IEEE P802.11  
Wireless LANs

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| 11be D2.0 CR for 13 part I | | | | |
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Abstract

This submission proposes resolutions for the following CIDs:

10680, 12105, 13502, 13503, 13504, 13505, 12106, 12110, 12107, 13508, 13509, 13510

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Uploaded by TGbe chair: Contains green tagged CIDs.
* Rev 2: Fix revision in resolution box

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 D2.0 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGbe D2.0 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.***

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| **CID** | **Commenter** | **Clause** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 10680 | Duncan Ho | 13.1 | 368.10 | "MLD" should be "non-AP MLD" since "STA" refers to a non-AP STA in this section | As in the comment | Accepted - |
| 12105 | Chaoming Luo | 13.1 | 368.12 | Change "or a STA or non-AP MLD transition to an AP MLD or a non-AP MLD transition to an AP" to " or non-AP MLD transitions between AP MLDs", since other cases are not supported by the procedures described in clause 13.4.2. Otherwise we should add descriptions of procedures in clause 13.4.2 for STA transitions between an AP and an AP MLD, and for non-AP MLD transitions between an AP and an AP MLD. | As commented | Rejected –  13.4.2 are just initial domain association.  Transitions are described in 13.5.2 where general term FTO and FTR are used to cover both cases. |
| 13502 | Amelia Andersdotter | 13.1 | 368.12 | There would be greater consistency between the first case in this sentence and later sentences if the list of situations where FT applies read: "only apply to STA transitions between APs, or to STA or non-AP MLD transitions to an AP MLD or to non-AP MLD transitions to an AP within the same mobility domain". Is it intentional that the case where a STA transitions between AP MLD is left out? | Change the text "only apply to STA transitions between AP, or a STA or non-AP MLD transition to an AP MLD or a non-AP MLD transition to an AP" to "only apply to STA transitions between APs, or to STA or non-AP MLD transitions to an AP MLD or to non-AP MLD transitions to an AP".  Possibly consider adding the case of STA transitions between AP MLD. | Revised –  We add “to” as suggested by the commenters.  “STA transitions between AP MLD” is not a valid case. If operating as a STA, due to say legacy, then there is no way to connect as MLD anyway. We also do not need to cover the case that STA connects with MLD for Wi-Fi 7. If using one link is the intention, then MLD allows operation with only one link  TGbe editor to make the changes shown in 11-22/1211r2 under all headings that include CID 13502 |
| 13503 | Amelia Andersdotter | 13.1 | 368.18 | The definitions of FTO and FTR could be shortened if "STA" and "non-AP MLD", and "AP" and "AP MLD" where listed together before the square brackets in the following way: "(or at later reassociation) between a STA or non-AP MLD [also known as FT Originator (FTO)] and AP or AP MLD [also known as FT Responder (FTR)]". With this wording the square brackets would only be repeated once for each term (FTO, FTR) in the paragraph. | Change "(or a later reassociation) between a STA [known as the FT Originator (FTO)] and AP [known as the FT Responder (FTR)] or between a non-AP MLD [known as the FT Originator (FTO)] and AP MLD [known as the FT Responder (FTR)]." to "(or at later reassociation) between a STA or non-AP MLD [also known as FT Originator (FTO)] and AP or AP MLD [also known as FT Responder (FTR)]." | Rejected –  Mixing the statement creates confusion on STA connects to AP MLD case, which can not be supported (for example, no way for legacy to do this).  For initial domain association procedure or for over-the-air procedure as an example, the procedure is always STA to AP or non-AP MLD to AP MLD.  If using one link is the intention, then MLD allows operation with only one link |
| 13504 | Amelia Andersdotter | 13.1 | 368.26 | On this line it says that the FT Protocol is executed when an FTO makes a transition to a target AP or to a target AP MLD, but the case where a STA (which can be an FTO) that is not a non-AP MLD transitions to a target AP MLD is not covered in the list of cases where FT applies on line 12, page 368, subclause 13.1 as per a another comment I made. I'm wondering again if the case where a STA transitions between AP MLD should actually be included in the list of cases where FT can be applied? | Add to the list of cases where FT protocols are used the case when a STA transitions between AP MLD. | Rejected –  We try to explain two points.  “STA transitions between AP MLD” is not a valid case.  Legacy STA can not understand MLD. Hence, there is no way to cover a STA connects to a MLD case. For legacy STA, they will just connect to one AP affiliated with the AP MLD in legacy way for this case. We also do not need to cover the case that STA connects with MLD for Wi-Fi 7. If using one link is the intention, then MLD allows operation with only one link  As for the following case about transition, Wi-Fi 7 STA can connects to Wi-Fi 6 AP and transitions to connects with Wi-Fi 7 AP MLD. For example, the over-the-air exchange will use MLD signaling. Hence, the following case is covered.  *a STA (which can be an FTO) that is not a non-AP MLD transitions to a target AP MLD is not covered in the list of cases* |
| 13505 | Amelia Andersdotter | 13.1 | 368.32 | It looks like the word "to" has been removed from "to a target AP" when it was probably intended that it remain. | Reinsert the word "to" so that the sentence reads "For an FTO to move to a target AP or target AP MLD" | Accepted - |
