IEEE P802.11  
Wireless LANs

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| 11be D4.0 CR for some subclauses in 4, 10, and 11 | | | | |
| Date: 2023-08-20 | | | | |
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**Abstract**

This submission proposes resolutions for the following CIDs:

19589, 19066, 19489, 19499, 19130, 19063, 19224, 19062, 19003, 19052,

19054, 19050, 19053, 19593, 19229, 19514, 19515

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Revision based on the discussion during the teleconference call
* Rev 2: Add email address.
* Rev 3: Move exact content to a new template
* Rev 4: Revision for the resolution of 19589

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 D4.0 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGbe D4.0 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 TGbe 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.***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 19589 | Xiangxin Gu | 4.3.21.23 | 63.34 | "a non-AP STA affiliated with the non-AP MLD" is wordy | change to "a STA affiliated with the non-AP MLD" and applied the change to the whole standard. | Revised –  There have been comments mentioning that “a STA affiliated with the non-AP MLD” may imply that an AP can affiliated with the non-AP MLD, which is not true. When there can be confusion, spelling out the details will be a better choice.  We also change other instances in the spec that use "a STA affiliated with the non-AP MLD".  TGbe editor to make the changes shown in 11-23/1383r4 under all headings that include CID 19589 |
| 19066 | Po-Kai Huang | 4.5.3.2 | 64.06 | Add high level description to each bullet to help reading. | Add (non-MLO to non-MLO) for first bullet, (MLO to MLO) for second bullet, (MLO to non-MLO) for third bullet. (non-MLO to MLO) for fourth bullet. | Revised-  Agree in principle with the commenter.  We also change the bullet to number.  TGbe editor to make the changes shown in 11-23/1383r3 under all headings that include CID 19066 |
| 19489 | Michael Montemurro | 4.5.3.1 | 64.07 | [WFA-R] These three bullets share a lot of words in common. This makes it difficult to determine what is different in these three cases. Rewording to highlight the differences would help the reader. | As in comment | Revised –  We add the short header for each bullet to highlight the difference.  TGbe editor to make the changes shown in 11-23/1383r3 under all headings that include CID 19066 |
| 19499 | Michael Montemurro | 4.5.3.3 | 65.38 | [WFA-R] Sentences with "respectively" more than once are extremely confusing. Some grammar websites say that "respectively" cannot appear two or more times in a sentence, but this happens a lot in this document. Page 66, line 54 is one example. In this case, two sentences would be much clearer. We suggest: Before a non-AP STA is allowed to deliver an MSDU via an AP, it first associates with the AP. Likewise, before a non-AP MLD is allowed to deliver an MSDU via an AP MLD, it first associates with the AP MLD. | As in comment | Revised –  Agree in principle with the commenter.  TGbe editor to make the changes shown in 11-23/1383r3 under all headings that include CID 19499 |
| 19130 | Bo Sun | 4.5.3.3 | 67.04 | Besides what has been updated in this paragraph, sub-clause 4.3.8 should also be updated to support MLD in RSNA | As comment | Revised –  Agree in principle with the commenter.  TGbe editor to make the changes shown in 11-23/1383r3 under all headings that include CID 19130 |
| 19063 | Po-Kai Huang | 10.3.2.14.2 | 334.60 | TR4 applies to IQMF except the frames exclduing in 35.3.14 as described in SNS12. | change "...for each MMPDU carried in one or more IQMFs ..." to "...for each MMPDU carried in one or more IQMFs (except the frames that are excluded in 35.3.14 (Multilink device individually addressed Management frame delivery)) ..." | Accepted - |
| 19224 | John Wullert | 10.3.2.14.3 | 335.06 | Problem with subject-verb agreement | Change "A STA and an MLD maintains" to "A STA and an MLD each maintains" | Revised –  We change to “A STA or an MLD..”  TGbe editor to make the changes shown in 11-23/1383r3 under all headings that include CID 19224 |
