### IEEE P802.11 Wireless LANs

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| 11be D0.3 CR for 4.5.3 | | | | |
| Date: 2021-04-19 | | | | |
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Abstract

This submission proposes resolutions for the following CIDs:

1000, 1109, 1441, 1720, 1762, 1825, 2091, 2118, 2235, 2236, 3413, 2238, 2263, 2900, 3006, 3348, 3415, 2556, 3414,

Revisions:

* Rev 0: Initial version of the document.

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 D0.3 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGbe D0.3 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.***

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| **CID** | **Commenter** | **Clause** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 1000 | Abhishek Patil | 4.5.3.1 | 31.56 | There are several instances in clause 4 that need updating the 'MLD' reference to 'non-AP' MLD [P31L56, P32L43, P33L41, etc]. | Updated the cited references + others to explicitly say 'non-AP MLD' - see P33L16 as an example | Revised –  When the context is with an AP MLD, we mention non-AP MLD explicitly. As a result, we just change P32L43.  For general description like the following, AP MLD needs to be associated as well, so we can not just change thd description to non-AP MLD.  *Association is sufficient for no-transition MSDU delivery between IEEE 802.11 STAs or MLDs.*  TGbe editor to make the changes shown in 11-21/0700r0 under all headings that include CID 1000. |
| 1109 | Alfred Asterjadhi | 4.5.3.3 | 32.41 | Instead of adding MLD in every occurrence of STA in these subclauses I think it is simpler to add a sentence in the beginning of the main subclause that in the case of MLO the STA refers to the MLD. Same consideration for reassoc, and deassoc. | As in comment. | Rejected –  We note that we specifically update the texts that is allowed by 11be at this point. For example, we do not have GLK enabled for MLD, so we can not just push STA to MLD. As a second example, MLD does not fit in the definition of a BSS.  Due to these reasons, we keep with the current description of only updating the ones that is enabled for MLD. |
| 1441 | Chunyu Hu | 4.5.3.2 | 32.16 | The newly added item d) is an extension from STA to MLD of case b). But a similar extension is missing for c). | Add an item to extend case b) | Rejected –  Although “ESS-transition” is defined in the current spec, there is no protocol defined for ESS-transition. As a result, we do not define that specific concept for MLD.  *c)* ***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.* |
| 1720 | Hanseul Hong | 4.5.3.3 | 33.16 | According to the text, one STA cannot be associated with more than one APs. One non-AP MLD cannot be asssociated with more than one AP MLDs. However, it is not clear if the each STA affiliated with non-AP MLD can be associated with the same AP. | Two options: 1) add clear statement that each STA in non-AP MLD cannot be associated with same AP 2) Enable the case | Rejected –  We already have the following sentence in 35.3.5.  *For each setup link, the corresponding non-AP STA affiliated with the non-AP MLD is in the same associated state as the non-AP MLD and is associated with the corresponding AP affiliated with the AP MLD, without providing the corresponding non-AP STA to the corresponding AP mapping to the DS, and enables the functionalities between a non-AP STA and its associated AP unless the functionalities have been extended to MLD level and specified otherwise.* |
| 1762 | Ilya Levitsky | 4.5.3.4 | 33.47 | Can reassociation include a movement for non-AP MLD that changes the association configuration of its affiliated STAs with APs of a same AP MLD? | Include in reassociation a movement for non-AP MLD that changes the association configuration of its affiliated STAs with APs of a same AP MLD? | Revised –  We note that although the descrition says from one to another. The baseline texts already allows reassition to the same AP. See 11.3.5.4. For MLD, we update with similar texts, so the case is also allowed. See 11.3.5.4.  We rewrite the texts to clarify this.  TGbe editor to make the changes shown in 11-21/0700r0 under all headings that include CID 1762. |
| 1825 | Jarkko Kneckt | 4.5.3 | 31.44 | The MLD Reconfiguration service should be described in the connectivity related services. The reconfiguration may add or delete links and non-AP MLD may change the link specific parameters of the affiliated STA. | Please add a clause to describe the MLD Reconfiguration service. | Revised –  We note that reassociation already allows reconfiguration.  We rewrite the texts to clarify this.  TGbe editor to make the changes shown in 11-21/0700r0 under all headings that include CID 1762. |
