IEEE P802.11
Wireless LANs

|  |
| --- |
| Normative Text for LB201 Comments on Active Scanning |
| Date: 2014-07-15 |
| Author(s): |
| Name | Affiliation | Address | Phone | Email |
| Jarkko Kneckt | Nokia | Otaniementie 19B, 02150 Espoo Finland | +358-50-4821550 | Jarkko.kneckt@nokia.com |
|  |  |  |  |  |

Abstract

The submission contains normative text to solve active scanning related comments.

The base standard of 802.11ai has changed. The submission uses 802.11mc D3.0 as base line.

Instructions to Editor:

This submission shows the change needed to implement 802.11ai support to the 802.11mc D3.0.

The text is tried to copy as it is present in the 802.11ai D2.0. The CID is marked after the changed text.

The resolutions to the comments are provided in submission 11-14-764r2. Please note that resolution to CID 4436 is not shown in this submission.

The submission is discussed on the 802.11ai ad hoc meeting on 11.7.2014. Outcome of the ad hoc meeting is R3.

R4 clarifies the step b) of clause 10.1.4.3.2. The timers are named and definitions for the timers are provided.

R5 changes if dotFILSActivated equals to true conditions to “if the STA is a FILS STA” conditions.

R6 contains editorial correction to a sentence in 6.3.3.2.2.

**3. Definitions, acronyms, and abbreviations**

**3.2 Definitions specific to IEEE Std 802.11**

***Instructions to the Editor: Add the following definitions to alphabetical order of the definitions list.***

ActiveScanningTimer A timer to measure the time to receive Probe Response, Beacon, FILS Discovery or Measurement Pilot frames in order to discover suitable AP for association. CID5002

FILSProbeTimer A timer used by a FILS STA to measure time to receive Probe Request, Probe Response, Beacon, FILS discovery and Measurement Pilot frames in order to skip the transmission of Probe Request frame. CID5002

**6.3.3.2 MLME-SCAN.request**

**6.3.3.2.2 Semantics of the service primitive**

Change the text as shown

**…**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Type | Valid Range | Description | IBSS Adoption |
| APConfigurationChangeCount | Octet string | As defined in 8.4.2.178 AP Configuration Sequence Number element | Indicates the configuration sequence number for the static information fields and elements as described in the 10.1.4.3.5 AP Configuration Information Set. This parameter is optionally present is dot11FILSActivated is true.CID5181.  | Do not adopt |

**6.3.3.3 MLME-SCAN.confirm**

**6.3.3.3.1 Function**

***Change the first paragraph as follows:***

This primitive returns the descriptions of the set of BSSs detected by the scan process. Multiple MLMESCAN. Confirm primitives can ~~may~~ be [CID4112] issued when the value of the ReportingOption parameter in the MLME-SCAN.request is ~~the MLME-SCAN.request has ReportingOption parameter set to~~ [CID4112] CHANNEL\_SPECIFIC or ~~to~~ IMMEDIATE ~~AT\_END~~. When ReportingOption parameter is set to AT\_END a single MLMESCAN.Confirm primitive ~~may be~~ is [CID4112] issued. [CID4410].

**6.3.3.3.2 Semantics of the service primitive**

***Insert the following rows at the end of the second table in this subclause:***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Type | Valid Range | Description | IBSS Adoption |
| CAG Number ~~ANQP Configuration~~~~Sequence Number~~ [CID4654] | CAG Number element ~~Integer~~ [CID4654] | ~~0~~1 - 255 | The value from the CAG Number element if such an element was present in the Probe Response or Beacon frame, else null. The parameter is optionally present only if dot11FILSActivated is true. [CID4654]~~The ANQP Configuration Sequence Number of the found BSS. This parameter is optionally present when dot11FILSActivated is true.~~ | Do not adopt |

**…**

***Instructions to the Editor: Change the following Description column of the BSSDescriptionSetFromFD.***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Type | Valid Range | Description | IBSS Adoption |
| Primary Channel | Integer | 0 - 255 | The Primary Channel of the advertised BSS. The Primary Channel is onlydefined within the indicated Operating Class as shown in Annex E. [CID4633] | Do not adopt |

**6.3.3.3.3 When generated**

***Change as follows:***

This primitive is generated by the MLME as a result of an MLME-SCAN.request primitive or if dot11FILSActivated is true, by an MLME-SCAN-STOP.request primitive following an MLMESCAN.request primitive to ascertain the operating environment of the STA. If dot11FILSActivated is true, the primitive is invoked to provide a ~~found~~  [CID4111] BSS report that matches the setting in the MLMESCAN.request's ReportingOption parameter.

