IEEE P802.11
Wireless LANs

|  |
| --- |
| Resolution for CID 15175 |
| Date: April 7, 2023 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Abhishek Patil | Qualcomm Inc. |  |  | appatil@qti.qualcomm.com |
| Gaurang Naik |  |  |  |
| George Cherian |  |  |  |
| Alfred Asterjadhi |  |  |  |
| Duncan Ho |  |  |  |
| Yanjun Sun |  |  |  |
| Abdel Karim |  |  |  |

 Abstract

This submission proposes resolution for CID 15175 received for TGbe LB271 against D3.0.

Revisions:

* Rev 0: Initial version of the document.

***TGbe editor: Baseline for this document is 11be D3.1***

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 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** | **Pg.Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 15175 | Po-Kai Huang | 35.3.4.6 | 496.43 | Starting from line 43, the description becomes a tutorial rather than normative texts. Suggest to move the tutorial to annex, which is where a tutorial belongs. It does not make sense to have 9+ page of tutorial in formal spec that does not specify normative behavior | Move all the sentences starting from line 43 in the clause to annex. | RevisedAgree in principle. There are several examples spread throughout the TGbe draft (esp. under clause 35.3). Although these examples are very useful in helping understand the rules and the expected behavior, they do take a lot of space in the core spec. They can be moved to the annex with references from proper locations. As suggested by the comment, these examples are moved to annex with appropriate references. TGbe editor, please make changes as shown in doc 11-23/0568r0 |

**Annex AF**

(informative)

**Examples of MLO**

***TGbe editor: Please update this clause as shown below:***

**AF.1 Introduction**

This annex provides several examples each intended to illustrate details of a specific feature within MLO,.

**AF.2 Advertisement of multi-link information**

**AF.2.1 Example of complete profile carried in a Basic Multi-Link element**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.2.2 Examples of inheritance in a Multi-Link element**

**AF.2.2.1 Inheritance in a Basic Multi-Link element**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.2.2.2 Inheritance in a Probe Request Multi-Link element**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.3 Contents of Management frames during MLO discovery and setup**

**AF.3.1 Management frames originating from an affiliated non-AP STA**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.3.2 Management frames originating from an affiliated AP that is not a member of a multiple BSSID set**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.3.3 Management frames originating from an affiliated AP that is a member of a multiple BSSID set**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.4 Example of Multi-link setup**

***TGbe editor: The existing contents of this subclause remains unchanged (except for updating the Figure number).***

**AF.5 Example of TID-to-Link mapping frame exchange**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.6 Example of critical update operation**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.7 Example of advertising quieting or channel switching information a link on another link**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.8 Multi-Link power-save operation**

**AF.8.1 Example of per-link power-save operation**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.8.2 Example of dynamic link switch using power states**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.8.3 Examples of listen interval operation**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.9 Example of cross-link group address BU indication**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

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

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.11 Example of proxy ARP service provided by an AP MLD**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.12 Example of TWT agreement negotiation for multiple links**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.13 Examples of multi-link channel access**

**AF.13.1 Example of MLD operation over an STR link pair**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.13.2 Example of PPDU end time alignment on an NSTR link pair**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.13.3 Example of end time alignment of response PPDUs using SRS Control field**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.13.4 Example of AP assisted medium synchronization recovery procedure**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.14 Examples of enhanced multi-link single radio operation**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**AF.15 Examples of enhanced multi-link multi-radio operation**

***TGbe editor: Please populate this clause based on the instructions provided in later part of this document.***

**35.3.3.3 Advertisement of complete or partial per-link information**

***TGbe editor: Please move the following from this subclause***

* ***the 5th paragraph [starting on P490L32 in TGbe D3.1],***
* ***the Figure 35-3,***
* ***the NOTE 4***

***to AF.2.1 (Example of complete profile carried in a Basic Multi-Link element).***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

An example of a Basic Multi-Link element, carried in an Association Request frame, containing a complete per-STA profile is shown in AF.2.1 (Example of complete profile carried in a Basic Multi-Link element).

**35.3.3.6.1 Inheritance in the per-STA profile of Basic Multi-Link element**

***TGbe editor: Please move the following from this subclause***

* ***the 8th paragraph [starting on P494L01 in TGbe D3.1],***
* ***the Figure 35-4***

***to AF.2.2.1 (Inheritance in a Basic Multi-Link element).***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

An example of inheritance in a Basic Multi-Link element is shown in AF.2.2.1 (Inheritance in a Basic Multi-Link element).

**35.3.3.6.2 Inheritance in the per-STA profile of Probe Request Multi-Link element**

***TGbe editor: Please move the following from this subclause***

* ***the 2nd paragraph [starting on P494L56 in TGbe D3.1],***
* ***the 3rd paragraph [starting on P495L01 in TGbe D3.1],***
* ***the Figure 35-4***

***to AF.2.2.2 (Inheritance in a Probe Request Multi-Link element).***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

An example of inheritance in a Probe Request Multi-Link element is shown in AF.2.2.2 (Inheritance in a Probe Requests Multi-Link element).

**35.3.4.6 Frame exchange sequences during MLO discovery and multi-link setup**

***TGbe editor: Please move the following from this subclause***

* ***the 4th paragraph [starting on P503L54 in TGbe D3.1],***
* ***all figures 35-9xx***

***to AF.3.1 (Management frames originating from an affiliated non-AP STA).***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

The contents of the Management frames transmitted by a non-AP STA affiliated with a non-AP MLD during MLO discover and setup are shown in AF.3.1 (Management frames originating from an affiliated non-AP STA).