| 2091 | kaiying Lu | 4.5.3.4 | 33.53 | Add reference at the end of the sentence (see 35.3.5.1 (Multi-link (re)setup procedure)). | as in comment | Revised –  Agree in principle with the commenter.  TGbe editor to make the changes shown in 11-21/0700r0 under all headings that include CID 2091. |
| 2118 | Laurent Cariou | 4.5.3.3 | 0.00 | it is a STA of an MLD that sends MSDU not an MLD, unless we harmonize such writing throughout the spec | as in comment | Revised –  In the baseline, “deliver” is used to describe the exchange of data between two end points from the DS perspective.  We change “send” to “deliver” since the context is again about the exchange between two end points in DS rather than the over-the-air transmission/send operation.  *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 STA or non-AP MLD.*  TGbe editor to make the changes shown in 11-21/0700r0 under all headings that include CID 2118. |
| 2235 | Mark Hamilton | 4.5.3.2 | 32.16 | Cart before the horse: the purpose of clause 4.5.3.2 is to introduce concepts and build up to the concepts of association or reassociation which are introduced next. The mobility concepts here (in 4.5.3.2) are to help describe and understand what association and reassocation mean. To use the terms associated and reassociated within this subclause both defeats the purpose, and creates a logical circularity in this introduction of these basic concepts. | Options: 1) Make changes along the lines proposed in another comment to remove the "affiliated station" concept in the concept of MLD, in which case these changes can just be removed as unnecessary; or 2) Reword these additions to use only the concept of "movement from one BSS to another BSS", and clarify the concept of "becoming" (in some cases) either an MLD or STA/AP. | Revised –  We note that association has been used in the subclase like the following.  ***BSS-transition:*** *This type is defined as a STA movement from one BSS in one ESS to another BSS within the same ESS. A fast BSS transition is a BSS transition that establishes the state necessary for data connectivity before the reassociation rather than after the reassociation.*  *The different association services support the different categories of mobility.*  We move the following to be the first paragraph of the subclause to help with the flow.  *The different association services support the different categories of mobility.*  TGbe editor to make the changes shown in 11-21/0700r0 under all headings that include CID 2235. |
| 2236 | Mark Hamilton | 4.5.3.2 | 32.20 | How does a non-AP MLD "become" a non-AP STA (and vice-versa)? Is this transition specified anywhere? Is this a new instantiation (presumably not, since this is trying to talk about reassociation)? So what is it? What changes? What doesn't change? | This transition to/from MLD-ness needs to be explained and detailed. | Revised –  We revise to clarify that the key is to have MAC address of the non-AP STA the same as the MAC address of the non-AP MLD.  TGbe editor to make the changes shown in 11-21/0700r0 under all headings that include CID 2236. |
| 3413 | Yonggang Fang | 4.5.3.2 | 32.20 | For "A non-AP MLD movement from being associated with one AP MLD in one ESS to become a non-AP STA that is reassociated with an AP within the same ESS", does (a) a STA of the non-AP MLD associate with an AP, or (b) the non-AP MLD associate with the AP? If it is (a), which STA of non-AP MLD will associate with the AP? |  | Revised –  It is (a) for the case of moving from an AP MLD to a legacy AP or moving from a legacy AP to an AP MLD  We revise to clarify that the key is to have MAC address of the non-AP STA the same as the MAC address of the non-AP MLD.  TGbe editor to make the changes shown in 11-21/0700r0 under all headings that include CID 2236. |
| 2238 | Mark Hamilton | 4.5.3.3 | 32.52 | The introduction and lack of defintion or description for the terms "STA association" and "MLD association" are confusing. From the words near the first (introductory) use of both of these terms, it seems they are synonyms for invoking the association service. So, how are they different from each other? New text in 11.3.1 mentions "referring to MLD authentication, MLD deauthentication, ...", but these terms are rarely used (including almost never in 11.3, which is what the paragraph at P87.51 is supposed to have as its scope!) and never defined. | The new terms/concepts of "STA association" and "MLD association" need to be defined and described clearly, somewhere, preferrably in a way that fits with the flow of building up concepts in 4.5. | Revised –  Agree in principle with the commenter.  TGbe editor to make the changes shown in 11-21/0700r0 under all headings that include CID 2238. |
