IEEE P802.11
Wireless LANs

|  |
| --- |
| Active scanning comment resolutions |
| Date: 2013-12-05 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Jarkko Kneckt | Nokia Corporation | Otaniementie 19 B | +358504821550 | Jarkko.Kneckt@Nokia.com |
|  |  |  |  |  |

Abstract

The submission provides comment resolutions for the remaining CIDs assigned to Jarkko Kneckt.

These CIDs are listed in submission 10-13-1076-15. Select the sheet with name Jarkko Kneckt.

The submission proposes a resolution to the following CIDS:

2033, 2035, 2047, 2036, 2039, 2045, 2047, 2106, 2107, 2232, 2445, 2452, 2474, 2477, 2513, 2614, 2728, 2767 and 3228.

The submission discusses on the resolution for the following CIDS, but no resolution is provided:

2232, 2473 and 2781.

The CID 2520 is requested to be transferred to be resolved by Santosh Pandey.

The CIDs 3307, 3358 and 2546 are duplicates. They all request that submission 11-13-1018 to be presented to 802.11ai group.

**CID 2106, 2614**

**Comment:** Annex C is a disaster zone. Lack of MIB modification in Annex C.

**Proposed change:**

The following work needs to be done:

1. Assign these definitions to objects - e.g. choose between smt, mac or phy

2. Insert <ANA> flags for managed namespaces

3. Correct the syntax for the definition of thse objects (part of step 1.)

4. Create a group for FILS objects

5. Add dot11FILSActivated to dot11SMTbase and up-rev it. Update the dot 11 compliance statement to use the new rev.

6. Create a compliance statement for FILS and cite the FILS group as mandatory in this compliance statement.

7. (probably later, but certainly before MDR completes) compile the MIB and fix any compilation errors.

**Discussion:** The commenter has valid points. MIB modifications in Annex C have not been made and proposed resolution describes clearly the needed tasks.

The PICS comments are assigned to other author. The proposed change #6 proposes to create PICS changes. Some coordination of the PICS changes may be needed.

**CID 2107**

**Comment:** "It is written by an external management entity" - if so, why is it read-only?

**Proposed Change:** Change "Read-Only" to "read-write". Ditto at 109.48, 110.04.

Also correct capitalization of "Read-Only" at 109.14.

**Proposed resolution**: REVISED. Implement the following changes to the next version of the 802.11ai specification.

**B.4.3 IUT configuration**

Instructions to the Editor: Append the IUT configuration table with the following item as shown below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item | IUT configuration | References | Status | Support |
| \*CF22 | Is Fast Initial Link Setup Supported?  | 10.44 | O | Yes No  |

**Annex C**

(normative)

**ASN.1 encoding of the MAC and PHY MIB**

**C.3 MIB Detail**

-- Station Management (SMT) Attributes

-- DEFINED AS "The SMT object class provides the necessary support

-- at the station to manage the processes in the station such that

-- the station may work cooperatively as a part of an IEEE 802.11

-- network."

...

Instructions to the Editor: Append the dot11smt list with the following item

dot11smt OBJECT IDENTIFIER ::= { ieee802dot11 1 }

-- dot11smt GROUPS

...

-- dot11RSNAConfigDLCGroupTable ::= { dot11smt 26 }

-- dot11FILSConfigTable ::= { dot11smt <ANA> }

Instructions to the Editor: Append the Dot11StationConfigEntry with the following item.

Dot11StationConfigEntry ::= SEQUENCE

{

dot11StationConfigTable OBJECT-TYPE

...

dot11BSSBroadcastNullCount Unsigned32,

dot11FILSActivated TruthValue

Instructions to the editor: Move the dot11FILSActivated description as the last item of the detailed descriptions of the Dot11StationConfigEntry and make the changes as shown.

dot11FILSActivated OBJECT-TYPE

SYNTAX ~~Boolean~~ TruthValue

MAX-ACCESS ~~R~~read-~~O~~only

STATUS ~~C~~current

DESCRIPTION ~~Description~~

“This is a capability variable.Its value is determined by device capabilities.This attribute, when true, indicates that the station implementation is capable of supporting fast initial link setup. The capability is disabled, otherwise.”

DEFVAL { false }

::= { dot11StationConfigEntry <ANA> }

Instructions to the editor: Add the following description of the dot11FILSConfig TABLE. Move the dot11FILSFDFrameBeaconMinimumInterval, dot11BeaconResponseDuration and dot11OmitReplicateProbeResponses to the table and make the following changes as shown.