**6.3.3.3.4 Effect of receipt**

***Change as follows:***

The SME is notified of the results of the scan procedure. If dot11FILSActivated is true, these results might ~~may~~ [CID4112] be intermediate results, according to the value of the ResultCode.

**6.3.3.4.3 When generated**

***Change as follows:***

This primitive is generated by the SME in order to stop ~~as means of stopping~~  [CID4113] all ongoing active or passive scan processes in the STA.

**6.3.11.2.2 Semantics of the service primitive**

Instructions to the editor: Add the Known OUIs as shown. [CID5194]

The primitive parameters are as follows:

MLME-START.request(

 **…**

Mesh Configuration,

Known OUIs, [CID5194]

VendorSpecificInfo

 …

***Instructions to the editor: Add the Known OUIs as shown.***

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Type | Valid range | Description |
| ... | ... | ... | ... |
| Known OUIs | A set of elements | As defined in 8.4.2.28 | Zero or more elements that Specify the OUIs and their values known by the AP. [CID5194] |
| VendorSpecificInfo | A set of elements | As defined in 8.4.2.28 | Zero or more elements. |

**8.3.3.9 Probe Request frame format**

***Instructions to the editor: Modify as shown.***

|  |  |  |
| --- | --- | --- |
| Order | Information | Notes |
| ~~20~~19CID4694 | AP-CSN | The AP-CSN element is optionally present if dot11FILSActivated is true. |

**8.3.3.10 Probe Response frame format**

***Instructions to the editor: Modify as shown.***

|  |  |  |
| --- | --- | --- |
| Order | Information | Notes |
| Last–n | Requested elements | Elements requested by the Request element (8.4.2.10) CID4982 of the Probe Request frame are present if dot11MultiDomainCapabilityActivated is true. See 10.1.4.3.4 (Sending a response to probe request). ~~See 10.1.4.3.2 (Active scanning procedure for a non-DMG STA).~~ Added erroneously by mc3.0. |

**8.4.2.1 General**

***Instructions to the editor: Modify as shown.***

***CID4539: Delete all “see” words from Element column, (the column needs to have just the element reference)****.* ***The deletion is shown for the below listed elements.***

***CID4002: Delete the length column.***

**Table 8-61— Element IDs**

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Element ID | ~~Length of indicated element (in octets)~~ CID4002 | Extensible |
| FILS Request Parameters(~~see~~ CID4539 8.4.2.174 (FILS Request Parameters element)) | <ANA> | ~~3 to 11~~  |  |
| FILS Indication (~~see~~ CID4539 8.4.2.179 (FILS Indication element)) | <ANA> | ~~3 to 257~~ |   |
| Differentiated Initial LinkSetup (~~see~~ CID4539 8.4.2.183 (Differentiated Initial LinkSetup element)) | <ANA> | ~~6 to 257~~ |  |

**8.4.2.174 FILS Request Parameters element**

***Instructions to Editor: Make the following changes as shown below***

***…***

**Figure 8-401cn—FILS Request Parameters element format CID[4453]**

|  |  |
| --- | --- |
| Value ~~B2B3B4~~ | Explanation |
| ~~00~~0 CID4003 | Access delay is indicated as Average Access Delay for Background (AC\_BK) subfield of the BSS AC Access Delay element as described in 8.4.2.43 (BSS AC Access Delay element). |
| ~~00~~1 | Access delay is indicated as Average Access Delay for Background (AC\_BE) subfield of the BSS AC Access Delay element as described in 8.4.2.43 (BSS AC Access Delay element). |
| ~~010~~2 | Access delay is indicated as Average Access Delay for Background (AC\_VI) subfield of the BSS AC Access Delay element as described in 8.4.2.43 (BSS AC Access Delay element). |
| ~~011~~3 | Access delay is indicated as Average Access Delay for Background (AC\_VO) subfield of the BSS AC Access Delay element as described in 8.4.2.43 (BSS AC Access Delay element). |
| ~~100~~4 | Access Delay is indicated as Average Access Delay as described in 8.4.2.43.(BSS AC Access Delay element) |
| ~~101~~5 | Reserved |
| ~~110~~6 | Reserved |
| ~~111~~7 | Delay criteria is not in use |

…

The Minimum Data Rate field is 3 octets long and contains an unsigned integer in units of kilobits per second that specifies the lowest total data rate specified at the MAC\_SAP for transport of MSDUs or A-MSDUs that the STA is going to transmit. The minimum MAC\_SAP data rate does not include the MAC and PHY overheads incurred in transferring the MSDUs or A-MSDUs.