| 2263 | Michael Montemurro | 4.5.3.3 | 32.32 | The 802.1X port applies to the AP MLD and non-AP MLD. | change: "(STA association) or multiple IEEE 802.11 links (MLD association)" to "(STA association or MLD association)" | Revised –  We simply revise as the following.  “In an RSNA, the IEEE 802.1X Port determines when to allow data traffic across an IEEE 802.11 link between two STAs or multiple IEEE 802.11 links between two MLDs.”  TGbe editor to make the changes shown in 11-21/0700r0 under all headings that include CID 2263. |
| 2900 | Stephen McCann | 4.5.3.3 | 33.28 | This does not appear to be correct. A non-AP MLD associates with an AP MLD, not an AP affiliated with an AP MLD. | Change the complete sentence to read "A STA or a non-AP MLD learns what APs or AP MLDs, respectively, are present and what operational capabilities are available from each of those APs or AP MLDs, respectively, and then invokes the association service to establish an STA or an MLD association, respectively." | Revised –  There are both capabilities of AP MLD and capabilities of APs affiliated with an AP MLD.  We revise toward this direction to clarify.  TGbe editor to make the changes shown in 11-21/0700r0 under all headings that include CID 2900. |
| 3006 | Xiaofei Wang | 4.5.3.3 | 33.15 | This paragraph is problematic since all STAs affliated with an AP MLD is an AP, and all STAs affliated with a non-AP MLD are non-AP STAs. Though I understand the intentions, but having the descriptions mashed up together for both STA or non-AP MLD and AP and AP MLD cause confusion. It may be better and clearer to separate the descriptions into two paragraphs, or change the definition of MLDs. | rewrite this paragraph into two paragraphs with separate cases and clearly define the conditions for each or change the definitions of MLDs. | Revised –  Ok to rewrite to two paragraphs for clarify.  TGbe editor to make the changes shown in 11-21/0700r0 under all headings that include CID 3006. |
| 3348 | Zhiqiang Han | 4.5.3.2 | 32.16 | There is another case: Intra-MLD transition. For example, A non-AP MLD has two affiliated STAs(STA1 and STA2), AP MLD has three affiliated APs(AP1, AP2 and AP3). STA1 is associated with AP1, STA2 is associated with AP2. Nomatter any reason, such as load balance, STA2 wants to be associated with AP3. | Add a new transition: Intra-MLD transition | Rejected –  This is already covered by reassociation to the same AP MLD. |
| 3415 | Yonggang Fang | 4.5.3.4 | 33.54 | For a MLD association, it is is in MLD level. Need to clarify how "a current MLD association of a non-AP MLD with an AP MLD to a STA association of a non-AP STA with an AP" ? |  | Revised –  This is for the case to move from a AP MLD to a legacy AP or move from a legacy AP to an AP MLD. The key is that the MAC address of the non-AP STA and the MLD MAC address of the non-AP MLD are the same.  TGbe editor to make the changes shown in 11-21/0700r0 under all headings that include CID 3415. |
| 2556 | Robert Stacey | 4.5.3.2 | 32.16 | The purpose of ML-transition and the distiction between BSS transition and ML transition or ESS transition and ML transition is not clear. The mechanics of these transitions are different but the network level result is the same. Also, it is not clear there is anything different in ESS-transition from full-on association. | Remove item d). If necessary, add to the description of BSS-transition and ESS-transition to describe the mechanics of MLD movement. To me, this type of meovement is similar to fast transition vs legacy transition; it just the handshake that changes. | Rejected –  The BSS transision has BSS concept, which requires synchronization of all STAs that does not work for MLD. The ESS transition is a concept that is not defined for MLD.  ML transision is used to describe the transision involving the new entity MLD defined for 11be. |
| 3414 | Yonggang Fang | 4.5.3.3 | 0.00 | As this paragraph mentions ML-transition, it should describe the association for the case of ML-transition ( d)-2) of 4.5.3.2 ), i.e. non-AP MLD associates with an AP. Or remove ML-transition from that sentence. | as suggested in comment. | Rejected –  Here, it just means that association is not sufficient to support the MLD transition. As a result, we only need to mention STA association and MLD association and do not need to elaborate all the cases. Detailed cases are described in 45.3.4 Reassocaition. Also, there is no non-AP MLD associates with an AP. Non-AP MLD associates with an AP MLD.  *Association is necessary, but not sufficient, to support BSS/ML-transition mobility. Association is sufficient to support no-transition mobility. Association is one of the services in the DSS.* |

