IEEE P802.11
Wireless LANs

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| BSS Max Idle Period Negotiation Enhancements for non-S1G PHYs |
| Date: 2020-09-17 |
| Author(s): |
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Abstract

This document proposes to extend BSS Max Idle Period for non-S1G PHYs, adopting the elements from the mechanism that have been defined for S1G PHY

r0: Initial Draft

r1: With corrections

r2: Received comments considered/incorporated

r3: Further changes on additional comments, reference to CID 5025 of IEEE-SA Ballot #2

r4: Incorporated more comments/suggestions into the proposed text; Added a Capability bit for Maximum Idle Time Request to ensure that there are no backward compatibility Issues

r5: Moved the Capability bit from Capability Information field to the Extended Capability

r6: Removed the Extended Capabiity bit

r7: Further edits

r8: Further edits; per request of some members, added text related to the capability bit but into an appendix

# CID 5025

|  |  |  |  |
| --- | --- | --- | --- |
| **CID** | **Comment** | **Proposed Change** | **Resolution** |
| 5025 | BSS Max Idle Period feature is an useful feature that is part of Network Management. However, the value of Max Idle Period can only be set by an AP and STAs have no ability to set its value. Having the flexibility of STA setting up this value would make it extremely beneficial to deep power saving IOT and other devices | Add a mechanism for the STAs to signal the Max Idle Period and the APs to set its value accordingly. A contribution 11-20/1313 is submitted for the group's consideration and can be accessed at https://mentor.ieee.org/802.11/dcn/20/11-20-1313-01-000m-bss-max-idle-period-negotiation-enhancements-for-non-s1g-phys.docx | REVISED. Incorporate the changes under “Proposed Changes” in 20/1313r4 |

### Introduction

BSS max idle period management has been introduced as part of the Wireless Network Management [1] to improve STA power saving and AP resource management. Extensions have been made to the mechanism in Sub 1 GHz License Exempt Operation [2] adding ability to an S1G non-AP STA to set the value of the BSS max idle period. This is desirable because otherwise an AP may use a single value to set this for the entire BSS which may not suit all devices in the BSS. For example, an IOT device such as a sensor may sleep for much longer duration than a laptop or a phone. [2] further adds a scaling factor that will increase the range of the period that can be specified.

The original mechanism developed in [1] is being used in the industry. Recently there has been more interest in adoption of the mechanism for more types of devices but using the extensions made in [2] for all PHYs.

This contribution attempts to bring in the changes that are necessary to update the mechanism so that non-AP STA can negotiate the setting of the BSS max idle period.

Note that both [1] and [2] have been rolled into [3] and we use [3] as the basis for discussion.

### Discussion

While well-intentioned, the changes that need to be brought in must be carefully considered and planned as there are implementations that already use the mechanism as defined in [1] and they should not be made non-compliant with any changes to the protocol. To this end, we intend to define a new capability MIB variable: BSS max idle period setting by non-AP STA. When this variable is set to true, then the non-AP STA will optionally include the BSS Max Period Element in the Association and Reassociation Request frames at the time of Associaton and Reassociation respectively.

The Max Idle Period field in BSS Max Idle Period element is 2 octets long. In [1] the maximum value of this field is 65,535,000 TUs, which is equivalent to 18.64 hours. By using the Unified Scaling Factor, [2] extends this period by a factor of upto 10,000. It is not clear if such a scaling factor needs to be used. In this contribution, we do not use the Unified Scaling factor, but this can be considered for a future version of the document.

### Proposed Changes

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGmd Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGmd Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGmd Editor: Editing instructions preceded by “Tgmd Editor” are instructions to the Tgmd editor to modify existing material in the Tgmd draft. As a result of adopting the changes, the Tgmd editor will execute the instructions rather than copy them to the Tgmd Draft.***

***All changes shown in this document are with reference to Tgmd Draft 4.0.***

* + - 1. MLME-ASSOCIATE.request
				1. Semantics of the service primitive

***Tgmd Editor: Change the entry for BSSMaxIdlePeriod in the table in the subclause as shown:***

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid range** | **Description** |
| BSSMaxIdlePeriod(11ah) | BSS Max Idle Period element | As defined in 9.4.2.78 (BSS Max Idle Period element) | Indicates the preferred BSS max idle period parameters. This parameter is optionally present if dot11WirelessManagementImplemented and dot11BSSMaxIdlePeriodIndicationByNonAPSTA are true, or if dot11S1GOptionImplemented is true; otherwise not present. |

