IEEE P802.11
Wireless LANs

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| Resolution for CIDs related to MLO Power Save (CC34) |
| Date: Feb 11, 2021 |
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 Abstract

This submission proposes resolutions for following (28) CIDs received for TGbe (CC34):

1027, 2561, 1107, 3411, 1108, 2090, 2120, 2282, 2356, 3255, 2325, 2133, 1167, 2601, 1695, 3031, 1168, 1479, 2252, 3032, 1818, 2301, 1696, 3321, 1635, 3203, 2326, 1169

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Updated based on offline feedback from several members (added as co-authors)

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 TGbe Draft. This introduction is not part of the adopted material.

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

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

#1: indicates changes based on comments/suggestions in doc 11-21/0218r0 (Mark Rison)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Pg/Ln** | **Section** | **Comment** | **Proposed Change** | **Resolution** |
| 1027 | Abhishek Patil | 108.35 | 11.21.13 | "When the AP is affiliated with an AP MLD and the ..... " This is a long roundabout way to differentiate between legacy and MLO association. Appears at a few other places in the spec (e.g., 6.3.7.3.2). The spec needs to provide a simpler way to differentiate between legacy association and association that is multi-link setup. | Add the following as the second paragraph in 35.3.5.1: "When (Re)Association Request frame and (Re)Association Response frames carry Multi-Link element, the association is a multi-link setup. Otherwise it is not a multi-link setup" | **Revised**Agree with the comment. The suggested change is made in clause 35.3.5.1 with a few changes. In addition, text in clause 6 is updated to simplify the differentiation between ML association and non-ML association.**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 1027** |
| 1107 | Alfred Asterjadhi | 31.27 | 4.3.19.2 | This either or condition does not look correct. Replace with neither nor. | As in comment. | **Revised**The cited sentence was revised as a resolution to another comment (CID 1027) and the reference to ‘either / or’ is no longer used.**TGbe editor, no further changes are needed to resolve this comment.** |
| 2561 | Rojan Chitrakar | 31.26 | 4.3.19.2 | Since BSS max idle period is constrained for STAs not affiliated with an MLD, it would be good to provide reference to 4.3.19.23a (MLD max idle period management) for the case when an STA is affiliated with an MLD. | Provide a reference to 4.3.19.23a (MLD max idle period management) for the case when an STA is affiliated with an MLD. | **Revised**Agree with the commenter. A reference to clause 4.3.19.23a is provided in the cited sentence.**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 2561** |
| 3411 | Yonggang Fang | 31.29 | 4.3.19.23a | The sentence of "This supports improved power saving at the non-AP MLD and resource management at the AP MLD." is not 100% correct and necessary. Suggest to remove it. | Delete this sentence | **Rejected**The BSS (or MLD) max idle period procedure is meant to help an STA (or non-AP MLD) save power – i.e., the STA (non-AP MLD) is able to maintain association state with the AP (or AP MLD) even when it doesn’t transmit a frame to the AP (or AP MLD) for an extended period of time. Furthermore, the cited sentence is similar to what appears in baseline standard. The cited sentence is kept. |
| 1108 | Alfred Asterjadhi | 31.41 | 4.3.19.23a | This sentence seems to imply that the ML setup can be teared down without the need of disassociating the STA. If this is the case then apply this consideration throughout the MLD subclauses. In the normative behavior subclauses it seems like tear down of ML setup is the same as disassociating the STA. | As in comment. | **Revised**Agree with the commenter. The sentence was updated to say that the AP MLD disassociated the non-AP MLD if it doesn’t receive any frames from the non-AP MLD for a prolonged period of time (that exceeds the BSS max idle period specified by the AP). Similar change was applied to sentences in clause 35.3.10.3.**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 1108** |