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 the second and so on. A bit value of 1 in the OUI Response Criteria field indicates that the receiver ~~holds~~  identifies CID4612 the Organization Identifier field of the corresponding Vendor Specific element in order to respond to the request and otherwise is 0. 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 RCPI Limit field is an unsigned integer in units of 1 dB. The receiver of Probe Request frame ~~is obliged to~~ responds CID5058, 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 responds regardless of the reception power of the Probe Request frame.

…

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 of the Probe Request frame CID[5188] 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 10-3d (Active scanning when a Probe Request frame is addressed to Broadcast address) and Figure 10-3d (Active scanning when a Probe Request frame is addressed to Broadcast address).

**10.1.4.3.2 Active scanning procedure**

***Instructions to Editor: This clause adopts the 802.11 MC D3.0 as a starting point. All text copied from 802.11ai D2.0 is shown as underlined. The blue and red color show the changes done by the comment resolution to the base standard or to 802.11ai D2.0.***

Upon receipt of the MLME-SCAN.request primitive with ScanType indicating an active scan, a STA shall use the following procedure:

For each channel to be scanned:

a) Wait until the ProbeDelay time has expired or a PHYRxStart.indication primitive has been received.

b) If the STA is a FILS STA, the STA sets the FILSProbetimer to 0 and starts the FILSProbetimer. While the FILSProbetimer is less than dot11FILSProbeDelay the STA may skip a probe request transmission and proceed to step i) after setting the ActiveScanningTimer to 0 and starting the timer, if one of the following conditions matches:

1) The STA receives a broadcast addressed Probe Request frame that the STA consideres to be able to discover a suitable candidate AP for association. The logic how the STA considers the Probe Request suitable is out of the scope of this standard.

2) The STA receives a Probe Response or a Beacon or a Measurement Pilot or an FILS Discovery frame that identify an AP which the STA consideres as a suitable candidate for association. The logic how the STA considers the AP as suitable candidate for association is out of the scope of this standard.

c) Perform the Basic Access procedure as defined in 9.3.4.2 (Basic access).

d) Send a probe request to the broadcast destination address. The probe request is sent with the SSID and BSSID from the MLMESCAN.request primitive. When the SSID List is present in the MLMESCAN.request primitive, send one or more Probe Request frames, each with an SSID indicated in the SSID List and the BSSID from the MLME-SCAN.request primitive.

f) Set the ~~timer~~ ActiveScanningTimer CID5002to 0 and start the ~~timer~~ ActiveScanningTimer CID5002.

g) If PHY-CCA.indication (BUSY) has not been detected before the ActiveScanningTimer [CID5113] reaches MinChannelTime, then proceed to step j).

 h) ~~If PHY-CCA.indication (BUSY) primitive has been detected before the timer reaches MinChannelTime, wait until the timer reaches MaxChannelTime and~~ If the STA is a non-FILS STA process all received probe responses and beacons while the ActiveScanningTimer is less than MaxChannelTime; ~~otherwise, when the timer reaches MinChannelTime proceed to step f).~~

i) If the STA is a non-FILS STA and while the ActiveScanningTimer CID5002is less than MaxChannelTime: [CID5112]:

1) Receive Probe Response, FILS Discovery and Beacon frames regardless of the receiver address. Process any received FILS Discovery, Probe Response and Beacon frames;

2) If the ReportingOption of the MLME-SCAN.request primitive [CID4760] is IMMEDIATE, and the scanning STA detects an ~~unreported~~ AP or information of the AP to which MLME-SCAN.confirm primitive has not been issued during the ongoing scan [CID 4761] ~~is detected~~, then issue a MLME-SCAN.confirm primitive with the Result-Code equal to INTERMEDIATE\_SCAN\_RESULT and one or more BSSDescriptionSet, BSSDescriptionFromFDSet, or BSSDescriptionFromMeasurementPilotSet containing information of the detected AP;

3) If ~~dot11FILSActivated is true and~~ the ReportingOption of the MLME-SCAN.request primitive [CID4760] is CHANNEL\_SPECIFIC, at the time when the timer reaches the MaxChannelTime issue an MLME-SCAN.confirm primitive, with the ResultCode equal to INTERMEDIATE\_SCAN\_RESULT and one or more BSSDescriptionSet, BSSDescriptionFromFDSet, or BSSDescriptionFromMeasurementPilotSet containing information of all APs that have been discovered from the scanned channel.

j) Set the NAV to 0 and scan the next channel.