| 19062 | Po-Kai Huang | 10.3.2.14.3 | 335.30 | missing 1 for the sentence "If either an MLD1 or an MLD2 is a non-QMF MLD, all STAs affiliated with the MLD1 shall use RC15 in Table 10-6 (Receiver caches), where the duplicate detection cache is maintained by the MLD, " | change the referred sentence to "If either an MLD1 or an MLD2 is a non-QMF MLD, all STAs affiliated with the MLD1 shall use RC15 in Table 10-6 (Receiver caches), where the duplicate detection cache is maintained by the MLD1, " | Accepted - |
| 19003 | Chaoming Luo | 11.1.4.3.9 | 367.31 | The subject of the first sentence is 'A FILS STA' that applies to 'to the address of the STA' or 'to the broadcast' cases. Whilst the 'except' case changes subject to 'a non-FILS EHT AP', which sounds weird grammatically. Furthermore, the subject of the last sentence 'A non-FILS STA' is indeed a superset of 'a non-FILS EHT AP', we should move the 'except' to the end of the paragraph. | Move "except that ..." to the end of the paragraph. | Accepted- |
| 19052 | Po-Kai Huang | 11.2.3.15.3 | 366.59 | The second bullet "If a GTK/IGTK/BIGTK update is in progress, the pending GTK, IGTK, and BIGTK shall be included in the WNM Sleep Mode Response frame." should be combined with the first bullet since they belong to the same context. Note that in bullet 3, only one bullet is used to describe the cases with or without GTK/IGTK/BIGTK update in progress. | Move the texts of the second bullet to the end of the first bullet and remove the second bullet. | Accepted - |
| 19054 | Po-Kai Huang | 11.2.3.15.3 | 367.10 | The second bullet is under the context of the first bullet. Should just combine them. | Move the texts of the second bullet to the end of the first bullet and remove the second bullet. | Accepted - |
| 19050 | Po-Kai Huang | 11.2.3.15.3 | 367.06 | Clarify that for MLO, the GTK, IGTK, BIGTK is indicated used WNM Sleep Mode MLO GTK/IGTK/BIGTK subelement. | As in comment | Revised –  Agree in principle with the commenter.  TGbe editor to make the changes shown in 11-23/1383r3 under all headings that include CID 19050 |
| 19053 | Po-Kai Huang | 11.2.3.15.3 | 367.17 | The third bullet operation does not match the baseline bullet 3 for non-MLO in 366.62. Specifically, the case when GKT update is in progress is missing. | Similar to the baseline, add the operation when GTK update is in progress. Suggested text below. "If a GTK update is in progress for a setup link, the pending GTK for the setup link shall be sent to the STA using another group key handshake immediately after the current GTK of the setup link has been sent." | Accepted - |
| 19593 | Xiangxin Gu | 11.20.6.1 | 392.01 | It is possible for a non-AP MLD to simultaneously have data transmission with its associated AP through its first affilliated STA on base channel and have TDLS data transmission with TDLS peer STA on TDLS off-channel through its second affliated STA. This operation enables the first affiliated STA not to be in doze during TDLS frame exchange on the off-channel then brings gain. | modify the standard text to make this operation possible. | Rejected –  A STR non-AP MLD can already do this. A non-STR non-AP MLD can utilize power save to change link. |
| 19229 | John Wullert | 11.3.4 | 370.51 | "NOTE 2--Frames transmissions..." should be "NOTE 2--Frame transmissions..." | As in comment | Accepted - |
| 19514 | Michael Montemurro | 11.3.6.2 | 50.75 | [WFA-R] This sentence is unclear. A comma is needed. | As in comment | Revised -  We assume the location of the comments is 375.47.  TGbe editor to make the changes shown in 11-23/1383r3 under all headings that include CID 19514 |
| 19515 | Michael Montemurro | 11.3..4 | 23.80 | [WFA-R] This sentence is unclear. A comma is needed. | As in comment | Revised -  We assume the location of the comments is 378.20  TGbe editor to make the changes shown in 11-23/1383r3 under all headings that include CID 19515 |