| 12106 | Chaoming Luo | 13.4.2 | 372.24 | According to clause 12.7.4, subscript n means the KDE could occur multiple times in the field for n links, so please change the description accordingly. | As commented | Revised –  Agree in principle with commenter. We revise the texts to align with 12.7.4.  TGbe editor to make the changes shown in 11-22/1211r2 under all headings that include CID 12106 |
| 12110 | Chaoming Luo | 13.7.1 | 376.51 | The subscript n means the subelement could occur multiple times in the FTE for n links, so please change the description accordingly. | As commented | Revised –  Agree in principle with commenter. We revise the texts to align with 12.7.4.  TGbe editor to make the changes shown in 11-22/1211r2 under all headings that include CID 12110 |
| 12107 | Chaoming Luo | 13.4.2 | 372.31 | "if RSNA has not been established" implies there is a case FT 4-way handshake may occur after RSNA has been established, which is not true. | Remove "if RSNA has not been established," | Rejected –  4-way handshake may be used later due to rekeying. |
| 13508 | Amelia Andersdotter | 13.4.2 | 370.25 | The initiation of the FT mobility domain only covers the cases STA->AP, AP->STA, non-AP MLD->AP MLD, AP MLD->non-AP MLD, and not the cases STA->AP MLD or non-AP MLD->AP. Is this intentional? | Clarify the conditions for the initiation of the FT mobility domain in the cases where a STA or AP is not an MLD but initiates a mobility domain with an MLD. Presumably this is adding two or four lines like "STA->AP MLD: Authentication-Request (Open System authentication algorithm) \n AP MLD->STA: Authentication-Response (Open System authentication algorithm, Status) \n non-AP MLD->AP: Authentication-Request (Open System authentication algorithm, Basic Multi-Link element) ..." etc. | Rejected –  The initiation of the FT mobility domain uses association and we have to have matched entities on both sides for the association.  STA-> AP MLD association or non-AP MLD -> AP association are not useful cases.  First, legacy can not understand MLD signaling.  Second, if the intention is to operate as one link, then MLD framework allows that. |
| 13509 | Amelia Andersdotter | 13.4.2 | 370.25 | the presence of the Basic Multi-Link element in the non-AP MLD->AP MLD association request is predicated by subclause 11.3.6.2, and the presence of the Basic Multi-Link element in the AP MLD->non-AP MLD association response is predicated by subclause 35.3.5.1, but is there a similar requirement for a Basic Multi-Link element to be present in the AP MLD->non-AP MLD authentication response/request apart from what is here, and what does the Basic Multi-Link element do in these cases? Subclause 11.3.6.2 doesn't mention the Basic Multi-Link element in the authentication response. Line 22, p. 334, subcl. 12.3.3.2.1 could be taken to mean that information about every affiliated STA in the non-AP MLD and every affiliated AP in the AP MLD is needed since they all Open System authenticate separately with one another. Could it be clarified why the Basic Multi-Link element needs to be in the Authentication-Response? Depending on why the Basic Multi-Link element is present in the Authentication-Responses, could it be removed? Similar questions for clause 13.4.3, or line 14, p. 375, cl. 13.5.2. | I can't answer - I'm partisan to not mandating the inclusion of elements in any exchanges if there's not a good reason for having them there (so, e.g., if cl. 11.3.6.2 doesn't make it mandatory in the response, why include it? Is this a question of aligning cl 11.3.6.2 with cl. 35.3.5.1? does it make a difference if it's association vs authentication request/response?). Towards the end of 35.3.5 it's specified that (Re)Association Response frames require Basic Multi-Link elements, but nowhere is it said that Authentication frames need them, and specifically not in the situation of authentication-response in cl. 13. I'm leaving this comment here in the event that there is a justification that I'm not grasping. | Rejected –  We answer the questions from the commenter below.  *but is there a similar requirement for a Basic Multi-Link element to be present in the AP MLD->non-AP MLD authentication response/request apart from what is here,*  Answer: Yes. See 9.3.3.11 Authentication frame format  *and what does the Basic Multi-Link element do in these cases?*  Answer: Provide MLD MAC address, so both sides understand the entity to work with  *Could it be clarified why the Basic Multi-Link element needs to be in the Authentication-Response?*  Answer: Yes. See 9.3.3.11 Authentication frame format and the following texts.  *A STA affiliated with an MLD shall include a Basic Multi-Link element in an Authentication frame that it transmits with the following rules: — the STA shall include the MLD MAC address of the MLD with which the STA is affiliated in the Common Info field of the element — the STA shall set all subfields in the Presence Bitmap subfield of the Multi-Link Control field of the element to 0 — the STA shall not include the Link Info field of the element.*  *Depending on why the Basic Multi-Link element is present in the Authentication-Responses, could it be removed?*  Answer: No. We need to provide MLD MAC address. |
| 13510 | Amelia Andersdotter | 13.4.2 | 372.12 | What happens if FT 4-way handshake needs to happen between STA and AP MLD as per section 13.1? | I don't dare guess here. The STA should follow the procedure as if it were a non-AP MLD? | Rejected –  We clarify that there are two situations. Connection and transition.  For a specific connection like 4-way handshake or association, type of entities needs to match, i.e., STA to AP or non-AP MLD to AP MLD. For transition as defined in 13.1, Wi-Fi 7 may function as STA when connect to Wi-Fi 6 AP and transition to function as non-AP MLD and connects to Wi-Fi 7 AP MLD. Hence, there is no conflict between the texts here and texts in 13.1 |