| 2090 | kaiying Lu | 31.37 | 4.3.19.23 | Similar to BSS max idle period, MLD max idle period enables an AP MLD to indicate a time period during which the AP MLD does not disassoicate the non-AP MLD due to nonreceipt of frames from the non-AP MLD on any setup link. "disassociate" more directly describe the behavior than "tear down the multi-link setup". | Please change "... does not tear down theﾠmulti-link setup ..." to "...does not disassociate the non-AP MLD". | **Revised**Agree with the commenter. The sentence was updated as suggested by the commenter. Similar change was applied to sentences in clause 35.3.10.3.**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 2090** |
| 2120 | Laurent Cariou | 0.00 | 11.21.13 | BSS MAX Idle Period element shall not be included in ML element | as in comment | **Reject**The commenter fails to identify an issue. Per 11be D0.3, the BSS Max Idle Period element is carried in the core frame (i.e., (Re)Association Response frame) and not within the ML IE as a subelement. The value carried in the Max Idle Period field is applied at the MLD level. |
| 2282 | Michael Montemurro | 108.41 | 11.21.13 | I'm not sure what this note is trying to say. Why are association frames not addressed to the AP MLD and not the AP affiliated with the AP MLD. If that was done thing would be much simpler. | Ensure that for (re-)association, the request is going to the AP MLD as the destination address and the BSSID is set correctly to the MLD AP. The commenter is willing to work to helping develop text to address this comment. | **Revised** The cited NOTE was deleted as a resolution to another comment (CID 1027). The revised spec will provide a simpler and clearer way to differentiate association that is ML setup or not.**TGbe editor, no further changes are needed to resolve this comment.** |
| 2356 | Morteza Mehrnoush | 139.20 | 35.3.10.1 | "active mode" is not mentioned, frame exchange is possible during the active mode as well. | Add "or active mode" as below:"Each STA of a non-AP MLD that is operating on an enabled link shall maintain its own power management mode and power states as defined in 11.2 (Power management) and 10.47 (Target wake time (TWT)). Frame exchanges on an enabled link are possible when the STA of the non-AP MLD operating on that link is in the awake state or active mode (see 11.2.3 (Power management in a non-DMG infrastructure network))." | **Rejected**A STA can be in awake state in both AM and PS mode (see 11ax D8.0 11.2.3.2). In addition, while in active mode, there are conditions when an HE STA may be unavailable. Therefore, awake captures the intended meaning. |
| 3255 | Yuchen Guo | 139.15 | 35.3.10.1 | This note is redundant, same contents as the 4th paragraph of 35.3.6.1.1 | delete this note | **Accepted** |
| 2325 | Ming Gan | 139.23 | 35.3.10.1 | For "continues to remaining active mode", change it to "continues to remain in active mode" | As in comment | **Revised**Fixed the typo as suggested by the commenter. In addition, a few other editorial updates were made in the paragraph**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 2325** |
| 2133 | Laurent Cariou | 0.00 | 35.3.10.2 | Shouldn't we phrase this whole paragraph by saying that the non-AP MLD is shall be able to perform all basic operations by monitoring only one link | as in comment | **Revised**Agree with the commenter. The sentence was updated as suggested by the commenter. In addition, the next sentence was deleted since the addition of ‘single’ captures the intention that not every STA of the non-AP MLD is required to receive beacon frame periodically.**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 2133** |