--\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

--\* dot11FILSConfig TABLE

--\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

dot11FILSConfigTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dot11FILSConfigEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The table containing fast initial link setup configuration objects."

::= { dot11smt <ANA> }

dot11FILSConfigEntry OBJECT-TYPE

SYNTAX Dot11FILSConfigEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the dot11FILSConfigTable."

INDEX { ifIndex }

::= { dot11FILSConfigTable 1 }

Dot11FastBSSTransitionConfigEntry ::=

SEQUENCE {

dot11FILSFDFrameBeaconMinimumInterval Unsigned32,

dot11BeaconResponseDuration Unsigned32,

dot11OmitReplicateProbeResponses TruthValue }

dot11FILSFD~~f~~FrameBeaconMinimumInterval OBJECT-TYPE

SYNTAX Unsigned~~8~~32(0..255)

MAX-ACCESS ~~Read-Only~~ read-write [CID2107]

STATUS ~~C~~current

DESCRIPTION ~~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 milliseconds. It indicates the minimum duration from the transmission of a FILS Discovery frame and the transmission of a Beacon frame. The FILS Discovery frame shall not be transmitted before or after a Beacon frame transmission within a duration defined by this value.”

DEFVAL {20}

dot11BeaconResponseDuration OBJECT-TYPE

SYNTAX Unsigned32(0..65535)

MAX-ACCESS ~~Read-Only~~ read-write [CID2107]

STATUS ~~C~~current

DESCRIPTION ~~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 32 microseconds. If the duration from the reception of the Probe Request frame to the TBTT is less than the value, the STA does not transmit a ProbeResponse frame as response to the Probe Request frame.”

DEFVAL {100}

dot11OmitReplicateProbeResponses OBJECT-TYPE

SYNTAX ~~Boolean~~TruthValue

MAX-ACCESS ~~Read-Only~~ read-write [CID2107]

STATUS ~~C~~current

DESCRIPTION ~~Description~~

"This is a control variable. It is written by an external management entity. Changes take effect for the next Probe Response frame. This attribute, when true, indicates that the station may respond with a single Beacon or Probe Response frame addressed to broadcast address, to two or more received Probe Request frames."

DEFVAL { false }

**CID 2035**

**Comment:** "containing all of the information gathered during the scan" - way too colloquial. The STA may have been collecting the RSSIs, or angular inforamtion, or even the phase of the moon.

**Proposed Change:** Reword to be precise

**Discussion:** The sentence is copied from the IEEE802.11-2012. The target of the sentence is to state that all information that can be returned is provided through the MLME. The text does not include restrictions to gathered information. These restrictions are added.

Proposed Resolution: REVISED. Implement the following changes.

**10.1.4.3.2 Sending a probe response Active scanning procedure**

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 that can be indicated in the elements and is [CID2035] gathered during the scan.

If the MLME receives an MLME-SCAN-STOP.request primitive, the STA shall immediately stop the scanning of the channel. 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 one or more BSSDescriptionSet, BSSDescriptionFromFDSet, or BSSDescriptionFromMeasurementPilotSet containing all of the information that can be indicated in the elements and is [CID2035] gathered during the scan.

**CID: 2036**

**Comment:** " Probe Request frame to a channel for which the STA has received after " -- received what, a party invitation?

**Proposed Change:** Add a description of what being received results in this "shall not" rule triggering.

**Discussion:** The original text was unclear, because the MLME primitive and the some frames are received without clearly identifying these two operations. The resolutions to CID2946 and CID3189 have already changed the sentence. The current description is part of the active scanning process and the MLME-SCAN.request primitive is automatically received. Thus there is just a single receive operation that solves the comment.

**Proposed Resolution:** REVISED, implement the changes as described to CIDs CID2946 and CID3189.The resolution text is already voted in in submission 13-1269r6.

f) If the STA is a FILS STA, the STA should proceed to step i) if the STA has received a broadcast addressed Probe Request frame and both of the following conditions are true:

1) The Probe Request has a Wildcard SSID or the same SSIDs as present MLME-SCAN.request primitive.