**Discussion:** *None.*

**Propose:**

*TGbe editor: Change 4.5.3* *as follows (track change on):*

* Overview of the services
* Connectivity-related services
* General

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

The primary purpose of a MAC sublayer is to transfer MSDUs between MAC sublayer entities. The information required for the distribution system service to operate is provided by the association services. Before an MSDU can be handled by the distribution system service a STA or an MLD is “associated.”

* Mobility types

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

The three transition types of significance to this standard that describe the mobility of STAs within a net-work are as follows:

* ***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).
* ***BSS-transition:*** This type is defined as a STA movement from one BSS in one ESS to another BSS within the same ESS. A fast BSS transition is a BSS transition that establishes the state necessary for data connectivity before the reassociation rather than after the reassociation.
* ***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.
* ***ML-transition:*** This type is defined as described below.
* A non-AP MLD movement from being associated with one AP MLD in one ESS to be reassociated with another AP MLD within the same ESS.
* A non-AP MLD movement from being associated with one AP MLD in one ESS to be a non-AP STA that is reassociated with an AP within the same ESS, where the MLD MAC address of the non-AP MLD is the same as the MAC address of the non-AP STA.(#2236)
* A non-AP STA movement from being associated with one AP in one ESS to be a non-AP MLD that is reassociated with an AP MLD with the same ESS, where the MAC address of the non-AP STA is the same as the MLD MAC address of the non-AP MLD.(#2236)

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

***Insert the following paragraph after the second paragraph (“The FT protocol provides ...”):***

The over-the-air FT protocol also provides a mechanism for a non-AP MLD to perform a ML transition in a robust security network (RSN).

***Move the following third paragraph as the first paragraph of the subclause: (#2235)***

The different association services support the different categories of mobility.(#2235)

* 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 STA or non-AP MLD.(#1000) This information is provided to the DS by the concept of association. Association is nec-essary, but not sufficient, to support BSS/ML-transition mobility. Association is sufficient to support no-tran-sition mobility. Association is one of the services in the DSS.

Before a STA or a non-AP MLD is allowed to deliver an MSDU via an AP or an AP MLD, respectively, it first becomes associated with the AP or the AP MLD, respectively. (#2118)

Association between two STAs is called STA association. Association between a non-AP MLD and an AP MLD is called MLD association.(#2238)

For a non-GLK STA that is not affiliated with an MLD, the act of becoming associated with an AP invokes the association service (STA association), 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 (MLD association), which provides the non-AP MLD to AP MLD mapping to the DS (see 35.3.5.1 (Multi-link (re)setup procedure)). How the information pro-vided 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 multiple IEEE 802.11 links between two MLDs.(#2263) 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 STAis 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 X?” Once an STA association is com-pleted, a non-AP STA can make full use of a DS (via the AP) to communicate. Similarly, once an MLD association is completed, a non-AP MLD can make full use of a DS (via the AP MLD) to communicate. STA ~~A~~association is always initiated by the non-AP STAnot the AP. MLD association is always initiated by the non-AP MLD not the AP MLD.(#3006)

An AP or an AP MLD might be associated with many STAs or non-AP MLDs, respectively, at the same time.