| 1167 | Arik Klein | 139.49 | 35.3.10.2 | The Non-AP MLD should perform BSS basic operations by monitoring the Beacon frames on one or more \*enabled\* links and not on any setup link - please replace "links" with "enable links" in the sentence. | Revise the sentece to the following: "A non-AP MLD may perform basic operations (such as receiving a traffic indication, time synchronization, receiving BSS parameter updates) by monitoring Beacon frames on one or more \*enabled\* links" | **Revised**The sentence was updated to say a non-AP MLD shall be able to perform basic BSS operation on a single enabled link.**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 1167** |
| 2601 | Rojan Chitrakar | 139.52 | 35.3.10.2 | Non-TIM Mode is only applicable for S1G STAs and is not relevant for EHT STAs. | Delete "and non-TIM mode". | **Revised**Deleted ‘non-TIM mode’ as suggested by the commenter. In addition, since TGbe has agreed that WNM sleep is at the MLD level, removed WMN sleep (doesn’t apply at the STA level).**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 2601** |
| 1695 | GEORGE CHERIAN | 139.56 | 35.3.10.2 | "NOTE 1--A single AID is assigned to a non-AP MLD during multi-link setup (see 35.3.5 (Multi-link (re)setup)). Therefore, the traffic indication for the non-AP MLD is consistent across Beacon frames transmitted by different APs of the same AP MLD."Convert this note to normative requirement | As in the comment | **Revised**Agree in principle with the commenter. The NOTE is deleted, and the corresponding text is converted to a normative sentence.**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 1695** |
| 3031 | Xiaofei Wang | 139.56 | 35.3.10.2 | The note is normative text and should be moved to regular spec text. | as in comment | **Revised**Agree in principle with the commenter. The NOTE is deleted, and the corresponding text is converted to a normative sentence.**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 3031** |
| 1168 | Arik Klein | 139.56 | 35.3.10.2 | Note 1 mentions that "single AID is assinged to a non-AP MLD during multi-link setup" and refers to secions 35.3.5 for further information. However, this subject is not mentined at all in this section. | 2 options are possible:Option 1: if such an information is avilable regarding the AID assignment - please update the reference to the appropriate section.Option 2: Add this information both in section 35.3.5 as well as in sections: 11.3.5.3, 11.3.5.5, | **Revised**The reference is fixed to point to clause 35.3.10.4**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 1168** |
| 1479 | Dibakar Das | 139.56 | 35.3.10.2 | "35.3.5 (Multi-link (re)setup)"-- the reference seems to be wrong | Change to "35.3.10.4 (Traffic indication)" | **Accepted** |
| 2252 | Massinissa Lalam | 139.56 | 35.3.10.2 | NOTE1 points to subclause 35.3.5 but nowhere in this clause one can find that a single AID is assgned to a non-AP MLD. In fact the normative mention of this is in subcaluse "35.3.10.4 Traffic indication":"An AP MLD shall assign a single AID to a non-AP MLD upon successful multi-link setup. All the STAs of the non-AP MLD shall have the same AID as the one assigned to the non-AP MLD during multi-link setup."I would suggest to put those two sentences in subclause 35.3.5 (or in the authentication procedure) | As in comment | **Revised**The reference is fixed to point to clause 35.3.10.4**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 2252** |
| 3032 | Xiaofei Wang | 139.56 | 35.3.10.2 | No description for single AID in 35.3.5, please correct reference to 35.3.10.4 | as in comment | **Revised**The reference is fixed to point to clause 35.3.10.4**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 3032** |
| 1818 | James Yee | 140.01 | 35.3.10.3 | Is there a reason why this subclause is not in 11.21.13 or 11.21.13a? Seems repetitive and first paragraph lacks context. | Clarify | **Revised**The paragraph in this subclause are updated to clarify the difference between legacy BSS max idle period and MLD max idle period.**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 1818** |
| 2301 | Michael Montemurro | 140.01 | 35.3.10.3 | This feature is still BSS max idle period. | Change the title at the cited location to: "BSS max idle period management for MLO" | **Revised**The paragraph in this subclause are updated to clarify the difference between legacy BSS max idle period and MLD max idle period.**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 2301** |
