 2908, 2304, 2466, 2467, 3198, 2710, 3044, 2807, 3349, 3371, 3129, 3310, 3312, 3313, 3199, 3350, 3351, 3372, 3373, 2014, 2763, 2506, 3131, 3293, 3314, 2759, 2764, 3200, 2401, 2909, 3201, 2408 and 3113.

The Probe Rsponse Reception Time element is merged with the FILS Request Parameters in order to reduce information elements that are created by 802.11ai. These elements are only used in Probe Request frame and can be merged.

Resolutions are provided in this submission.

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| --- | --- | --- | --- | --- |
| 2762 | 40.39 | the filtering behavior described in the FILS Request Parameters is non indicative of the AP ability to support the probing STA connection's QoS requirements, it does limit the probability of other STA's relaying on the same Probe Req thus conflicting to the Probe Rsp broadcast add. | have all APs respond and select from within those and have the AP indicate the FILS criteria in the Probe Rsp, attempt association only to APs that qualifies. A multiple session can be executed to shorten time to association e.g. give a temporary add. or identifier to associate Probe Req, Rsp and association to a single STA. | REJECTED. The Probe Response criterion is reducing the number of probe response messages and avoiding probe response storms and heavy large overhead. The STA has possiblity to request Probe response from all APs, but it may also reduce the probe response transmissions from APs that it is not interested. |
| 3197 | 40.42 | First letter of frame names are capitalized | Change "...whether to transmit a Probe response frame as described in 10.1.4.3.6 (Selecting the response frame..." to "...whether to transmit a Probe Response frame as described in 10.1.4.3.6 (Selecting the response frame..." | ACCEPTED. |
| 2908 | 40.44 | There is an extra closing parenthesis. | Change to: "probe request))." | ACCEPTED. |
| 2304 | 41.00 | "may be present in the IE respectively" contains a normative term. In addition, the bitmap undoubtedly needs to correlate to fields that actually exist in the element; also "IE" is gone and "respectively" has nothing to be respective with. | Replace "may be present in the IE respectively" with:"are present in the element." | ACCEPTED. |
| 2466 | 41.08 | Remove references to data access categories for a probe response. A probe response is not data. | (lines 50-61) Remove all references to data traffic access categories for probe response. A probe response is not a data frame. It does not have data like access category. A new device also does not know how an AP is managing its Access Categories, so how is it expected to choose a category. | REJECTED.The commenter indicates that delay values of the Table 8-183cv are related to Probe Response frame. The delays are related to data transmission delays for each AC of hte data. The criteria uses AC specific access delays to determine should the response be transmitted.  |
| 2467 | 41.08 | Refererence to 8.4.2.21 is wrong. 8.4.2.21 refers to channel switching | The entire table is of questionable value. I propose removing it and associated text. | REJECTED. The table specifies how the access delays of the data frames that are considered as a probe response criteria. Similar to CID 3199 that corrects the reference number.  |
| 3198 | 41.09 | In Figure 8-401cu and Figure 8-401cv, the bits of a field should addressed as B0, B1, etc as in Figure 8-197 in 802.11-2012 | Add the bit naming for the figures in comment. Also address the bits as named in line 2 of the same page. | REVISED. Resolution shown in this submission. |
| 2710 | 41.10 | The "Received Signal Strength Limit present" subfield in Parameter Control Bitmap is suggested to change to "RCPI Limit present" to be consistent with other narrations throughout this subclause. | As per comment | ACCEPTED. |
| 3044 | 41.10 | Is a 'Received Signal Strength Limit present' subfield in a Figure 8-401cu correspond to a 'RCPI Limit' subfield? | Replace 'Received Signal Strength Limit' in a Figure 8-401cu by 'RCPI Limit'. | REVISED. Similar to CID2710. |
| 3069 | 41.10 | According to the clause 2.1.1 of the 802.11 Style Guide (11-09/1034r7), it is better add bit labels (B0, B1, ..) to a bit-aligned figure like a Figure 8-401cu. | Add bit labels such as B0, B1, .. to the Figure 8-401cu, the Figure 8-401cv, the Figure 8-401dj, the Figure 8-401dl, the Figure 8-401dn, the Figure 8-401ds, the Figure 8-401dt, the Figure 8-502l, the Figure 8-502k. | 8.4.2.177 changes done, other parts need checking.This CID remains open. |