See Figure 10-3c ~~(Probe response) for~~ Active scanning when non-DMG STA transmits Probe Request to individual address and Figure 10-3d Active scanning when non-DMG STA transmits Probe Request to broadcast address.

When all channels in the ChannelList have been scanned, the MLME shall issue an MLME-SCAN.confirm primitive with one or more BSSDescriptionSet, BSSDescriptionFromFDSet, or BSSDescriptionFromMeasurementPilotSet containing all of the information gathered during the scan. [CID4763, CID5185]

If the MLME receives an MLME-SCAN-STOP.request primitive, the STA shall stop the scanning of the channel. The STA should discard any ~~buffered~~ Probe Request frame queued for transmission ~~without transmitting the untransmitted Probe Request frame~~ [CID4764]. If the STA is transmitting a Probe Request frame, the STA shall complete the transmission of the Probe Request frame.~~If the MLME receives an MLME-SCAN-STOP.request primitive, the STA shall immediately stop the scanning of the channel.~~  [This is editorial deletion] The STA shall not continue the active scanning process at unscanned channels listed in the ChannelList parameter of the MLME-SCAN.request primitive. The MLME shall issue an MLMESCAN.confirm primitive with the ResultCode set to SUCCESS and with one or more BSSDescriptionSet, BSSDescriptionFromFDSet, or BSSDescriptionFromMeasurementPilotSet[CID5186] containing all of the information gathered during the scan.

When the MaxChannelTime field of the FILS Request Parameters element of the Probe Request frame is present, the value of the MaxChannelTime field is set to the MaxChannelTime of the MLME-SCAN.request as defined in 8.4.2.174 (FILS Request Parameters element).

~~The SSID List element shall not be included in a Probe Request frame in an IBSS.~~[CID5190]



**FIGURE 3-c --- Active scanning when non-DMG STA transmits Probe Request to individual address.**



**FIGURE 3-d -- Active scanning when non-DMG STA transmits Probe Request to individual address.**

**10.1.4.3.4 Criteria for sending a ~~probe~~ response**

***Instructions to Editor: This clause adopts the 802.11 MC D3.0 as a starting point. Only the changes caused by 802.11ai are shown. All text copied from 802.11ai D2.0 is shown as underlined. The blue and red color show the changes done by the comment resolution to the base standard or to 802.11ai D2.0.***

…

l) The STA has dot11FILSActivated equal to true [CID5191] and the Probe Request frame contains a FILS Request Parameters element and the corresponding Probe Request frame are met:

1) The Max Delay Limit field of the FILS Request Parameters indicates a delay ~~larger~~ shorter than the selected average access delay of the responding STA. The BSS Delay Criteria field of the FILS Criteria field of the FILS Request Parameters element indicates the selected average access delay for the comparison as defined in Table 8-222f (BSS Delay Criteria field) ~~8.4.2.174 (FILS Request Parameters element)~~CID(4637). The Max Delay Limit field indicates the length of the selected average access delay. If the compared ~~a~~Average ~~a~~Access Delayindicates value 255 Measurement not available, the STA shall respond and the response shall include BSS AC Access Delay element as described in 8.4.2.43 (BSS AC Access Delay element) and Average Access Delay element as described in 8.4.2.38 (BSS Average Access Delay element). If the compared Average Access Delay indicates value 254 Service unable to access channel, the response shall not be transmitted.

2) The HT Support Criteria of the FILS Criteria field of the FILS Request Parameters element is 1 and the responding STA is not a HT STA.

3) The VHT Support Criteria of the FILS Criteria field of the FILS Request Parameters element is 1 and the responding STA is not a VHT STA.

4) The Minimum Data Rate field of the FILS Request Parameters element indicates a data rate ~~lower~~ higher than the one that can be provided over the MAC\_SAP.

5) The RCPI Limit field of the FILS Request Parameters element ~~as described in~~  [CID5193] 8.4.2.174 (FILS Request Parameters element) indicates RCPI ~~lower~~  higher than the RCPI of the Probe Request frame. [CID5117]

6) The values of the Known OUIs elements of the MLME-START.request that the STA has received do not equal~~s~~ to the values of OUIs as specified by the OUI Response Criteria of the FILS Request Parameters element ~~as explained in~~ CID5193 8.4.2.174 (FILS Request Parameters element).