**Discussion:**

*TGbe editor: Change Clause 4.5.3.2 as follows (track change on):*

* + - 1. **Mobility types**

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

The three transition types of significance to this standard that describe the mobility of non-GLK STAs or MLDs within a network are as follows:

* + - * 1. ***No-transition:*** In this type, two subclasses that are usually indistinguishable are identified:

Static—no motion.

Local movement—movement within the PHY range of the communicating STAs, i.e., movement within a basic service area (BSA).

* + - * 1. ***BSS-transition:*** This type is defined for a STA or an MLD as follows:

1. (non-MLO to non-MLO): (#19066) ~~a~~A STA movement from one BSS in one ESS to another BSS within the same ESS.
2. (MLO to MLO): (#19066)A non-AP MLD movement from one AP MLD in one ESS, where each non-AP STA affiliated with the non-AP MLD is within one BSS and different non-AP STAs affiliated with the non-AP MLD are within different BSSs, to another AP MLD within the same ESS, where each non-AP STA affiliated with the non-AP MLD is within another BSS and different non-AP STAs affili- ated with the non-AP MLD are within different BSSs.
3. (MLO to non-MLO): (#19066)A non-AP MLD movement from one AP MLD in one ESS, where each non-AP STA affiliated with the non-AP MLD is within one BSS and different non-AP STAs affiliated with the non-AP MLD are within different BSSs, to another BSS within the same ESS and becoming a non-AP STA, where the MLD MAC address of the non-AP MLD is the same as the MAC address of the non-AP STA.
4. (non-MLO to MLO): (#19066)A non-AP STA movement from one BSS in one ESS to an AP MLD within the same ESS and becoming a non-AP MLD, where each non-AP STA affiliated with the non-AP MLD is within another BSS, different non-AP STAs affiliated with the non-AP MLD are within different BSSs and the MAC address of the non-AP STA is the same as the MLD MAC address of the non-AP MLD.

A fast BSS transition is a BSS transition that establishes the state necessary for data connectivity before the reassociation rather than after the reassociation.

* + - * 1. ***ESS-transition:*** This type is defined as STA movement from a BSS in one ESS to a BSS in a different ESS. This case is supported only in the sense that the STA might move. Maintenance of upper-layer connections cannot be guaranteed by IEEE Std 802.11; in fact, disruption of service is likely to occur.

***Move the following third paragraph as the first paragraph of this subclause:***

The different association services support the different categories of non-GLK mobility.

*TGbe editor: Change Clause 4.5.3.3 as follows (track change on):*

* + - 1. **Association**

## Change the first three paragraphs as follows:

To deliver an MSDU within an ESS via the DS, the DS needs to know which AP or AP MLD within the ESS to deliver the MSDU, so that the MSDU might ultimately be delivered to the addressed IEEE 802.11 non- AP STA or non-AP MLD. This information is provided to the DS by the concept of association. Association is necessary, but not sufficient, to support BSS-transition mobility. Association is sufficient to support no- transition mobility. Association is one of the services in the DSS.

Before a non-AP STA is allowed to ~~send~~deliver an MSDU via an AP, it first becomes associated with the AP. Before a non-AP MLD is allowed to deliver an MSDU via an AP MLD, it first becomes associated with the AP MLD.(#19499)

For a non-GLK STA that is not affiliated with an MLD, the act of becoming associated with an AP invokes the association service, which provides the STA to AP mapping to the DS. For a non-AP MLD, the act of becoming associated with an AP MLD invokes the association service (see 11.3 (STA authenticationAuthentication and association)), which provides the non-AP MLD to AP MLD mapping to the DS. How the information provided by the association service is stored and managed within the DS is not specified by this standard.

## Change the fifth paragraph as follows:

Within a robust security network (RSN), association is handled differently. In an RSNA, the IEEE 802.1X Port determines when to allow data traffic across an IEEE 802.11 link between two STAs or one or more IEEE 802.11 link(s) between two MLDs. A single IEEE 802.1X Port maps to one association, and each association maps to an IEEE 802.1X Port. An IEEE 802.1X Port consists of an IEEE 802.1X Controlled Port and an IEEE 802.1X Uncontrolled Port. The IEEE 802.1X Controlled Port is blocked from passing general data traffic between two STAs or between two MLDs until an IEEE 802.1X authentication procedure completes successfully over the IEEE 802.1X Uncontrolled Port. Once the AKM completes successfully, data protection is enabled to prevent unauthorized access, and the IEEE 802.1X Controlled Port unblocks to allow protected data traffic. IEEE 802.1X Supplicants and Authenticators exchange protocol information via the IEEE 802.1X Uncontrolled Port. It is expected that most other protocol exchanges use the IEEE 802.1X Controlled Ports. However, a given protocol might need to bypass the authorization function and make use of the IEEE 802.1X Uncontrolled Port.