* + - 1. MLME-ASSOCIATE.indication
				1. Semantics of the service primitive

***Tgmd Editor: Change the entry for BSSMaxIdlePeriod in the table in the subclause as shown:***

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid range** | **Description** |
| BSSMaxIdlePeriod(11ah) | BSS Max Idle Period element | As defined in 9.4.2.78 (BSS Max Idle Period element) | Indicates the preferred BSS max idle period parameters. This parameter is optionally present if dot11WirelessManagementImplemented and dot11BSSMaxIdlePeriodIndicationByNonAPSTA are true or if dot11S1GOptionImplemented is true; otherwise not present. |

* + - 1. MLME-REASSOCIATE.request

6.3.8.2.2 Semantics of the service primitive

***Tgmd Editor: Change the entry for BSSMaxIdlePeriod in the table in the subclause as shown:***

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid range** | **Description** |
| BSSMaxIdlePeriod(11ah) | BSS Max Idle Period element | As defined in 9.4.2.78 (BSS Max Idle Period element) | Indicates the preferred BSS max idle period parameters. This parameter is optionally present if dot11WirelessManagementImplemented and dot11BSSMaxIdlePeriodIndicationByNonAPSTA are true, or if dot11S1GOptionImplemented is true; otherwise not present. |

* + - 1. MLME-REASSOCIATE.indication
				1. Semantics of the service primitive

***Tgmd Editor: Change the entry for BSSMaxIdlePeriod in the table in the subclause as shown:***

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid range** | **Description** |
| BSSMaxIdlePeriod(11ah) | BSS Max Idle Period element | As defined in 9.4.2.78 (BSS Max Idle Period element) | Indicates the preferred BSS max idle period parameters. This parameter is optionally present if dot11WirelessManagementImplemented and dot11BSSMaxIdlePeriodIndicationByNonAPSTA are true or if dot11S1GOptionImplemented is true; otherwise not present. |

* Association Request frame format

***Tgmd Editor: Add the following at the appropriate place in*** “***Table 9-34—Association Request frame body” as shown:***

* Association Request frame body

|  |  |  |
| --- | --- | --- |
| Order | Information | Notes |
| 34 | BSS Max Idle Period | The BSS Max Idle Period element is optionally present if dot11WirelessManagementImplemented and dot11BSSMaxIdlePeriodIndicationByNonAPSTA are true, or if dot11S1GOptionImplemented is true; otherwise not present |

* Reassociation Request frame format

***Tgmd Editor: Add the following at the appropriate place in*** “***Table 9-38—Reassociation Request frame body” as shown:***

|  |
| --- |
| * Reassociation Request frame body
 |
| Order | Information | Notes |
| 38 | BSS Max Idle Period | The BSS Max Idle Period element is optionally present if dot11WirelessManagementImplemented and dot11BSSMaxIdlePeriodIndicationByNonAPSTA are true, or if dot11S1GOptionImplemented is true; otherwise not present |

11.21.13 BSS max idle period management

***Tgmd Editor: Change the subclause as shown below***

If dot11BssMaxIdlePeriod (#4684)is nonzero, ~~the STA~~an AP shall include the BSS Max Idle Period element in the (Re)Association Response frame ~~or the Reassociation Response frame~~. Otherwise, ~~the STA~~ an AP shall not include the BSS Max Idle Period element in the (Re)Association Response frame ~~or the Reassociation Response frame~~. A (11ah)non-S1G STA may send protected or unprotected keepalive frames, as indicated in the Idle Options field.

(11ah)Extended BSSMaxIdlePeriod values are those that had a nonzero unified scaling factor(#1360) (Table 9-50 (Unified Scaling Factor subfield encoding(11ah))) value signaled by an S1G STA. An S1G non-AP STA may include the BSS Max Idle Period element in transmitted (Re)Association Request frames ~~and Reassociation Request frames~~ to indicate a preferred BSSMaxIdlePeriod value.The S1G AP ~~selects~~chooses a value for BSSMaxIdlePeriod based on the S1G STA’s preferred BSSMaxIdlePeriod (if any) and the type of the S1G STA. The S1G AP indicates its chosen value to the S1G STA in the (Re)Association Response frame.