A STA or a non-AP MLD learns what APs or AP MLDs, respectively, are present and what operational capabilities are available from each of those APs or AP MLDs and APs affiliated with each AP MLD, respectively,(#2900) and then invokes the association service to establish a~~n~~ STA or an MLD association, respectively. 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).

* Reassociation

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

Association is sufficient for no-transition MSDU delivery between IEEE 802.11 STAs or MLDs. Additional functionality is needed to support BSS/ML-transition mobility. The additional required functionality is provided by the reassociation service. Reassociation is one of the services in the DSS.

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

The reassociation service (see 11.3.5 (Association, reassociation, and disassociation))(#2091) is invoked to “move”:

* a current STA association (see 4.5.3.3 (Association)) of a non-AP STA from one AP to the same AP or another AP~~.~~ (#1762)
* or a current MLD association (see 4.5.3.3 (Association))(#2091) of a non-AP MLD from one AP MLD to the same AP MLD or another AP MLD(#1762)
* or a current STA association of a non-AP STA with an AP to an MLD association of a non-AP MLD with an AP MLD, where the MAC address of the non-AP STA is the same as the MLD MAC address of the non-AP MLD.(#3415)
* or a current MLD association of a non-AP MLD with an AP MLD to a STA association of a non-AP STA with an AP(#2091), where the MLD MAC address of the non-AP MLD is the same as the MAC address of the non-AP STA. (#3415)

In an ESS with a DS, the reassociation service informs the DS of the current mapping between AP and STA or between AP MLD and non-AP MLD ~~as the STA moves from BSS to BSS within the ESS~~. For a general link in an IEEE 802.1Q network, the reassociation service informs higher layer services how the link is reconfigured, commonly, with which BSS the GLK non-AP STA is a member of. The higher layer services will then destroy, disable, or maintain the existing Internal Sublayer Service SAPs, create or enable new Internal Sublayer Service SAPs, inform the GLK convergence function of the reconfigured general link mapping of the Internal Sublayer Service SAPs, and inform the network routing protocol of the updated general link. The GLK AP and GLK non-AP STA each then establish or maintain a service\_access\_point\_identifier for the reconfigured general link, for their respective MS SAPs. Reassociation also enables changing association attributes of an established association while the non-AP STA or non-AP MLD remains associated with the same AP or the same AP MLD, respectively. Reassociation is always initiated by the non-AP STA or the non-AP MLD.

***Change the last paragraph as follows:***

Only the fast BSS/ML transition facility can move an RSNA during reassociation. Therefore, if FT is not used, the old RSNA is deleted and a new RSNA is constructed.

* Disassociation

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

For a non-GLK STA that is not affiliated with an MLD, the act of becoming disassociated invokes the disassociation service, which voids any existing STA to AP mapping known to the DS, for the disassociating STA. For a non-AP MLD, the act of becoming disassociated invokes the disassociation service, which voids any existing non-AP MLD to AP MLD mapping known to the DS, for the disassociating non-AP MLD (see 35.3.5.3 (Multi-link tear down procedure))

.

***Change the fourth, fifth, and sixth paragraphs as follows:***

The disassociation service can be invoked by either party in an STA association (non-AP STA or AP, see 4.5.3.3 (Association)) or a MLD association (non-AP MLD or AP MLD). Disassociation is a notification, not a request. Disassociation cannot be refused by the receiving STA or the receiving MLD except when management frame protection is negotiated and the message integrity check fails.

An AP or an AP MLD can disassociate STAs or non-AP MLDs, respectively, to enable the AP or the AP MLD to be removed from a network for service or for other reasons.

STAs or MLDs attempt to disassociate when they leave a network. However, the MAC protocol does not depend on STAs or MLDs invoking the disassociation service. (MAC management is designed to accommodate loss of communication with an associated STA or an associated MLD.)