## Change the seventh, eighth, and ninth paragraphs as follows:

At any given instant, a non-AP STA is associated with no more than one AP, and a non-AP MLD is associated with no more than one AP MLD. This allows the DS to determine a unique answer to the questions, “Which AP is serving non-AP STA X?” and “Which AP MLD is serving non-AP MLD Y?” Once an association is completed between a non-AP STA and an AP, a non-AP STA can make full use of a DS (via the AP) to communicate. Similarly, once an association is completed between a non-AP MLD and an AP MLD, a non-AP MLD can make full use of a DS (via the AP MLD) to communicate. Association between a non-AP STA and an AP is always initiated by the non-AP STA, not the AP. Association between a non-AP MLD and an AP MLD is always initiated by the non-AP MLD, not the AP MLD.

An AP might be associated with many non-AP STAs at the same time. Similarly, an AP MLD might be associated with many non-AP MLDs at the same time.(#19499)

A non-AP STA learns what APs are present and what operational capabilities are available from each of those APs and then invokes the association service to establish an association with an AP. Similarly, a non-AP MLD learns what MLDs are present and what operational capabilities are available from each of those AP MLDs and APs affiliated with each AP MLD, and then invokes the association service to establish an association with an AP MLD.(#19499) A FILS STA is able to discover, authenticate and associate with the AP with a reduced number of frame transmissions. For details of how a STA learns about what APs are present, see 11.1.4 (Acquiring synchronization, scanning).

*TGbe editor: Change Clause 4.5.3.8 as follows (track change on): (#19130)*

* **Robust security network association (RSNA)**

The following features are defined for an RSNA:

* Authentication mechanisms for STAs or MLDs(#3203)
* Key management algorithms
* Cryptographic key establishment
* (#432)Cryptographic mechanisms, such as Counter Mode(#3112) with cipher-block chaining message authentication code protocol (CCMP) and Galois/Counter Mode(#3112) protocol (GCMP)
* Fast basic service set (BSS) transition (FT) mechanism
* Cryptographic encapsulation mechanisms for robust Management frames(#3203)

An RSNA might rely on components external to the IEEE 802.11 architecture.

The first component is an IEEE 802.1X port access entity (PAE). PAEs are present on all STAs or all MLDs in an RSNA and control the forwarding of data to and from the medium access control (MAC). An AP or an AP MLD always implements the Authenticator PAE and Extensible Authentication Protocol (EAP) Authenticator roles, and a non-AP STA or a non-AP MLD always implements the Supplicant PAE and EAP peer roles. In an IBSS or PBSS, each STA implements both the Authenticator PAE and Supplicant PAE roles and both EAP Authenticator and EAP peer roles.

A second component is the Authentication Server (AS). The AS authenticates the elements of the RSNA itself, i.e., the STAs or MLDs provide material that the RSNA elements use to authenticate each other. The AS communicates through the IEEE 802.1X Authenticator with the IEEE 802.1X Supplicant on each STA or on each MLD, enabling the STA or the MLD to be authenticated to the AS and vice versa. An RSNA depends upon the use of an EAP method that supports mutual authentication of the AS and the STA or mutual authentication of the AS and the MLD, such as those that meet the requirements in IETF RFC 4017. In certain applications, the AS might be integrated into the same physical device as the AP or the AP MLD, or into a STA in an IBSS or PBSS.

In some applications, there is no need for a PAE or AS, and a STA and AP, or a non-AP MLD and AP MLD, or two IBSS STAs, or two mesh STAs in an MBSS, might authenticate each other using a password.

An RSNA using fast BSS transition relies on an external protocol to distribute keys between the pairwise master key (PMK) R0 key holder (R0KH) and PMK-R1 key holder (R1KH) Authenticator components. The requirements for this protocol are described in 13.2.2 (Authenticator key holders).

*TGbe editor: Change Clause 10.3.2.14.2 as follows (track change on):*

**10.3.2.14.2 Transmitter requirements**

(…existing texts…)

***Change the existing rows SNS2 and SNS4, insert four new rows, and a new footnote after TR3 to*** [***Table 10-5 (Transmitter sequence number spaces)***](#bookmark5)***:***.