If dot11WirelessManagementImplemented is true, dot11BSSMaxIdlePeriod is non zero and dot11BSSMaxIdlePeriodIndicationByNonAPSTA is true, then a non-S1G non-AP STA shall include a BSS Max Idle Period element in the (Re)Association Request frame. If the BSS Max Idle Period element is present in the (Re)Association Request frame received by a non-S1G AP that has dot11BSSMaxIdlePeriodIndicationByNonAPSTA equal to true, then the non-S1G AP may choose ~~select~~ the non-AP STA’s preferred maximum idle period. The non-S1G AP indicates its chosen value to the non-S1G STA in the (Re)Association Response frame.

The value chosen by the AP is the value that the AP will use in making disassociate decisions based on the timeout value equal to BSSMaxIdlePeriod for the non-AP STA that is the recipient of the (Re)Association Response frame ~~or Reassociation Response frame~~. An AP may provide different values for BSSMaxIdlePeriod to different STAs.

(11ah)A STA may send at least one protected or unprotected keepalive frame per BSSMaxIdlePeriod, as indicated in the Idle Options field. When a STA transmits an unprotected keepalive frame, it shall use a frame that has 48-bit TA and RA fields.

The Max Idle Period field of the BSS Max Idle Period element indicates the time period during which a STA can refrain from transmitting frames to its associated AP without being disassociated. A non-AP STA is considered inactive if the AP has not received a Data frame, PS-Poll frame, or Management frame (protected or unprotected as specified in this paragraph) of a frame exchange sequence initiated by the STA for a time period greater than or equal to the time specified by the Max Idle Period field. If the Idle Options field requires protected keepalive frames, then the AP may disassociate the STA if no protected frames are received from the STA for a (11ah)duration of BSSMaxIdlePeriod. If the Idle Options field allows unprotected or protected keepalive frames, then the AP may disassociate the STA if no protected or unprotected frames (11ah)with 48-bit TA and RA fields are received from the STA for a duration (11ah)of BSSMaxIdlePeriod.

NOTE—The AP can disassociate or deauthenticate the STA at any time for other reasons even if the STA satisfies the keep-alive frame transmission requirements.

**Annex C**

* MIB detail

***Tgmd Editor: Insert the following into Dot11StationConfigEntry as shown below:***

Dot11StationConfigEntry ::= SEQUENCE

 {

 dot11StationID MacAddress,
. . . .

 dot11LocalMACAddressPolicyActivated TruthValue,

 dot11BSSMaxIdlePeriodIndicationByNonAPSTA TruthValue

}

***Tgmd Editor: Change the entry for dot11BSSMaxIdlePeriod as shown:***

dot11BssMaxIdlePeriod OBJECT-TYPE

 SYNTAX Unsigned32 (1..65535)

 MAX-ACCESS read-write

 UNITS "1000 TUs"

 STATUS current

 DESCRIPTION

 "This is a control variable.

 It is written by an external management entity or the SME.

 Changes take effect as soon as practical in the implementation.

 At an AP, ~~T~~this attribute indicates ~~that~~ the time period that passes before an AP disassociates an inactive non-AP STA. This value may be overriden by the AP based on the non-AP STA indication, if any, in (Re)Association Request frame. ~~This~~ The (overridden, if needed)value is transmitted in the (Re)Association Response ~~and Reassociation Response~~ frame~~s~~.

 At a non-AP STA, this attribute indicates the requested time before which the AP should not disassociate the inactive non-AP STA due to inactivity. This value might be transmitted in the (Re)Association Request frame."

 ::= { dot11StationConfigEntry 107}

***Tgmd Editor: Insert the following into dot11StationConfig TABLE after dot11LocalMACAddressPolicyActivated:***

dot11BSSMaxIdlePeriodIndicationByNonAPSTA OBJECT-TYPE

 SYNTAX TruthValue

 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 is only present for a non-S1G STA.

 This attribute, when true at a non-AP STA, indicates that the STA might include the BSS Max Idle Period element in (Re)Association Request frames.

 This attribute, when true at an AP, indicates that the AP might consider the value of the Max Idle Period subfield in the BSS Max Idle Period element in the (Re)Association Request frame in setting the Max Idle Period subfield in the BSS Max Idle Period element in the (Re)Association Response frame."