**Discussion:**

**none**

**Proposed change:**

***TGbe editor: Change 13. Fast BSS transition as follows (track change on):***

1. **Fast BSS transition**
   1. **Overview**

***Change the first four paragraphs as follows:***

Fast BSS transition seeks to reduce the length of time that connectivity is lost between a STA and the DS or between an non-AP MLD(#10680) and the DS during a BSS transition. The FT protocols are part of the reassociation service and only apply to STA transitions between APs, or to(#13502) a STA or non-AP MLD transition to an AP MLD or to(#13502) a non-AP MLD transition to an AP within the same mobility domain within the same ESS (see 4.5.3.2 (Mobility types)).

The FT protocols require information to be exchanged during the initial association (or a later reassociation) between a STA [known as the *FT Originator* (FTO)] and AP [known as the *FT Responder* (FTR)] or between a non-AP MLD [known as the *FT Originator* (FTO)] and AP MLD [known as the *FT Responder* (FTR)]. The initial exchange is referred to as the *FT initial mobility domain association*. Subsequent reassociations to APs within the same mobility domain may make use of the FT protocols.

Two FT protocols are defined:

* *FT protocol.* This protocol is executed when an FTO makes a transition to a target AP or target AP MLD and does not require a resource request prior to its transition.
* *FT resource request protocol.* This protocol is executed when an FTO requires a resource request prior to its transition.

For an FTO to move ~~from its current AP~~ to(#13505) a target AP or target AP MLD utilizing the FT protocols, the message exchanges are performed using one of two methods:

* *Over-the-Air.* The FTO communicates directly with the target AP or target AP MLD using IEEE

802.11 authentication with the FT authentication algorithm.