| 2807 | 41.28 | On Figure 8-401cv, it is hard to know which is the LSB.There is a sub-field: BSS Delay Criteria and Table 8-183ae defines the value of this sub-field. It is confusing which is the LSB of this sub-field. Is the value=4 in table "100" or "001" on the figure ?Same for Figure 8-401djt, 8-401dl, 8-401dn, 8-401ds etc.. | It is better to indicate Bx(B0, B1, B2, B3, B4, B5, B6, B7) above the Figures like Figure 8-401df, and modify Table 80183ae like Table 8-183aj with Bit indicated (B3, B2, B1).Since there are many similar cases in this specification and this maybe a common practice, I don't request it strongly. | ACCEPTED.  |
| 3129 | 41.28 | Figure 8-401cv, "HT Support Criteria" and "VHT Support Criteria", why an AP's support of HT or VHT or not relevant given that there is already an "Minimum Data Rate" field in the FILS Request Parameters element? | Explain why "HT Support Criteria" and "VHT Support Criteria" are used for FILS. Otherwise, remove the two fields. | REJECTED. The HT and VHT provide the standard for air interface capabilities. The Minimum Data Rate indicates just the total throughput over MAC SAP that the STA is going to transmit. The Minimum Data Rate may consider link performance, other traffic and many different criteria when the AP is responding to the request. The HT and VHT criteria focus only to the capabilities of the AP. Thus, these criteria are specific. |
| 3130 | 41.28 | Figure 8-401cv, it's inefficient to using one bit for "HT Support Criteria" and one bit for "VHT Support Criteria" in the FILS Criteria field. It's better to specify a 2-bit "Supported PHY" field, in which value "0" indicates "HT support", value "1" indicates "HT and VHT support" and value "2" and "3" are reserved for possible future use. | To be more efficient, instead of using one bit for "HT Support Criteria" and one bit for "VHT Support Criteria" in the FILS Criteria field, specify a 2-bit "Supported PHY" field, in which value "0" indicates "HT support", value "1" indicates "HT and VHT support" and value "2" and "3" are reserved for possible future use. | REJECTED. The STA should have possibility to indicate that HT or VHT criteria are not present. The proposed logic does not allow to request responses from VHT AP only, i.e. HT and VHT APs may always respond. The field has many reserved bits and there is room to add more criteria to the coming standards. For instance in future the response could be requested only from HEW APs.  |
| 3312 | 41.28 | Figure 8-401cv, "HT Support Criteria" and "VHT Support Criteria", why an AP's support of HT or VHT or not relevant given that there is already an "Minimum Data Rate" field in the FILS Request Parameters element? | Explain why "HT Support Criteria" and "VHT Support Criteria" are used for FILS. Otherwise, remove the two fields. | REJECTED. The HT and VHT provide the standard for air interface capabilities. The Minimum Data Rate indicates just the total throughput over MAC SAP that the STA is going to transmit. The Minimum Data Rate may consider link performance, other traffic and many different criteria when the AP is responding to the request. The HT and VHT criteria focus only to the capabilities of the AP. Thus, these criteria are specific. |
| 3313 | 41.28 | Figure 8-401cv, it's inefficient to using one bit for "HT Support Criteria" and one bit for "VHT Support Criteria" in the FILS Criteria field. It's better to specify a 2-bit "Supported PHY" field, in which value "0" indicates "HT support", value "1" indicates "HT and VHT support" and value "2" and "3" are reserved for possible future use. | To be more efficient, instead of using one bit for "HT Support Criteria" and one bit for "VHT Support Criteria" in the FILS Criteria field, specify a 2-bit "Supported PHY" field, in which value "0" indicates "HT support", value "1" indicates "HT and VHT support" and value "2" and "3" are reserved for possible future use. | REJECTED. The STA should have possibility to indicate that HT or VHT criteria are not present. The proposed logic does not allow to request responses from VHT AP only, i.e. HT and VHT APs may always respond. The field has many reserved bits and there is room to add more criteria to the coming standards. For instance in future the response could be requested only from HEW APs. |
|  |  |  |  |  |
| 3349 | 41.37 | "A Reduced Neighbor Report Request field value of 1 indicates that the information of other BSSs are requestedto be included in the Probe Response frame transmitted in response to the Probe Request."Request element (sub-clause 8.4.2.10) can be placed in a Probe Request frame to request that the responding STA include the requestedinformation in the Probe Response frame. What is the difference with the Request element? | Remove a Reduced Neighbor Report Request field from FILS Criteria field or clarify the difference with the Request element. | ACCEPTED. Based on the 802.11ai group feedback as described in the presentation 13-1165r1, the group recommended to delete the field.  |