 ::= { dot11StationConfigEntry TBD}

**APPENDIX**

This appendix contains possible additions to the draft text, should the group decide to have the capability bit:

### Proposed Changes

Interpretation of a Motion to Adopt

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* + - 1. Extended Capabilities element

***Tgmd Editor: Request ANA to assign one of the currently reserved bits in Table 9-153 to “Max Idle Time Request” and make the appropriate chages to the Table and Insert the following paragraph within the Notes Column for the changed/added row***

An AP sets the Max Idle Time Request subfield to 1 within transmitted Beacon, Probe Response, (Re)Association Response frames if dot11WirelessManagementImplemented and dot11BSSMaxIdlePeriodIndicationByNonAPSTA are true and it will process the (Re) Association Request frames with BSS Max Idle Period. Otherwise, it is set to 0.

11.21.13 BSS max idle period management

***Tgmd Editor: Change the subclause as shown below***

If dot11BssMaxIdlePeriod (#4684)is nonzero, ~~the STA~~an AP shall include the BSS Max Idle Period element in the (Re)Association Response frame ~~or the Reassociation Response frame~~. Otherwise, ~~the STA~~ an AP shall not include the BSS Max Idle Period element in the (Re)Association Response frame ~~or the Reassociation Response frame~~. A (11ah)non-S1G STA may send protected or unprotected keepalive frames, as indicated in the Idle Options field.

(11ah)Extended BSSMaxIdlePeriod values are those that had a nonzero unified scaling factor(#1360) (Table 9-50 (Unified Scaling Factor subfield encoding(11ah))) value signaled by an S1G STA. An S1G non-AP STA may include the BSS Max Idle Period element in transmitted (Re)Association Request frames ~~and Reassociation Request frames~~ to indicate a preferred BSSMaxIdlePeriod value.The S1G AP ~~selects~~chooses a value for BSSMaxIdlePeriod based on the S1G STA’s preferred BSSMaxIdlePeriod (if any) and the type of the S1G STA. The S1G AP indicates its chosen value to the S1G STA in the (Re)Association Response frame.

If dot11WirelessManagementImplemented is true, dot11BSSMaxIdlePeriod is non zero, dot11BSSMaxIdlePeriodIndicationByNonAPSTA is true, and the Max Idle Time Request subfield in Extended Capabilities element in Beacon, Probe Response, (Re)Association Response frames sent by the AP, then a non-S1G non-AP STA may include a BSS Max Idle Period element in the (Re)Association Request framethen a non-S1G non-AP STA shall include a BSS Max Idle Period element in the (Re)Association Request frame. If the BSS Max Idle Period element is present in the (Re)Association Request frame received by a non-S1G AP that has dot11BSSMaxIdlePeriodIndicationByNonAPSTA equal to true, then the non-S1G AP choose select the non-AP STA’s preferred maximum idle period. The non-S1G AP indicates its chosen value to the non-S1G STA in the (Re)Association Response frame.

The value chosen by the AP is the value that the AP will use in making disassociate decisions based on the timeout value equal to BSSMaxIdlePeriod for the non-AP STA that is the recipient of the (Re)Association Response frame ~~or Reassociation Response frame~~. An AP may provide different values for BSSMaxIdlePeriod to different STAs.

(11ah)A STA may send at least one protected or unprotected keepalive frame per BSSMaxIdlePeriod, as indicated in the Idle Options field. When a STA transmits an unprotected keepalive frame, it shall use a frame that has 48-bit TA and RA fields.

The Max Idle Period field of the BSS Max Idle Period element indicates the time period during which a STA can refrain from transmitting frames to its associated AP without being disassociated. A non-AP STA is considered inactive if the AP has not received a Data frame, PS-Poll frame, or Management frame (protected or unprotected as specified in this paragraph) of a frame exchange sequence initiated by the STA for a time period greater than or equal to the time specified by the Max Idle Period field. If the Idle Options field requires protected keepalive frames, then the AP may disassociate the STA if no protected frames are received from the STA for a (11ah)duration of BSSMaxIdlePeriod. If the Idle Options field allows unprotected or protected keepalive frames, then the AP may disassociate the STA if no protected or unprotected frames (11ah)with 48-bit TA and RA fields are received from the STA for a duration (11ah)of BSSMaxIdlePeriod.

NOTE—The AP can disassociate or deauthenticate the STA at any time for other reasons even if the STA satisfies the keep-alive frame transmission requirements.

**References:**

1. IEEE Std 802.11v™-2011: Wireless Network Management (Amendment 8)
2. IEEE Std 802.11ah™-2016: Sub 1 GHz License Exempt Operation (Amendment 2)
3. P802.11 Tgmd Draft 4.0