2) The FILS Request Parameters element is not present in the received Probe Request or the FILS Request Parameters element of the Probe Request frame has only fields that are present in the MLME-SCAN.request primitive and for every field that is present in the FILS Request Parameters element of the Probe Request 10.1.4.3.3 allows the same or more responses as the FILS Request Parameters element present in the MLME-SCAN.request primitive. [CID2946, CID3189]

**CID2039**

**Comment:** "The STA knows the OUIs" -- where is the Clause 6 or MIB interface to configure the "known OUIs"?

**Proposed change:** Add an interface to the MIB or start/join primivites to configure the Known OUIs.

**Discussion:** The commenter has valid point, the configuration of the known CIDs is not described. The MLME-Start.request could be good primitive to configure the known OUI parameters.

**Proposed Resolution:** REVISED. Implement the following text to the 802.11ai.

**6.3.11.2 MLME-START.request**

**6.3.11.2.1 Function**

This primitive requests that the MAC entity start a new BSS or become a member of an MBSS.

**6.3.11.2.2 Semantics of the service primitive**

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

The primitive parameters are as follows:

MLME-START.request(

 **…**

Mesh Configuration,

Known OUIs,

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.  |
| VendorSpecificInfo | A set of elements | As defined in 8.4.2.28 | Zero or more elements. |

**CID 2045**

**Comment:** "one for each preferred AP" - this is part of normative text. "preferred" is undefined.

**Proposed Change:** Please define "preferred" in this context or indicate how the STA makes the choice (e.g. according to implementation defined criteria)

**Discussion:** The commenter has a valid point. The criteria to consider a STA as preferred AP is not defined in this clause. The term preferred AP seems misleading. Even if a STA knows the parameter values of the AP, the AP may not be preferred. Also it may be difficult to define the preferred AP. The STAs may have multiple considerations for preferred AP and these considerations may not consider different APs to be the preferred AP.

As one possible resolution to the comment is to eliminate the term preferred and just state that parameters of the AP may be known by the STA. The text is repeating the message that one AP Configuration Information Set contains the parameters of a single AP. This is obvious, because the parameter values of a single Beacon or Probe Response frame are stored to a AP Configuration Information Set.

**Proposed Resolution**: REVISED.

**10.1.4.3.10 ~~FILS~~ AP Configuration Information Set ~~active scanning procedure~~ ~~to preferred AP~~**

Instructions to the editor: Make the changes as shown

A non-AP STA with dot11FILSActivated equal to true may retain one or multiple AP Configuration Information Sets~~,~~  ~~one for each preferred AP which the STA previously obtained~~. An AP Configuration Information Set is a set of information fields and information elements of the Beacon frame or the Probe Response frame that include AP-CCC element, excluding the following dynamic information fields and elements.

…

A non-AP STA with dot11FILSActivated equal to true may send a Probe Request frame including an AP-CCC element (as defined in 8.4.2.185) if the STA has the AP Configuration Information Set associated with the AP-CCC of the ~~preferred~~ AP.

**10.44.1 General**

Instructions to the editor: Make the changes as shown

FILS Discovery frame may contain a 1-octet AP-CCC field that is set to the current version number of AP Configuration Information Set, as defined in 10.1.4.3.10. If a non-AP STA retains AP Configuration Information Sets of the ~~preferred~~ APs which the STA has previously obtained, the non-AP STA shall use the received FD AP-CCC information as follows:

**CID 2232**

**Comment:** This defined "TLV" is not sufficiently useful to be worth the hassle of yet another "structure-type" definition. For instance, all legacy elements are TLVs. Consequently, do TLVs include all of the element ID numbers as TLV type ID numbers, or not? Worse, the new specific TLVs defined in the 11ai amendment don't seem to have any consistent type:

 1 octet Type ID with 1 octet Length field:

 FILS IP Address Request TLV

 FILS Secure Container TLV

 FILS Server Information TLV

 (as well as, of course, all elements)

 1 octet Type ID with 2 octet Length field:

 FILS IP Address Assigned TLV

 FILS HLP Wrapped Data TLV

 Key RSC TLV

 GTK Transfer TLV

 Why not just define all of these to be the same type as ANQP-element and have 2 octet type ID and 2 octet length field for all of them (except of course elements)?

**Proposed Change:**

 Remove this definition of "TLV" and replace the new definitions of specific TLVs with definitions of specific ANQP-elements.