**Table 10-5—Transmitter sequence number spaces**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sequence number space identifier** | **Sequence number space** | **Applies to** | **Status** | **Multiplicity** | **Transmitter requirements** |
| … |  |  |  |  |  |
| SNS2 | Individually addressed QoS Data | A STA transmitting an indi- vidually addressed QoS Data frame, excluding SNS5 and SNS9 | Mandatory | Indexed by  <Address 1, TID> |  |
| … |  |  |  |  |  |

**Table 10-5—Transmitter sequence number spaces *(continued)***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sequence number space identifier** | **Sequence number space** | **Applies to** | **Status** | **Multiplicity** | **Transmitter requirements** |
| SNS4 | QMF | A QMF STA transmitting a QMF excluding SNS12 | Mandatory | Indexed by  <Address 1, TID> | TR2 |
| … |  |  |  |  |  |
| SNS9 | Individually addressed QoS Data | An MLD transmitting through any STA affiliated with the MLD an individually addressed QoS Data frame that is not a QoS(+) Null frame to a STA affiliated with another MLD. | Mandatory | Indexed by  <MLD MAC  Address that the STA iden- tified by Address 1 is affiliated with, TID> per MLD |  |
| SNS10 | Individually addressed Management frame (except the frames that are excluded in 35.3.14  (Multi-link device indi- vidually addressed Management frame deliv- ery)) | If either an MLD1 or an MLD2 is a non-QMF MLD, the MLD1 transmitting through any STA affiliated with the MLD1 an individu- ally addressed Management frame (except the frames that are excluded in 35.3.14 (Multi-link device individu- ally addressed Management frame delivery)) to a STA affiliated with another MLD2. | Mandatory | Indexed by  <MLD MAC  Address that the STA iden- tified by Address 1 is affiliated with> per MLD |  |
| SNS11 | Group addressed data | An AP MLD transmitting through any AP affiliated with the AP MLD a group addressed Data frame | Mandatory | Single instance per AP MLD |  |
| SNS12 | IQMF (except the frames that are excluded in 35.3.14  (Multi-link device indi- vidually addressed Management frame deliv- ery)) | An QMF MLD transmitting through any STA affiliated with the MLD an IQMF (except the frames that are excluded in 35.3.14 (Multi- link device individually addressed Management frame delivery)) to a STA affiliated with another QMF MLD. | Mandatory | Indexed by  <MLD MAC  Address that the STA iden- tified by Address 1 is affiliated with, AC> per MLD | TR4 |
| TR1: …  …  TR4: The MLD shall assign the sequence number from one modulo 1024 counter per <MLD MAC Address that the STA identified by Address 1 is affiliated with, AC> tuple starting at 0 and incrementing by 1 for each MMPDU car- ried in one or more IQMFs (except the frames that are excluded in 35.3.14 (Multilink device individually addressed Management frame delivery))(#19063) with Address 1 and ACI fields matching the <MLD MAC Address that the STA identi- fied by Address 1 is affiliated with, AC> tuple values corresponding to that counter. | | | | | |

(…existing texts…)

*TGbe editor: Change Clause 10.3.2.14.3 as follows (track change on):*

**10.3.2.14.3 Receiver requirements**

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

A STA or(#19224) an MLD maintains one or more duplicate detection caches. [Table 10-6 (Receiver caches)](#bookmark6) defines the conditions under which a duplication detection cache is supported and the rules followed by the receiver for the cache. When a Data, Management or Extension frame is received, a record of that frame is inserted in an appropriate cache. That record is identified by a sequence number and possibly other information from the MAC control fields of the frame. When a Data, Management or Extension frame is received in which the Retry subfield of the Frame Control field is equal to 1, the appropriate cache, if any, is searched for a matching frame. In DMG, when a group addressed frame is received the appropriate cache is searched for a matching frame. When a PV1 Data frame or PV1 Management frame is received, the appropriate cache, if any, is searched for a matching frame, despite the absence of a Retry subfield in the Frame Control field. If the search is suc- cessful, the frame is considered to be a duplicate. Duplicate frames are discarded.