| 1696 | GEORGE CHERIAN | 140.03 | 35.3.10.3 | "A STA of a non-AP MLD may send at least one protected or unprotected keepalive frame per BSSMaxIdlePeriod, as indicated in the Idle Options subfield."Make the following clear: BSSMaxIdlePeriod is maintained at the MLD level, and any of the STAs affiliated with the MLD can send the keealive message. | As in the comment | **Revised**The paragraph in this subclause are updated to clarify the difference between legacy BSS max idle period and MLD max idle period.**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 1696** |
| 3321 | Yunbo Li | 140.03 | 35.3.10.3 | "A STA of a non-AP MLD may send at least one protected or unprotected keepalive frame per BSSMaxIdlePeriod". "may send" means may not send. The non-AP MLD can not keep alive if none of affilicated STA send a keepalive frame. | Change to "At least one STA of a non-AP MLD shall send at least one protected or unprotected keepalive frame per BSSMaxIdlePeriod , as indicated in the Idle Options subfield, to keep alive." | **Revised**The cited sentence is updated to say one or more STA of the non-AP can send a keepalive frame. The baseline spec has a ‘may’ hence making this as a (shall) requirement will create backward compatibility issues without bringing in any benefits. If the non-AP MLD does not send any keepalive frames, then the AP MLD is free to disassociate it. In addition, provided examples of frames that can qualify as keepalive frames. Similar change was made to baseline 11.21.13. The examples are the same as the ones listed in the baseline clause 11.21.13.**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 3321** |
| 1635 | Evgeny Khorov | 140.04 | 35.3.10.3 | "A STA of a non-AP MLD may send at least one protected or unprotected keepalive frame per BSSMaxIdlePeriod, as indicated in the Idle Options subfield." Here "may" means that it is not obligatory, and it is used together with "at least one", which seems redundant. | As in comment | **Revised**The sentence is updated to clarify the intended meaning. Furthermore, the part about protected or unprotected frame is moved to a separate sentence to avoid confusion with respect to the type of frame that is sent to meet the max idle period requirement.**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 1635** |
| 3203 | Young Hoon Kwon | 140.08 | 35.3.10.3 | The definition on the Max Idle Period subfield should be described in 9.4.2.78. | Delete this sentence here and modify the definition on the Max Idle Period subfield in 9.4.2.78 to incorporate this definition. | **Revised**The cited sentence is deleted as suggested by the commenter. The description in clause 9.4.2.78 is updated to cover the case when the element is included in a (Re)Association Response frame during a multi-link association. Furthermore, the first paragraph in clause 35.3.10.3 is updated to clarify that the Max Idle Period field of the BSS Max Idle Period element indicates the MLD Max Idle Period when the association is a multi-link setup.**TGbe editor, please make changes as shown in doc 11-21/0250r1 tagged as CID 3203** |
| 2326 | Ming Gan | 140.09 | 35.3.10.3 | Change "with whom" to "with which" | As in comment | **Revised** The cited sentence was deleted as a resolution to another comment (CID 3203).**TGbe editor, no further changes are needed to resolve this comment.** |
| 1169 | Arik Klein | 140.09 | 35.3.10.3 | Replace the "setup link" with "enabled link", since frame exchange is allowed only on enabled links, as defined in section 35.3.6.1.1 | The revised sentence shall be: " The Max Idle Period subfield of the BSS Max Idle Period element indicates the time period during which anon-AP MLD can refrain from transmitting frames on any \*enabled\* link to the AP MLD, with whom it has performed multi-link setup, without causing a tear down of the multi-link setup." | **Revised** The cited sentence was deleted as a resolution to another comment (CID 3203).**TGbe editor, no further changes are needed to resolve this comment.** |