**Discussion: The resolution of the CID is still open.**

802.11af **defines in 8.2.6 TLVs which Type Id is one octet in length and length field that is one octet in length. This TLV type can be considered as default TLV.Thus, the following elements are in constant format:**

1 octet Type ID with 1 octet Length field:

 FILS IP Address Request TLV

 FILS Secure Container TLV

 FILS Server Information TLV

 (as well as, of course, all elements)

The TLVwith 2 octet length field has been used to be able to extend the length of the elements. This is new TLV and needed for implementation flexibility and to carry the values parts of the frame that exceed 255 octets.

The structure of the ANQP-element has type ID field that is 2 octets in length and Length field that is 2 octets in length. The structure of the ANQP-element could be used here as well, but it is unclear can ANQP-elements be transmitted in the management frames similarly as the TLVs. At the moment only the GAS Request and GAS Response frames carry ANQP-elements.

The above mentioned elements are targeted to be used within the management frames, like Association request and response. The elements enable these messages to carry more information, vaoid the creation of unnecessary frames and reduce the initial link setup times.

802.11ai should decide may specific ANQP-elements needed for fast initial link setup be places to selected management frames, like association request and association response. If this is possible, it is advisable to change all of the TLVs to be GAS-elements. However, placing GAS-elements to the selected management frames is a new feature and requires discussion and deep understanding how it affects.

**CID2445**

**Comment:** Change "TBTT Information Field Type" to "TBTT Information Field Length"

**No proposed Change.**

**Discussion:** The TBTT Information Field Type field is part of the Reduced Neighbor Report element as defined in the IEEE802.11af. The 802.11ai task group has decided to merge the Reduced Neighbor Report elements defined in 802.11ai to the Reduced Neighbor Report element defined in the 802.11af. If 802.11ai changes the name of the field, then the merging between the standards becomes more difficult. Thus, it is recommended to keep the same name.

**Proposed Resolution:** REJECTED. The TBTT Information Field Type field is part of the Reduced Neighbor Report element as defined in the IEEE802.11af. The 802.11ai task group has decided to merge the Reduced Neighbor Report elements defined in 802.11ai to the Reduced Neighbor Report element defined in the 802.11af. If 802.11ai changes the name of the field, then the merging between the standards becomes more difficult. Thus, it is recommended to keep the same name.

**CID 2452**

**Comment:** Add clarification that "when one of the following is received"

**Proposed Change:** ...channel for which the STA has received one of the following after the MLME-SCAN.request primitive"

**Discussion:** Thecommenter has valid point that the rule should apply for each scanned channel. The text has changed and the operation has been takes as a part of the channel specific scanning operation. Thus, the comment is solved already in D1.2.

**Proposed Resolution:** REVISED.Incorporate the following text ot the 802.11ai standard. The resolution text is already voted in in submission 13-1269r6.

f) If the STA is a FILS STA, the STA should proceed to step i) if the STA has received a broadcast addressed Probe Request frame and both of the following conditions are true:

1) The Probe Request has a Wildcard SSID or the same SSIDs as present MLME-SCAN.request primitive.

2) The FILS Request Parameters element is not present in the received Probe Request or the FILS Request Parameters element of the Probe Request frame has only fields that are present in the MLME-SCAN.request primitive and for every field that is present in the FILS Request Parameters element of the Probe Request 10.1.4.3.3 allows the same or more responses as the FILS Request Parameters element present in the MLME-SCAN.request primitive. [CID2946, CID3189]

**CID 2473**

**Comment:** No need for imposing requirements on the rates of probe response frame with a "shall" statement. Should be an implementation decision

**Commented Text in 802.11 D1.0:**

Additionally, an AP with dot11FILSActivated equal to true, receiving a Probe Request frames containing a FILS Capability field in the Extended Capabilities element equal to 1 shall transmit Probe Response frame in a PPDU using a rate other than a DSSS/CCK (Clause 16 or Clause 17) rate.

**Proposed Change:** Lines 59-61: Change "shall" to should.

**Discussion:** The system efficiency of the WLAN has been discussed a lot in HEW and in other groups. One possibility to increase WLAN system capacity is to avoid 802.11b transmissions. The requirement of using other PHY than DSSS/CCK is well justified.

The use of DSSS/CCK could be justified, when the area has 802.11b devices. In this operation the FILS capable AP could be discoverable for these STAs.

**Proposed Resolution:** Comment is open. The proposed change by the commenter has merits and group needs to make careful decision.