***Change the fourth paragraph as follows:***

A receiving STA shall implement the applicable receiver requirements defined in [Table 10-6 (Receiver](#bookmark6) [caches)](#bookmark6) with the Status indicated as Mandatory. An MLD shall implement the applicable receiver require- ments defined in [Table 10-6 (Receiver caches](#bookmark6)) with the Status indicated as Mandatory. All STAs affiliated with an MLD shall use RC14 in [Table 10-6 (Receiver caches)](#bookmark6), where the duplicate detection cache is main- tained by the MLD, to assist the MLD in discarding duplicate individually addressed QoS Data frames belonging to a TID without BA negotiation that are transmitted from the STAs affiliated with another MLD. If either an MLD1 or an MLD2 is a non-QMF MLD, all STAs affiliated with the MLD1 shall use RC15 in [Table 10-6 (Receiver caches)](#bookmark6), where the duplicate detection cache is maintained by the MLD1(#19062), to assist the MLD1 in discarding duplicate individually addressed Management frame (except the frames that are excluded in 35.3.14 (Multi-link device individually addressed Management frame delivery)) that are trans- mitted from the STAs affiliated with another MLD2. All STAs affiliated with an QMF MLD shall use RC17 in [Table 10-6 (Receiver caches)](#bookmark6), where the duplicate detection cache is maintained by the QMF MLD, to assist the QMF MLD in discarding duplicate IQMF (except the frames that are excluded in 35.3.14 (Multi- link device individually addressed Management frame delivery)) that are transmitted from the STAs affili- ated with another QMF MLD. An MLD shall implement RC16 in [Table 10-6 (Receiver caches](#bookmark6)) maintained by the MLD to discard duplicate group addressed Data that are delivered from the associated MLD. A dupli- cated group addressed Data frame received on any link shall be discarded. The method used to handle the sequence number wrap around for duplicate detection is implementation specific. A receiving STA should implement the applicable receiver requirements defined in [Table 10-6 (Receiver caches)](#bookmark6) with the Status indicated as Recommended. A receiving STA and a receiving MLD may implement the applicable receiver requirements defined in [Table 10-6 (Receiver caches)](#bookmark6) with Status indicated as Optional. Applicability is defined by the Applies to column. The Status column indicates the level of support that is required if the Applies to column matches the received frame. The Multiplicity / Cache size column indicates the ~~index-~~ ~~es~~indicesthat identify a cache entry and the number of entries that shall be supported. The Receiver require- ments column identifies requirements for the operation of this cache. The referenced requirements are defined at the end of the table. The requirements relate to caching information that identifies a cache entry and discarding duplicate MPDUs.

(…existing texts…)

*TGbe editor: Change Clause 11.1.4.3.9 as follows (track change on):*

**11.1.4.3.9 Contents of a probe response**

***Change the second paragraph as follows:***

A FILS STA 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 to the broadcast address if the STA that generated the probe request indicated FILS Capability. A non-FILS STA that transmits a Probe Response frame shall set the Address 1 field to the address of the STA that generated the probe request except that a non-FILS EHT AP affiliated with an AP MLD may respond with a multi-link probe response with the Address 1 field of the Probe Response frame set to the broadcast address (see 35.3.4.2 (Use of multi-link probe request and response)).(#19003)

*TGbe editor: Change Clause 11.2.3.15.3 as follows (track change on):*

* + - * 1. **WNM sleep mode AP operation**

***Change the last paragraph, include splitting it into two paragraphs, as follows:***

For non-MLO, with RSN and a valid PTK is configured for the STA:

If ~~RSN is used with~~ management frame protection ~~and a valid PTK is configured~~ is negotiated for the STA, the current GTK, IGTK, and BIGTK shall be included in the WNM Sleep Mode Response frame. (#19052)

(#19052)

If ~~RSN is used without~~ management frame protection ~~and a valid PTK is configured~~is not negotiated for the STA, the current GTK shall be sent to the STA using a group key handshake (see 12.7.7 (Group key handshake) immediately following the WNM Sleep Mode Response frame. If a GTK

update is in progress, the pending GTK shall be sent to the STA using another group key handshake immediately after the current GTK has been sent.