***TGbe Editor: Please note, the baselines for this document are REVmd D5.0 and 802.11be D0.3***

**35.3.5 Multi-link (re)setup**

**35.3.5.1 Multi-link (re)setup procedure**

***TGbe editor: Please modify the 2nd paragraph in this subclause as shown below:***

For a non-AP MLD to perform multi-link (re)setup with an AP MLD, the non-AP MLD and the AP MLD shall exchange (Re)Association Request/Response frames and shall follow the MLD (re)association procedure as described in 11.3 (STA/MLD authentication and association). A (Re)Association Request/Response frame exchange that results in a successful association is for a multi-link (re)setup if both the frames carried Basic variant Multi-link element. Otherwise the association is not for a multi-link (re)setup.[CID 1027]

**6.3.7.3.2 Semantics of the service primitive**[CID 1027]

***TGbe editor: Please modify the following row in this as shown below:***

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid range** | **Description** |
| BSSMaxIdlePeriod | As defined in BSS Max Idle Period element | As defined in 9.4.2.78 (BSS Max Idle Period element) | Indicates the BSS max idle period parameters of the AP or PCP when association is not for a multi-link setup (see 35.3.5.1); otherwise indicates the MLD max idle period parameter of the AP MLD. This parameter is present if dot11WirelessManagementImplemented is true and is not present otherwise. |

**6.3.7.5.2 Semantics of the service primitive**[CID 1027]

***TGbe editor: Please modify the following row in this as shown below:***

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid range** | **Description** |
| BSSMaxIdlePeriod | BSS Max Idle Period element | As defined in9.4.2.78 (BSS Max Idle Period element) | Indicates the BSS max idle period parameters of the AP or PCP when association is not for a multi-link setup (see 35.3.5.1); otherwise indicates the MLD max idle period parameter of the AP MLD. This parameter is present if dot11WirelessManagementImplemented is true or dot11S1GOptionImplemented is true; otherwise not present. |

**6.3.8.3.2 Semantics of the service primitive**[CID 1027]

***TGbe editor: Please modify the following row in this as shown below:***

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid range** | **Description** |
| BSSMaxIdlePeriod | BSS Max Idle Period element | As defined in 9.4.2.78 (BSS Max Idle Period element) | Indicates the BSS max idle period parameters of the AP or PCP when association is not for a multi-link setup (see 35.3.5.1); otherwise indicates the MLD max idle period parameter of the AP MLD. This parameter is present if dot11WirelessManagementImplemented is true or dot11S1GOptionImplemented is true; otherwise not present. |

**6.3.8.5.2 Semantics of the service primitive**[CID 1027]

***TGbe editor: Please modify the following row in this as shown below:***

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid range** | **Description** |
| BSSMaxIdlePeriod | BSS Max Idle Period element | As defined in 9.4.2.78 (BSS Max Idle Period element) | Indicates the BSS max idle period parameters of the AP or PCP when association is not for a multi-link setup (see 35.3.5.1); otherwise indicates the MLD max idle period parameter of the AP MLD. This parameter is present if dot11WirelessManagementImplemented is true or dot11S1GOptionImplemented is true; otherwise not present. |

**4.3.19 Wireless network management**

* + - 1. **BSS max idle period management**

***TGbe editor: Please modify this subclause as shown below:***

[CID 1027]When association is not for a multi-link setup, BSS max idle period management enables an AP to indicate a time period during which the AP does not disassociate a STA due to nonreceipt of frames from the STA (also see 4.3.19.23a).[CID 2561] This supports improved STA power saving and AP resource management.

**4.3.19.23a MLD max idle period management**

***TGbe editor: Please modify this subclause as shown below:***

[CID 1027]When association is for a multi-link setup, MLD max idle period management enables an AP MLD to indicate a time period during which the AP MLD does not disassociate the non-AP MLD[CID 2090, 1108] due to nonreceipt of frames from the non-AP MLD on any setup link. This supports improved power saving at the non-AP MLD and resource management at the AP MLD.

* 1. **Wireless network management procedures**

**11.21.13 BSS max idle period management**

***TGbe editor: Please modify the following paragraphs in this subclause (11be D0.3) as shown below:***

If dot11BssMaxIdlePeriod is nonzero or dot11MldMaxIdlePeriod is nonzero, an AP shall include the BSS Max Idle Period element in the (Re)Association Response frame. Otherwise, the AP shall not include the BSS Max Idle Period element in the (Re)Association Response frame.

[CID 1027]When association is for a multi-link setup, the values carried in the BSS Max Idle Period element apply at the MLD level and the associated MLDs follow the MLD max idle period procedure defined in 35.3.10.3 (MLD max idle period management). The rest of this subclause defines the procedure for the BSS max idle period when the association is not a multi-link setup.