**CID 2033**

**Comment:** "shall immediately stop the scanning of the channel". What exactly does this "immediately" mean? As transmitting a probe request is part of scanning, does this mean it stops half way through a probe request? If there's a probe request queued, but not yet transmitted, is it transmitted?

**Proposed Change:** Please reword to clarify STA operations in these cases and remove "immediately", which always gives rise to questions like this.

**Commented text:** If the MLME receives an MLME-SCAN-STOP.request primitive, the STA shall immediately stop the scanning of the channel.

**Discussion:** Thecommenter has a valid point, stopping the scanning immediately is not described in details. Also the immediate word does not clarify the operation. In the active scanning, the stopping of the listening should avoid transmitting any untransmitted probe request, but canceling the ongoing transmission of the probe request requires too much new implementation for this specific operation.

**Proposed Resolution:** REVISED. Make the following changes to the 802.11ai standard.

If the MLME receives an MLME-SCAN-STOP.request primitive, the STA shall ~~immediately~~ stop the scanning of the channel. The STA shall discard the frame without transmitting the untransmitted Probe Request frame.

If the STA is transmitting the Probe Request frame, the STA shall complete the transmission of Probe Request frame.

**CID 2047**

**Comment:** “Avoid language such as "STA knows". STAs are devices not persons”

**Proposed Change:** Change language

**Commented text:** f) The STA knows the OUIs as specified by the OUI Response Criteria of the FILS Request Parameters element as explained in 8.4.2.177 (FILS Request Parameters element).

**Discussion:** The term knows is not perfect and it is related to human behavior. As a response to the CID2039, the known OUIs may be configured to the BSS through the MLME-START.request. The condition should compare are the OUIs configured to the BSS and if the configuration is performed, then the response is transmitted.

**Proposed Resolution: REVISED.** Change the 802.11ai langue as shown:

f) The values of the Known OUIs elements of the MLME-START.request that the STA has received equals to ~~knows~~ the values of OUIs as specified by the OUI Response Criteria of the FILS Request Parameters element as explained in 8.4.2.177 (FILS Request Parameters element).

**CID 2477**

**Comment:** Change "shall" to should. Behavior should not be mandatory.

**Proposed Change:** No need to make the behavior mandatory (lines 54-59)

**Commented text:** If the Probe Response Reception Time element is present in the Probe Request frame, the responding STA with dot11FILSActivated true shall discard the pending untransmitted Probe Response frame to the Probe Request frame when the elapsed time after reception of the Probe Request exceeds the time indicated by value of the MaxChannelTime field of the Probe Response Reception Time element of the Probe Request frame.

**Discussion:** The requirement may be relaxed, should is as good operation. The comment is similar to the CID2777.

**Proposd Resolution:** REVISED. The proposed resolution text is already incorporated in submission 11-13-1269r6.

The STA with dot11FILSActivated equal to true should not respond to Probe Request frames addressed to individual or broadcast address if the next TBTT of the responding STA is within dot11BeaconResponseDuration and is no later than any deadline of MaxChannelTime indicated in the FILS Request Parameter element ~~Probe Response Reception Time~~ ~~if~~ when the MaxChannelTime field ~~Probe Response Reception Time element~~ is present in any of Probe Request frames. If the Probe Request frame indicates FILS Capability and the MaxChannelTime field of the FILS Request Parameter element is not present, the STA should not respond to the Probe Request frame if the next TBTT of the responding STA is within dot11BeaconResponseDuration. There is one exception to the rule. The STA shall respond to Probe Request frame which includes the Element ID of the RCPI element in the Requested Element Ids of the Request element.

**CID 2513**

**Comment:** Confusing sentence

**Proposed Change:** Lines 59-65: This is a long confusing sentence. Should line 60 say "equal to true if the association"

**Discussion:** It is true that the sentence is long and confusing. The sentence has been improved in submission 11-13-1296r2. The target is not to say "equal to true if the association". More detailed resolution text is shown in proposed resolution text.