| 3371 | 41.37 | "A Reduced Neighbor Report Request field value of 1 indicates that the information of other BSSs are requestedto be included in the Probe Response frame transmitted in response to the Probe Request."Request element (sub-clause 8.4.2.10) can be placed in a Probe Request frame to request that the responding STA include the requestedinformation in the Probe Response frame. What is the difference with the Request element? | Remove a Reduced Neighbor Report Request field from FILS Criteria field or clarify the difference with the Request element. | ACCEPTED. Based on the 802.11ai group feedback as described in the presentation 13-1165r1, the group recommended to delete the field. |
| 2760 | 41.44 | reference in red text | correct font/color of reference | ACCEPT. |
| 3199 | 41.62 | The reference seems incorrect. 8.4.2.21 (Channel Switch Announcement element 802.11-2012) seems unrelated to Average Access Delay | Change reference from 8.4.2.21 to 8.4.2.41 | ACCEPT.  |
| 3350 | 42.03 | "An HT Support Criteria field value of 1 indicates that responding STA must be HT capable. A value of 0indicates otherwise."If a STA wants to receive a Probe Response frame from only a HT capable STA, the STA can transmit a Probe Request frame in HT PPDU format.Because the non HT capable STA can not receive a Probe Request transmitted in HT PPDU format, it does not respond with a Probe Response frame.So, the concept of of the HT Support Criteria field is already suppoted in the current spec. | Remove a HT Support Criteria field from FILS Criteria field. | REJECTED. As discussed in 13-1165r1, the group saw value on maintaining the HT and VHT support criteria fields.  |
| 3351 | 42.03 | "An VHT Support Criteria field value of 1 indicates that responding STA must be VHT capable. A value of 0indicates otherwise."If a STA wants to receive a Probe Response frame from only a VHT capable STA, the STA can transmit a Probe Request frame in VHT PPDU format.Because the non VHT capable STA can not receive a Probe Request transmitted in VHT PPDU format, it does not respond with a Probe Response frame.So, the concept of of the VHT Support Criteria field is already suppoted in the current spec. | Remove a VHT Support Criteria field from FILS Criteria field. | REJECTED. As discussed in 13-1165r1, the group saw value on maintaining the HT and VHT support criteria fields.  |
| 3372 | 42.03 | "An HT Support Criteria field value of 1 indicates that responding STA must be HT capable. A value of 0indicates otherwise."If a STA wants to receive a Probe Response frame from only a HT capable STA, the STA can transmit a Probe Request frame in HT PPDU format.Because the non HT capable STA can not receive a Probe Request transmitted in HT PPDU format, it does not respond with a Probe Response frame.So, the concept of of the HT Support Criteria field is already suppoted in the current spec. | Remove a HT Support Criteria field from FILS Criteria field. | REJECTED. As discussed in 13-1165r1, the group saw value on maintaining the HT and VHT support criteria fields. |
| 3373 | 42.03 | "An VHT Support Criteria field value of 1 indicates that responding STA must be VHT capable. A value of 0indicates otherwise."If a STA wants to receive a Probe Response frame from only a VHT capable STA, the STA can transmit a Probe Request frame in VHT PPDU format.Because the non VHT capable STA can not receive a Probe Request transmitted in VHT PPDU format, it does not respond with a Probe Response frame.So, the concept of of the VHT Support Criteria field is already suppoted in the current spec. | Remove a VHT Support Criteria field from FILS Criteria field. | REJECTED. As discussed in 13-1165r1, the group saw value on maintaining the HT and VHT support criteria fields. |
| 2014 | 42.04 | "responding STA must be HT capable" the word "must" has a special meanding in standards that is not applicable here. | Review all uses of "must" in the non-boilerplate text and replace all with alternatives. Beware adding normative verbs in Clause 8. | REVISED. 3 instances of musts are changed as shown in this submission. |
| 2763 | 42.04 | The type of PHY (HT/VHT) is non indicative of the AP ability to support the probing STA connection's QoS requirements, it does limit the probability of other STA's relaying on the same Probe Req thus conflicting to the Probe Rsp broadcast add. what happens when the next PHY is available? what about 11ad? what about the DS limitations as these may be (and in many time are) more limmiting than the last hop? | define resource requirement instead of PHY layer type. | REJECTED. The 802.11ai saw value of keeping the HT and VHT fields. The commenter is not providing details of hte resource requirement mechanism.  |
| 2506 | 42.08 | Typo | Should read: is 0 | ACCEPTED.  |