* *Over-the-DS.* The FTO communicates with the target AP via the current AP. The communication between the FTO and the target AP is carried in FT Action frames between the FTO and the current AP. Between the current AP and target AP, communication is via an encapsulation method described in 13.10.3 (Remote Request/Response frame definition). The current AP converts between the two encapsulations.

**13.4.2 FT initial mobility domain association in an RSN**

(…existing texts…)

Between a STA and an AP, the FT 4-way handshake is as follows: R1KHS1KH: EAPOL-Key(0, 0, 1, 0, P, 0, 0, ANonce, 0, {})

S1KHR1KH: EAPOL-Key(0, 1, 0, 0, P, 0, 0, SNonce, MIC, {RSNE[PMKR1Name], MDE, FTE, RSNXE})

R1KHS1KH: EAPOL-Key(1, 1, 1, 1, P, 0, 0, ANonce, MIC, {RSNE[PMKR1Name], MDE,

GTK[N], IGTK[M], BIGTK[Q], FTE, TIE[ReassociationDeadline], TIE[KeyLifetime], RSNXE}) S1KHR1KH: EAPOL-Key(1, 1, 0, 0, P, 0, 0, 0, MIC, {})

Between a non-AP MLD and an AP MLD, the FT 4-way handshake is as follows: R1KHS1KH: EAPOL-Key(0, 0, 1, 0, P, 0, 0, ANonce, 0, {MAC Address})

S1KHR1KH: EAPOL-Key(0, 1, 0, 0, P, 0, 0, SNonce, MIC, {RSNE[PMKR1Name], MDE, FTE,

RSNXE, MAC Address, MLO Linkn})

R1KHS1KH: EAPOL-Key(1, 1, 1, 1, P, 0, 0, ANonce, MIC, {MAC Address, MLO Linkn with RSNE[PMKR1Name], MDE, MLO GTKn, MLO IGTKn, MLO BIGTKn, FTE, TIE[Reassociation-

Deadline], TIE[KeyLifetime]})

S1KHR1KH: EAPOL-Key(1, 1, 0, 0, P, 0, 0, 0, MIC, {MAC Address})

where MLO GTKn, MLO IGTKn, and MLO BIGTKn are defined in 12.7.4 (EAPOL-Key frame notation).(#12106)

(…existing texts…)

* 1. **FT reassociation**
     1. **FT reassociation in an RSN**

***Change as follows:***

If the FTO does not send a Reassociation Request frame to the target ~~AP~~FTR within the reassociation deadline interval received during the FT initial mobility domain association, the target ~~AP~~FTR may delete the PTKSA, and the FTO shall abandon this transition attempt.

The FTO shall perform a reassociation directly with the target ~~AP~~FTR via the following exchange:

FTOTarget ~~AP~~FTR: Reassociation Request(RSNE[PMKR1Name], MDE, FTE[MIC, ANonce, SNonce, R1KH-ID, R0KH-ID], RIC-Request, RSNXE, Basic Multi-Link element)

Target ~~AP~~FTRFTO: Reassociation Response(RSNE[PMKR1Name], MDE, FTE[MIC, ANonce, SNonce, R1KH-ID, R0KH-ID, GTK[N], IGTK[M], BIGTK[Q], MLO GTKn, MLO IGTKn, MLO

BIGTKn], RIC-Response, RSNXE, Basic Multi-Link element)

where

* “an” means that the subelement could occur multiple times in the field for *n* links.
* MLO GTK is the MLO GTK subelement for the AP affiliated with the AP MLD for the link specified by the value in the Link ID field,
* MLO IGTK is the MLO IGTK subelement the AP affiliated with the AP MLD for the link specified by the value in the Link ID field
* MLO BIGTK is the MLO BIGTK subelement for the AP affiliated with the AP MLD for the link specified by the value in the Link ID field.
* The GTK[N], IGTK[M], and BIGTK[Q] are present when the FTR is an AP.
* The MLO GTKn, MLO IGTKn, MLO BIGTKn, and the Basic Multi-Link element are present when the FTR is an AP MLD.(#12110)

(…existing texts…)