For MLO, with RSN and a valid PTK is configured for the non-AP MLD:

If management frame protection is negotiated for the MLDs, the current GTK, IGTK when management frame protection is negotiated, and BIGTK when beacon protection is negotiated for each setup link shall be included in the WNM Sleep Mode Response frame using the WNM Sleep Mode MLO GTK/IGTK/BIGTK subelement (see 9.6.13.20 (WNM Sleep Mode Response frame format)).(#19050) using the WNM Sleep Mode MLO GTK/IGTK/BIGTK subelement (see 9.6.13.20 (WNM Sleep Mode Response frame format))(#19050)(#19054)

(#19054)

If management frame protection is not negotiated for the MLDs, the current GTK for each setup link shall be sent to the non-AP MLD using a group key handshake (see 12.7.7 (Group key handshake)) immediately following the WNM Sleep Mode Response frame. If a GTK update is in progress for a setup link, the pending GTK for the setup link shall be sent to the STA using another group key handshake immediately after the current GTK of the setup link has been sent.(#19053)

*TGbe editor: Change Clause 11.3.4 as follows (track change on):*

* + 1. **Frame filtering based on STA or MLD state**

(…existing texts…)

***Insert the following paragraph and NOTE after the now-shifted tenth paragraph (“A STA shall not transmit Class 3...”):***

A STA affiliated with an MLD shall not transmit Class 3 frames unless the MLD is in State 3 or State 4.

NOTE 2—Frame(#19229) transmissions on a link between an AP MLD and a non-AP MLD associated with the AP MLD is subject to additional constraints (see 35.3.7 (Link management)).

*TGbe editor: Change Clause 11.3.6.2 as follows (track change on):*

* + - 1. **Non-AP STA, non-AP MLD, and non-PCP STA association initiation procedures**

***Insert the following paragraph after the first paragraph (“The SME shall delete...”):***

The SME shall delete any PTKSA, GTKSA, IGTKSA, BIGTKSA and temporal keys held for communication with the AP MLD by using MLME-DELETEKEYS.request primitive (see 12.6.16 (RSNA security association termination)) before invoking MLME-ASSOCIATE.request primitive.

***Insert the following two paragraphs after the now-shifted fifth paragraph (“Upon receipt of an MLME-ASSOCIATE.request primitive that is ...”):***

For a non-AP MLD associated with an AP MLD, a non-AP STA affiliated with the non-AP MLD shall not send an Association Request frame without Basic Multi-Link element.

NOTE 1—A non-AP MLD can disassociate from the associated AP MLD to allow a non-AP STA that was affiliated with the non-AP MLD to send an Association Request frame without a Basic Multi-Link element to perform association with an AP.

***Change the now-shifted eighth paragraph as follows:***

Upon receipt of an MLME-ASSOCIATE.request primitive, a non-AP STA, non-AP MLD, and non-PCP STA shall associate with an AP, AP MLD, or PCP, respectively, using the following procedure:

* + - * 1. If the state for the AP, AP MLD, or PCP is State 1, the MLME shall inform the SME of the failure of the association by issuing an MLME-ASSOCIATE.confirm primitive, and this procedure ends.
        2. All the states, agreements and allocations listed in both numbered lists in [11.3.6.4 (Non-AP STA,](#bookmark5) [non-AP MLD, and non-PCP STA reassociation initiation procedures)](#bookmark5) item c) are deleted or reset to initial values.
        3. The ~~MLME~~non-AP STA shall transmit an Association Request frame to the AP or PCP,(#19514) or a non-AP STA affiliated with the non-AP MLD shall transmit an Association Request frame with Basic Multi- Link element to an AP affiliated with the AP MLD. The non-AP STA affiliated with a non-AP MLD may initiate the transmission of the Association Request frame on the recommended link included in the MLME-ASSOCIATE.request primitive, unless specified otherwise. The RSNE contained in the MLME-ASSOCIATE.request primitive shall be included in the Association Request frame. The RSNE shall specify exactly one pairwise cipher suite and exactly one AKM suite. If the MLME- ASSOCIATE.request primitive contained the EmergencyServices parameter equal to true, an Interworking element with the UESA field set to 1 shall be included in the Association Request frame.

(…existing texts…)

*TGbe editor: Change Clause 11.3.6.2 as follows (track change on):*

* + - 1. **Non-AP STA, non-AP MLD, and non-PCP STA reassociation initiation procedures**

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

Except when the association is part of a fast BSS transition, the SME shall delete any PTKSA, GTKSA, IGTKSA, BIGTKSA, WIGTKSA, WTKSA, and TPKSA (including temporal keys) held for communication with the AP, AP MLD, or PCP by using the MLME-DELETEKEYS.request primitive (see 12.6.16 (RSNA security association termination)) before invoking an MLME-REASSOCIATE.request primitive.