| 3131 | 42.11 | "The Max Delay Limit field is an unsigned integer in units of 200++s to calculate the value of the maximum access delay for delay criteria as indicated by the BSS Delay Criteria field of the FILS Criteria of the FILS Request Parameters element." What does "calculate" mean here? | Replace "calculate" with "indicate". | ACCEPTED.  |
| 3293 | 42.11 | Therefore the maximum value is therefore 200 x 255 us = 51ms. Is this a concern? | Check that this maximum value is suitable for the FILS protocol design | REVISED. The 802.11ai discussed on the suitable maximum value as shown in 13-1165r1. The 802.11ai recommended value 400 microseconds. |
| 3314 | 42.11 | "The Max Delay Limit field is an unsigned integer in units of 200++s to calculate the value of the maximum access delay for delay criteria as indicated by the BSS Delay Criteria field of the FILS Criteria of the FILS Request Parameters element." What does "calculate" mean here? | Replace "calculate" with "indicate". | ACCEPTED.  |
|  |  |  |  |  |
|  |  |  |  |  |
| 2759 | 42.15 | reference in red text | correct font/color of reference | ACCEPTED.  |
| 2764 | 42.23 | the usage model and use cases of 11ai are dense deployment and heavy load signaling and/or traffic. as a result a power measurement such as RCPI is not indicative and a CINR is more appropriate value.Regardless of that, the Active Scanning scenario is limited in statistics which to a couple of dozens of DB (+10DB) in pedestrian environments making it highly undesirable as metric for response conditioning.Please also note that in many of the PHYs the link budget changes drastically between discovery/association and actual data transfer thus using the RCPI metric of a single transmission is non indicative. | Remove RCPI as metric of channel conditions to when responding to Probe Req | REJECTED. The RCPI value indicates that the AP is in proximity. Estimation of the interference is complicated and requires longer estimation time that is available in scanning. Typically the interference is in busy channel that may be detected from BSS Load and other values. The responding AP cannot know the interference level of the STA that transmitted the probe request. It is more essetial to know hte interference in STA, because there are more DL traffic.However, the interference at the STA is less dependent on the selected AP, and therefore does not need to be taken into account. In summary, it is highly likely that the AP with strongest RCPI of the probe message also gives best channel quality for the communication  |
| 3200 | 42.23 | Why is the RCPI limit in steps of 0.5 dB? If we make it in steps of 1 dB we don't loose any resolution and it would avoid some computation at the AP for evaluating this field. This is helpful for practical implementation of FILS AP. | Change "The RCPI Limit field is an unsigned integer in units of 0.5 dB." to "The RCPI Limit field is an unsigned integer in units of 1 dB." | ACCEPTED. |
| 2401 | 42.25 | What does "is obliged to respond" mean? | Use "shall", "should", "may" or "can" as per section 1.4 of IEEE 802.11-2102. | REJECTED. Clause 8 shall not have and normative text. It is not allowed to use the proposed words. |
| 2909 | 42.31 | It looks like there is a missing "to" between "corresponds" and "the second" | change to: "Bit 0 corresponds to the first Vendor Specific element, bit 1 corresponds tothe second and so on." | ACCEPTED. |
| 3201 | 42.31 | Sentence does not read well | Change "A bit in the OUI Response Criteria field of 1 indicates ..." to "A bit value of 1, in the OUI Response Criteria field indicates..." | ACCEPTED. |
| 2408 | 42.32 | Meaning of the sentence is not very clear | Change "A bit in the OUI Response Criteria field of 1 indicates that the receiver mustknow the Organization Identifier field of the corresponding Vendor Specific element in order to respond tothe request and otherwise is0." to "A bit in the OUI Response Criteria field set to 1 indicates that the receiver mustknow the Organization Identifier field of the corresponding Vendor Specific element in order to respond tothe request and otherwise it is set to 0" | REVISED. The text is corrected. New text is:” A bit value of 1,[CID2408]in the OUI Response Criteria field of 1 [CID2408] indicates that the receiver must [CID2014] knowholds the Organization Identifier field of the corresponding Vendor Specific element in order to respond to the request and otherwise is 0[CID3113].” |
| 3113 | 42.34 | is0 -> is 0 | Chagne as commented | ACCEPTED. |
| 2305 | 43.00 | Normative statement in a definitions clause. | Replace "shall be 2" with "is 2" and on the next line replace" shall be an" with "is an". |  |
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**8.4.2.1 General**