**Proposed Resolution: REVISED. Adopt the same resolution text as already adopted in submission 11-13-1296r2.**

~~The~~ An [CID 2047] AP with dot11FILSActivated equal to true may provide ~~communicate with~~ the STAs with dot11FILSActivated equal to true the definition of ~~association between the AP-CCC value and~~ [CID 2784, 3203, 3229] the AP ~~C~~configuration ~~I~~information ~~S~~set [CID 2308] and its AP-CSN value by including in a Beacon frame or a Probe Response frame an AP-CCC element (as defined in 8.4.2.185) with the Full-Set Indicator set to 1 [CID 2784, 3203, 3229] and the complete set of information fields and elements within the AP ~~C~~configuration ~~I~~information ~~S~~set [CID 2308] ~~in a Beacon frame, a Probe Response frame~~ ~~that is sent with a broadcast receiver address (RA) or that is sent in response to a Probe Request frame that doesn't contain an AP-CCC element~~. [CID 2784, 3203, 3229]

**CID 2767**

**Comment:** Different STA may have drastic different channel conditions to a an AP while some of the conditions are spatial/channel related e.g. RCPI, minimum data rate. it is not possible to infer from the conditions of one STA to another.

**Proposed Change:** Exclude spatial and channel related parameters for consideration as conditioing Probe Rsp from other parameters

**Commented text:** A broadcast addressed Probe Response or a Beacon or a measurement pilot frame or an FILS Discovery frame containing at least the same information as indicated in the received MLMESCAN. request primitive. In this case, the STA follows the steps starting from sub-steps 1) of Step e) as described in 10.1.4.3.2.

**Discussion:** The comment seems to discuss on the RCPI condition in the Probe Request frame. The commented text is not related to comment and the proposed change. It seems that the commenter has made an error pointing the comment to appropriate text.

802.11ai task group has discussed extensively on the possibility to reduce the number of unnecessarily transmitted scanning frames, like Probe Requests and especially Probe Responses. The conclusion of these discussions is that avoiding Probe Response storms and improving the system performance of the WLAN is highly desireable.Especially in the dense deployments the number of Probe Response frame transmissions from the APs that have poor link to the requesting STA may be very high.

The criteria to respond with Probe Response set rules on which responses the requesting STA is interested. The rules may define a link performance threshold, congestion threshold or capability thresholds. The use of the criteria depends on the scanning STA. It is likely that scanning STA uses the criteria, if it is aware of better candidate.

**The RCPI value indicates that the AP is in proximity. Estimation of the RCPI value from the Probe Request frame is already part of the 802.11 standard. In 802.11 standard the transmitter of the Probe Request may request that RCPI measurement is included to the Probe Response frame. The response criteria uses the very same assessment for RCPI.**

Also it should be noted that estimation of the interference is complicated and requires longer estimation time that is available in scanning. The interference based scanning or the transmission rate estimation have been deleted from the 802.11ai for the sake of clarity.

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 is 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

**Proposed Resolution: REJECTED.**

802.11ai task group has discussed extensively on the possibility to reduce the number of unnecessarily transmitted scanning frames, like Probe Requests and especially Probe Responses. The conclusion of these discussions is that avoiding Probe Response storms and improving the system performance of the WLAN is highly desireable.Especially in the dense deployments the number of Probe Response frame transmissions from the APs that have poor link to the requesting STA may be very high.

The criteria to respond with Probe Response set rules on which responses the requesting STA is interested. The rules may define a link performance threshold, congestion threshold or capability thresholds. The use of the criteria depends on the scanning STA. It is likely that scanning STA uses the criteria, if it is aware of better candidate.

**The RCPI value indicates that the AP is in proximity. Estimation of the RCPI value from the Probe Request frame is already part of the 802.11 standard. In 802.11 standard the transmitter of the Probe Request may request that RCPI measurement is included to the Probe Response frame. The response criteria uses the very same assessment for RCPI.**

Also it should be noted that estimation of the interference is complicated and requires longer estimation time that is available in scanning. The interference based scanning or the transmission rate estimation have been deleted from the 802.11ai for the sake of clarity.

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 is 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

**CID 2781 Comment is Open**

**Comment:** it is not clear what's the expected operation of the AP in case a Neighbor Report is requested and the next TBTT is within the dot11BeaconResponseDuration. Does the STA receives the Neighbor Report or does the AP use the Beacon and as a result the reduced neighbor report is missing from AP response.

**Proposed Change:** Clarify that inclusion of a reduced neighbor report in the Probe Req overides the usage of Beacon as a replacemnt for Probe Rsp.

**Discussion:** The reduced neighbor report provides the operating channel that contains other APs and it may provide the TBTT timing information, BSSID and other parameter values of the neighboring APs.