[CID 1027]A non-S1G STA may send protected or unprotected keepalive frames, as indicated in the Idle Options field.

***TGbe editor: Please modify the now shifted fifth paragraph in this subclause (REVmd D5.0) as shown below:***

[CID 3321, #1]A STA may send at least one protected or unprotected keepalive frame (such as Data frame, PS-Poll frame, or Management frame) per BSSMaxIdlePeriod, as indicated in the Idle Options field.

**35.3.10 Multi-link power management**

**35.3.10.1 General**

***TGbe editor: Please modify the two paragraphs in this subclause as shown below:***

Each STA of a non-AP MLD that is operating on an enabled link shall maintain its own power management mode and power states as defined in 11.2 (Power management) and 10.47 (Target wake time (TWT)). Frame exchanges on an enabled link are possible when the STA of the non-AP MLD operating on that link is in the awake state (see 11.2.3 (Power management in a non-DMG infrastructure network)).

[CID 3255][CID 2325, #1]Figure 35-4 (Each STA of a non-AP MLD maintains its own power state) illustrates the power save operation for each STA affiliated with a non-AP MLD during multi-link operation. As depicted in the figure, during the initial portion of the illustration, both STAs affiliated with the non-AP MLD are in active mode and involved in frame exchange. At some point in time, STA 2 affiliated with non-AP MLD operating on link 2 signals to AP 2 that it has entered power save mode (i.e., PM=1) and transitions to doze state. It remains in doze state for the rest of the illustration. A little later, STA 1 enters power save mode (i.e., signals PM=1). While operating in this mode, it signals awake state to AP 1 by transmitting a frame (such as PS-Poll frame) on link 1. STA 1 participates in frame exchange with AP 1 while in awake state.

***TGbe editor: Visio file: 11-20/1289r2***



**Figure 35-4—Each STA affiliated with a non-AP MLD maintains its own power state**[#1]

**35.3.10.2 Basic BSS operation**

***TGbe editor: Please modify this subclause as shown below:***

[CID 2133, 1167]A non-AP MLD shall be able to perform basic operations (such as receiving a traffic indication, time synchronization, receiving BSS parameter updates) by monitoring Beacon frames on a single enabled link. This is in addition to mechanisms such as individual TWT agreement.[CID 2601] With these mechanisms, a non-AP MLD can receive basic information about the AP MLD and one or more APs of the AP MLD on a single link while the other STA(s) of the non-AP MLD are in doze state.

[CID 1695, 3031, 1168, 1479, 2252, 3032]An AP MLD shall assign a single AID to a non-AP MLD during multi-link setup (see 35.3.10.4) and the traffic indication for the non-AP MLD shall be the same in the Beacon frames transmitted by the APs affiliated with the AP MLD, that are operating on the links that are part of the multi-link setup.

[CID 1695, 3031]NOTE —Each AP of an AP MLD provides a critical updates indication when there is an update to the BSS parameters for another AP of the AP MLD (see 35.3.8 (BSS parameter critical update procedure)).

**35.3.10.3 MLD max idle period management**

***TGbe editor: Please modify this subclause as shown below:***

[CID 1027, 1818, 2301, 1696, 3203]During multi-link setup, if the AP of an AP MLD includes a BSS Max Idle Period element in the (Re)Association Response frame, then the value carried in the Max Idle Period field is applied at the MLD level. The AP MLD shall use this timeout value for making disassociation decisions. An AP MLD may provide different BSS Max Idle Period values for different non-AP MLDs.

[CID 3321, 1635, #1]At least one STA affiliated with a non-AP MLD may send at least one keepalive frame (such as Data frame, PS-Poll frame, or Management frame) per BSS Max Idle Period if the non-AP MLD wants to avoid getting disassociated from the AP MLD due to nonreceipt of frames. A keepalive frame shall be protected or unprotected as indicated in the Idle Options subfield.