If the MaxChannelTime field of the FILS Request Parameters element is present in the Probe Request frame, the responding STA with dot11FILSActivated equal to true should discard the pending untransmitted Probe Response frame to the Probe Request frame [CID 4720] when the elapsed time measured from the end of the reception of the Probe Request frame by the MAC entity of the responding STA exceeds the time indicated by value of the MaxChannelTime field of the FILS Request Parameters element of the Probe Request frame. If the MaxChannelTime field is not present in the Probe Request frame, transmission time of the pending untransmitted Probe Response frame by the responding STA is only limited by the retransmission procedure in 9.20.2.6 (Retransmit Procedures).

An AP shall remain in the Awake state, and shall respond to probe requests, subject to the criteria above.

…

**10.1.4.3.5 Contents of a ~~probe~~ response**

***Instructions to Editor: This clause adopts the 802.11 MC D3.0 as a starting point. All text copied from 802.11ai D2.0 is shown as underlined. The blue and red color show the changes done by the comment resolution to the base standard or to 802.11ai D2.0.***

A STA that responds to a probe request according to 10.1.4.3.4 (Criteria for sending a probe response) shall transmit a Probe Response or a Beacon frame as follows:

~~— The Probe Response frame is individually addressed to the STA that generated the Probe Request frame.~~

A FILS STA ~~in which dot11FILSActivated is true~~ that transmits a Probe Response frame shall either set the Address 1 field to the address of the STA that generated the probe request or shall set it to the broadcast address if the STA that generated the probe request is indicating FILS Capability. The Address 1 field shall be set to the address of the STA that generated the probe request if the STA is not indicating FILS Capability. A STA in which dot11FILSActivated ~~is~~ equal to false that transmits a Probe Response frame shall set the Address 1 field to the address of the STA that generated the probe request

Each element requested in a Request element shall be included in the Probe Response or the Beacon frame if the responding STA supports that element. In the Probe Response frame, the STA shall return the requested elements in the same order as requested in the Request element. If dot11RadioMeasurementActivated is true and if the Request element of the Probe Request includes the RCPI element ID, the STA shall include in the Probe Response an RCPI element containing the measured RCPI value of the received Probe Request frame. If no measurement result is available, the RCPI value shall be set to indicate that a measurement is not available.

When the MaxChannelTime field is present in any of Probe Request frames, the STA with dot11FILSActivated true should respond with a Beacon frame to Probe Request frames addressed to individual or broadcast address if:

1. The STA is queuing Beacon for transmission [CID5118] or the next TBTT of the responding STA is within dot11BeaconResponseDuration
2. If MaxChannelTime field is present in any of Probe Request frames, the next TBTT is no later than any deadline of MaxChannelTime indicated in the FILS Request Parameter element of the Probe Request frames.
3. A Beacon frame contains the Element Ids requested by the Requested Element IDs.

If a FILS STA ~~with dot11FILSActivated true~~ receives two or more Probe Request frames, subject to the criteria above, and the STA has dot11OmitReplicateProbeResponses equal to true, the responding STA may transmit a Probe Response frame or a Beacon frame as a response to all Probe Request frames. The Beacon frame may be transmitted if the STA is queuing Beacon for transmission or the next TBTT is within dot11BeaconResponseDuration. [CID4303] If a Probe Response frame is transmitted, then the individually addressed Probe Response frame shall be transmitted to all non-FILS STAs from which a Probe Response frame is received. [CID4773]

**Annex C**

(normative)

**C.3 MIB Detail**

Instructions to the editor:

dot11FILSConfigEntry OBJECT-TYPE

SYNTAX Dot11FILSConfigEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the dot11FILSConfigTable."

INDEX { ifIndex }

::= { dot11FILSConfigTable 1 }

dot11FILSConfigEntry ::=

SEQUENCE {

dot11FILSFDFrameBeaconMinimumInterval Unsigned32,

dot11BeaconResponseDuration Unsigned32,

dot11OmitReplicateProbeResponses TruthValue,

dot11DILSActivated TruthValue,

dot11FILSProbeDelay unsigned32 }

…

Instructions to the editor: Add the following text after the dot11DILSActivated MIB parameter.

dot11FILSProbeDelay OBJECT-TYPE

SYNTAX Unsigned32(0..100)

MAX-ACCESS read-write

STATUS Current

DESCRIPTION

“This is a control variable.

It is written by an external management entity.

Changes take effect as soon as practical in the implementation.

This attribute indicates the duration in units of 0.1 microseconds. This delay specifies a time that the STA with dot11FILSActivated equal to true waits for Probe Request, Probe Response, Beacon, FILS Discovery and Measurement Pilot frames in order to cancel transmission of own Probe Request frame.

DEFVAL {200}