Instruction to editor delete Probe Response Reception element from Table 8-54

**8.4.2.177 FILS Request Parameters element**

The contents of the FILS Request Parameters element in Probe Request frame are used in determining whether to transmit a Probe ~~r~~Response[CID3197] frame as described in 10.1.4.3.6 (Selecting the response frame to probe request~~)~~). [CID2908] The FILS Request Parameters element is defined in Figure 8-401ct— (FILS Request Parameters element).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Parameter Control Bitmap | FILS Criteria | MAXDelayLimit | RCPI Limit | OUI Response Criteria | MaxChannelTime |
| Octets: | 1 | 1 | 1 | 0 or 1  | 0 or 1  | 0 or 1  | 0 or 1  | 0 or 1  |



The Element ID is equal to the FILS Request Parameters element value in Table 8-54 (Element IDs).

The Parameter Control Bitmap field is 1 octet in length and illustrated in Figure 8-401cu (Parameter Control Bitmap field). Bits 0 to 4 of the Parameter Control Bitmap field correspond to the Parameter fields that ~~may be~~ are [CID2304] present in the IE respectively. A value of 1 in a bit indicates the corresponding parameter is present, and the value of 0 indicates the corresponding parameter is not present.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 | B4 | B5- B7[CID3198] |
|  | FILS Criteria Present | Max Delay Limit Present | Minimum Data Rate Present | ~~Received Signal Strength~~RCPI[CID2710]Limit Present | OUI Response Criteria Present | Reserved |
| Bits | 1 | 1 | 1 | 1 | 1 | 3 |



The FILS Criteria field is 1 octet in length and is illustrated in Figure 8-401cv (FILS Criteria field).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0–B2 | B3 | B4 | B5-B7[CID3198] |
|  | BSS Delay Criteria | HT Support Criteria | VHT Support Criteria | Reserved |
| Bits: | 3 | 1 | 1 | ~~2~~3 CID3349 |



~~A Reduced Neighbor Report Request field value of 1 indicates that the information of other BSSs are requested to be included in the Probe Response frame transmitted in response to the Probe Request. The detailed descriptions of the information of other BSSs are provided in 10.44.3 (Reduced Neighbor Report). A Reduced Neighbor Report Request field value of 0 indicates that such BSS information is not requested.~~ CID3349

The BSS Delay Criteria field indicates the delay type that is applied in the decision to respond to the Probe Request frame as described in 10.1.4.3.7 (Criteria to respond to probe request) ~~10.1.4.3.7 (Criteria to respond to probe request)~~[CID2759]. The delay type is selected as indicated in the Table 8-183ae (BSS Delay Criteria field).