***Insert the following paragraph after the fourth paragraph (“Upon receipt of an MLME- REASSOCIATE.request primitive that is...”):***

For a non-AP MLD associated with an AP MLD, a non-AP STA that is affiliated with the non-AP MLD and has MAC address not equal to the MLD MAC address of the non-AP MLD shall not send a Reassociation Request frame without Basic Multi-Link element to any AP affiliated with that AP MLD.

***Change the now-shifted sixth paragraph as follows:***

Upon receipt of an MLME-REASSOCIATE.request primitive, a non-AP STA, non-AP MLD, and non-PCP STA shall reassociate with an AP, AP MLD, or PCP, respectively, using the following procedure:

* + - * 1. If the STA (with respect to the AP or PCP) or non-AP MLD (with respect to the AP MLD) is not associated in the same ESS or the state for the new AP, AP MLD, or PCP is State 1, the MLME shall inform the SME of the failure of the reassociation by issuing an MLME-REASSOCIATE.confirm primitive, and this procedure ends.
        2. The ~~MLME~~non-AP STA shall transmit a Reassociation Request frame to the new AP or PCP,(#19515) or a non-AP STA affiliated with the non-AP MLD shall transmit a Reassociation Request frame with Basic Multi-Link element in the Reassociation Request frame to an AP affiliated with the new AP MLD. The non-AP STA affiliated with a non-AP MLD may initiate the transmission of the Reassociation Request frame on the recommended link included in the MLME- REASSOCIATE.request primitive, unless specified otherwise. The RSNE contained in the MLME- ASSOCIATE.request primitive shall be included in the Reassociation Request frame. The RSNE shall specify exactly one pairwise cipher suite and exactly one AKM suite. If the MLME- REASSOCIATE.request primitive contained the EmergencyServices parameter equal to true, an Interworking element with the UESA field set to 1 shall be included in the Reassociation Request frame.

(…existing texts…)

------------resolution for 19589 only relevant paragraphs are shown below----------------------

*TGbe editor: Change Clause 35.3.4.6 as follows (track change on):*

**35.3.4.6 Frame exchange sequences during MLO discovery and ML setup**

Figure 35-6 (Possible frame exchange sequences during MLO discovery and ML setup when the AP operating on the channel corresponds to a nontransmitted BSSID) shows possible frame exchange sequences that are performed, during MLO discovery and ML setup, between a non-AP(#19589) STA affiliated with a non-AP MLD and an AP affiliated with an AP MLD, that corresponds to a nontransmitted BSSID in a multiple BSSID set.

*TGbe editor: Change Clause 35.3.16.5.2 as follows (track change on):*

**35.3.16.5.2 End time alignment of response PPDUs using SRS Control field**

A non-AP STA affiliated with a non-AP MLD operating on a pair of NSTR links for that MLD shall not transmit a PPDU carrying an MPDU with SRS Control subfield to an AP unless a non-AP STA affiliated with the non-AP MLD has received from the AP MLD a Basic Multi-Link element with the SRS Support subfield equal to 1. A non-AP(#19589) STA affiliated with a non-AP MLD shall not transmit a TB PPDU carrying an MPDU with SRS Control subfield.

An AP affiliated with an AP MLD shall not transmit a PPDU carrying an MPDU with SRS Control subfield to a non-AP(#19589) STA affiliated with a non-AP MLD.

*TGbe editor: Change Clause AF.10 as follows (track change on):*

**AF.10 Examples of frame exchanges for TDLS discovery and setup involving a non-AP MLD**

Figure AF-39 (TDLS direct link involving a non-AP(#19589) STA affiliated with a non-AP MLD and a non-AP STA that is not affiliated with a non-AP MLD) and Figure AF-40 (TDLS direct link involving non-AP STAs affiliated with different non-AP MLDs) provide examples of a single link TDLS direct link where at least one of the peer STAs is a TDLS non-AP STA affiliated with a non-AP MLD. The TA field of Data frames transmitted by the TDLS STA that is affiliated with an MLD over the direct link is set to its non-AP MLD’s MAC address.

**Figure AF-39—TDLS direct link involving a non-AP(#19589) STA affiliated with a non-AP MLD and a non-AP STA that is not affiliated with a non-AP MLD**