[3203, #1]A non-AP MLD is considered inactive if the AP MLD has not received a Data frame, PS-Poll frame, or Management frame (protected or unprotected as specified in this paragraph) or a frame exchange sequence initiated by the non-AP MLD on any setup link for a time period greater than or equal to the time specified by the Max Idle Period subfield of the BSS Max Idle Period element. If the Idle Options subfield of the BSS Max Idle Period element requires protected keepalive frames, then the AP MLD may [CID 2090, 1108]disassociate the non-AP MLD if no protected frames are received from any STA of the non-AP MLD for a duration of BSS Max Idle Period. If the Idle Options subfield allows unprotected or protected keepalive frames, then the AP MLD may [CID 2090, 1108]disassociate the non-AP MLD if no protected or unprotected frames are received from any STA of the non-AP MLD for a duration of BSS Max Idle Period.

NOTE—The AP MLD can disassociate or deauthenticate the non-AP MLD at any time for other reasons even if the non-AP MLD satisfies the keepalive frame transmission requirements.

* **BSS Max Idle Period element**[3203]

***TGbe editor: Please modify this subclause as shown below:***

When association is not for a multi-link setup, the BSS Max Idle Period element contains the time period a non-AP STA can refrain from transmitting frames to the AP before the AP might disassociate the STA due to inactivity.

When association is for a multi-link setup, the BSS Max Idle Period element contains the time period a non-AP MLD can refrain from transmitting frames to the AP MLD before the AP MLD might disassociate the non-AP MLD due to inactivity.

The format of the BSS Max Idle Period element is shown in Figure 9-460 (BSS Max Idle Period element format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Element ID | Length | Max Idle Period | Idle Options |
| Octets: | 1 | 1 | 2 | 1 |
| * **BSS Max Idle Period element format**
 |

The Element ID and Length fields are defined in 9.4.2.1 (General).

The BSSMaxIdlePeriod parameter indicates the idle timeout limit, as described in 11.21.13 (BSS max idle period management) and 35.3.10.3 (MLD max idle period management). The time period is specified in units of 1000 TUs. The value of 0 is reserved. In a non-S1G STA or an MLD, the Max Idle Period field is an unsigned integer that contains the value of the parameter BSSMaxIdlePeriod. In an S1G STA, the two MSBs of the Max Idle Period field contain the Unified Scaling Factor subfield and the remaining 14 bits contain the Unscaled Interval subfield (see Figure 9-89 (Listen Interval field format carried in an S1G PPDU)). In an S1G STA, the BSSMaxIdlePeriod parameter used by the MLME primitives is in units of 1000 TUs and is equal to the value of the Unscaled Interval subfield, multiplied by the scaling factor that corresponds to the value indicated in the Unified Scaling Factor subfield. The Unified Scaling Factor subfield encoding is defined in Table 9-48 (Unified Scaling Factor subfield encoding).

The Idle Options field indicates the options associated with the BSS Idle capability. The Idle Options field is shown in Figure 9-461 (Idle Options field format).

|  |  |  |
| --- | --- | --- |
|  | B0 | B1 B7 |
|  | Protected Keep-Alive Required | Reserved |
| Bits: | 1 | 7 |
| * **Idle Options field format**
 |

The Protected Keep-Alive Required subfield is set to 1 to indicate that only a protected frame indicates activity. The Protected Keep-Alive Required subfield is set to 0 to indicate that either an unprotected or a protected frame indicates activity.

The BSS Max Idle Period element is included in Association Request and Response frames, as described in 9.3.3.5 (Association Request frame format) and 9.3.3.6 (Association Response frame format), and Reassociation Request and Response frames, as described in 9.3.3.7 (Reassociation Request frame format) and 9.3.3.8 (Reassociation Response frame format). The use of the BSS Max Idle Period element and frames is described in 11.21.13 (BSS max idle period management) and 35.3.10.3 (MLD max idle period management).