An HT Support Criteria field value of 1 indicates that responding STA ~~must~~ is CID2014 ~~be~~ HT capable. ~~A value of 0 indicates otherwise.~~

A VHT Support Criteria field value of 1 indicates that responding STA ~~must~~ is CID2014 ~~be~~ VHT capable. ~~A value of 0 indicates otherwise.~~

The Max Delay Limit field is an unsigned integer in units of ~~2~~400μs[CID3293] to ~~calculate~~ indicate[CID3131] the value of the maximum access delay for delay criteria as indicated by the BSS Delay Criteria field of the FILS Criteria of the FILS Request Parameters element. Value 0 is reserved. The use of the maximum access delay and the delay criteria are explained in 10.1.4.3.7(Criteria to respond to probe request)~~10.1.4.3.7(Criteria to respond to probe request)~~[CID2579].

The RCPI Limit field is an unsigned integer in units of ~~0.5~~ 1 [CID3200] dB. The receiver of Probe Request frame is obliged to respond, if the RCPI of the received probe request frame is equal or higher than -90 dBm + value of RCPI Limit field.Value 255 indicates that receiver is obliged to respond regardless of the reception power of the Probe Request frame.

OUI Response Criteria field is a bitmap in which the bits correspond to the Vendor Specific elements of the Probe Request frame in order of presence. Bit 0 corresponds to the first Vendor Specific element, bit 1 corresponds to [CID2909] the second and so on. A bit value of 1,[CID2408]in the OUI Response Criteria field ~~of 1~~ [CID2408] indicates that the receiver ~~must~~ [CID2014] ~~know~~holds the Organization Identifier field of the corresponding Vendor Specific element in order to respond to the request and otherwise is 0[CID3113]. If the number of the Vendor Specific elements of the Probe Request frame is less than the number of bits of the OUI Response Criteria field, the remaining bits of the OUI Response Criteria field are 0.

The MaxChannelTime field contains the value of MaxChannelTime of the MLME-SCAN.request represented in an unsigned integer of units of 200 microseconds. It presents the time that the transmitter will be available after the transmission of the Probe Request to receive the Probe Responses since it contains the value of MaxChannelTime as shown in Figure 10-3c (Example of active scanning process when Probe Request frame is addressed to individual address.) and Figure 10-3d (Example of active scanning process when Probe Request frame is addressed to broadcast address.).

**~~8.4.2.178 Probe Response Reception Time element~~**

***Instructions to the editor: Delete clause 8.4.2.178. Delete or redirect all***

**~~~~**

**~~Figure 8-401cs—Probe Response Reception Time element~~**

~~The Element ID is equal to the Probe Response Reception Time element value in Table 8-54 (Element IDs).~~

~~The MaxChannelTime field contains the value of MaxChannelTime of the MLME-SCAN.request represented in an unsigned integer of units of 200 microseconds. It presents the time that the transmitter will be available after the transmission of the Probe Request to receive the Probe Responses since it contains the value of MaxChannelTime as shown in Figure 10-3c (Example of active scanning process when Probe Request frame is addressed to individual address.) and Figure 10-3d (Example of active scanning process when Probe Request frame is addressed to broadcast address.).~~

**10.1.4.3.5 ~~Active Scanning Procedure~~ Sending a probe request**

***Instructions to the editor: change the last paragraph as shown***

A Probe Request frame may contain Probe Response Reception Time element. When present, the MaxChannelTime field of the ~~Probe Response Reception Time~~  FILS Request Parameters element of the Probe Request frame is the MaxChannelTime of the MLME-SCAN.request as defined in 8.4.2.17~~8~~7.