If the channel has many APs, it is likely that some of these APs will provide Reduced Neighbor Report. If the channel has only a single AP, the Reduced Neighbor Report could be requested in new request. This resolution model is according to the lines of the comment resolutions shown in 11-13-1269r6 for CID 2777. In this resolution TBTT within the dot11BeaconResponseDuration cancels the Probe Response transmission.

On the other hand one can argue, that requested elements should always be returned. One solution is to add these elements to Beacon frame. In other possible solution is to always respond with Probe Response.

**CID 2728**

**Comment:** The procedure for FILS does not enable devices which are stringent on battery life to comply to the usage of FILS. Since most devices today are such, it 11ai misses on providing for its use cases.

**Proposed Change:** Modify 10.1.4.3.2 to provide for AP discovery of PWR strangit devices

**Commented text:** (Active scanning procedure in general)

For each channel to be scanned:

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

b) Perform the Basic Access procedure as defined in 9.3.4.2.

c) When the criteria defined in 10.1.4.3.5 are met, send a probe

**Discussion:** The comment fails to identify any problem or to propose any technical feature. 802.11ai is improving the scanning operation. Faster and more reliable scanning operation reduces the power consumption of the PWR strangit devices.

**Proposed Resolution: REJECT.** The comment fails to identify any problem or to propose any technical feature. 802.11ai is improving the scanning operation. Faster and more reliable scanning operation reduces the power consumption of the PWR strangit devices.

**CID 3228**

**Comment:** The AP may not send all the neighbor AP information it has in the Reduced Neighbor report. The information of neighbors included in the report is implementation specific.

**Proposed Change:** Delete sentence "A Reduced Neighbor Report element is included in the Probe Response frame for each BSS of which information is available."

**Discussion:** Thecomment is valid. There may be multiple reasons why the Neighbor list does not include all neighbors. These are listed in proposed resolutions.

**Proposed resolution:** REVISED As written in submission 11-13-1098r5: “A reduced neighbor report may not be exhaustive either by choice, or due to the fact that there may be neighbor APs not known to the AP.”

**CID 2474**

**Comment:** Incorrect to state that "A result of procedures defined in this sub clause is that in each infrastructure BSS and IBSS there is at least one STA that is awake at any given time ..."

**Proposed Change:** Remove the lines. Does not add any information or behavior information. (pp74, line 64 to pp75 line 22)

**Commented text:** Only APs and STAs in an IBSS or in an MBSS respond to probe requests. A result of the procedures defined in this subclause is that in each infrastructure BSS and IBSS there is at least one STA that is awake at any given time to receive and respond to probe requests. In an MBSS, STAs might not be awake at any given time to respond to probe requests. In an infrastructure BSS or in an IBSS, a STA that sent a Beacon frame shall remain in the Awake state and shall respond to probe requests, subject to criteria in the next paragraph, until a Beacon frame with the current BSSID is received. If the STA is contained within an AP, it shall remain in the Awake state and always respond to probe requests, subject to criteria in the next paragraph. There may be more than one STA in an IBSS that responds to any given probe request, particularly in cases where more than one STA transmitted a Beacon frame following the most recent TBTT, either due to not receiving successfully a previous Beacon frame or due to collisions between beacon transmissions.

In an infrastructure BSS or in an IBSS, STAs receiving Probe Request frames shall respond with a probe response when the SSID in the probe request is the wildcard SSID or matches the specific SSID of the STA or when the specific SSID of the STA is included in the SSID List element. Furthermore, a STA with dot11RadioMeasurementActivated true receiving a probe request with a DSSS Parameter Set element containing a Current Channel field value that is not the same as the value of dot11CurrentChannel shall not respond with a probe response. An AP shall respond to all probe requests meeting the above criteria. In an IBSS a STA that transmitted a Beacon frame since the last TBTT shall respond to group addressed Probe Request frames. A STA in an IBSS shall respond to Probe Request frames sent to the individual address of the STA.

**Discussion:** Theactive scanning text describes the active scanning mode for all topologies. The commented text describes the operation in other topologies. This text needs to be in the standard, otherwise 802.11ai would be changing the operation of the topologies that is not in the scope of the 802.11ai.

**Proposed Resolution: REJECTED.** 802.11ai cannot change the operation of the other topologies than infrastructure topology. The commented text describes the operation in other topologies. This text needs to be in the standard, otherwise 802.11ai would be changing the operation of the topologies that is not in the scope of the 802.11ai.