***TGbe editor: after the above has been performed, please move the following from this subclause***

* ***the 5th paragraph (P505L34)***
* ***all figures 35-10xx***

***to AF.3.2 (Management frames originating from an affiliated AP that is not a member of a multiple BSSID set).***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

The contents of the Management frames transmitted by an AP affiliated with an AP MLD during MLO discover and setup where the AP is not a member of a multiple BSSID set are shown in AF.3.2 (Management frames originating from an affiliated AP that is not a member of a multiple BSSID set).

***TGbe editor: after the above has been performed, please move the following from this subclause***

* ***the 8th, 9th, 10th, 11th, and 12th paragraphs (P508L07, P508L33, P509L01, P509L11 and P509L21 respectively)***
* ***all figures 35-12xx***

***to AF.3.3 (Management frames originating from an affiliated AP that is a member of a multiple BSSID set).***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

The contents of the Management frames transmitted by an AP affiliated with an AP MLD during MLO discover and setup where the AP is a member of a multiple BSSID set are shown in AF.3.3 (Management frames originating from an affiliated AP that is a member of a multiple BSSID set).

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

***TGbe editor: Please update the following paragraph in this subclause as shown below:***

An example of multi-link setup is shown in AF.4 (Example of Multi-link setup).

**35.3.7.1.7 Advertised TID-to-link mapping in Beacon and Probe Response frames**

***TGbe editor: Please move the following from this subclause***

* ***the 9th paragraph [starting on P525L59 in TGbe D3.1],***
* ***the Figure 35-14***

***to AF.5 (Example of TID-to-Link mapping frame exchange).***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

An example of TID-to-Link mapping frame exchange involving advertised mapping is shown in AF.5 (Example of TID-to-Link mapping frame exchange).

**35.3.10 BSS parameter critical update procedure**

***TGbe editor: Please move the following from this subclause***

* ***the 10th paragraph [starting on P535L57 in TGbe D3.1],***
* ***the Figure 35-16***

***to AF.6 (Example of critical updates operation).***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

An example of critical update operation in MLO is shown in AF.6 (Example of critical updates operation).

***TGbe editor: Please update the title of 35.3.11 as shown below:***

**35.3.11 Multi-link procedures for (extended) channel switching and channel quieting**

***TGbe editor: Please update the 1st sentence of the 8th paragraph [starting on P539L41 in TGbe D3.1] in this subclause as follows:***

Figure 35-17 (Example of an AP carrying a Quiet element to signal channel quieting on another link) illustrates two APs, AP 1 and AP 2, that are affiliated with the same AP MLD and operate on Link 1 and Link 2, respectively.

***TGbe editor: Please update the 1st sentence of the 9th paragraph [starting on P540L26 in TGbe D3.1] in this subclause as follows:***

Figure 35-18 (Example of an AP carrying a Channel Switch Announcement element to signal channel switching on another link) illustrates two APs, AP 1 and AP 2, that are affiliated with the same AP MLD and operate on Link 1 and Link 2, respectively.

***TGbe editor: After the above two updates have been performed, please move the following from this subclause***

* ***the 8th paragraph,***
* ***the Figure 35-17,***
* ***the 9th paragraph,***
* ***the Figure 35-18***

***to AF.7 (Example of advertising quieting or channel switching information a link on another link).***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

Examples of critical update operation in MLO described in this subclause are shown in AF.7 (Example of advertising quieting or channel switching information a link on another link).

**35.3.12 Multi-link power management**

**35.3.12.1 General**

***TGbe editor: Please move the following from this subclause***

* ***the 2nd paragraph [starting on P542L55 in TGbe D3.1],***
* ***the Figure 35-20***

***to AF.8.1 (Example of per-link power-save operation).***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

An example of power-save operation in MLO is shown in AF.8.1 (Example of per-link power-save operation).

**35.3.7.2 Dynamic link transitions**

***TGbe editor: Please update the 1st paragraph in this subclause as follows:***

A non-AP MLD may use the power states of its affiliated non-AP STAs (see 35.3.12 (Multi-link power management)) to dynamically change the link(s) on which it operates. An example of link transition operation by a signal radio non-AP MLD using power states is shown in AF.8.2 (Example of per-link power-save operation).

Figure 35-15 (Example of link transition operation by a single radio non-AP MLD using power states) provides an illustration of operation of a single radio non-AP MLD with default mapping (all TIDs mapped to all setup links), where the non-AP MLD transitions from operating on link 1 with non-AP STA 1 to operating on link 2 with non-AP STA 2, where both non-AP STA 1 and non-AP STA 2 are affiliated with the non-AP MLD.

***TGbe editor: After the above updates have been performed, please move the following from this subclause***

* ***the new 2nd paragraph (starting “Figure 35-15 …”),***
* ***the Figure 35-15,***
* ***the subsequent paragraphs in this subclause (P527L46, P527L54 and P527L62)***

***to AF.8.2 (Example of per-link power-save operation).***

* + - 1. **Operation for MLD listen interval**

***TGbe editor: Please move the following from this subclause to AF.8.3 (Examples of listen interval operation):***

* ***the 4th, 5th, 6th and 7th paragraphs (P548L05, P548L37, P549L01, and P549L33 respectively) along with figures 35-22 and 35-23 at their appropriate locations with respect to these paragraphs.***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

Examples of listen interval operation in MLO are shown in AF.8.3 (Examples of listen interval operation).

**35.3.15.1 AP MLD operation for group addressed frames**

***TGbe editor: Please move the following from this subclause to AF.9 (Example of cross-link group address BU indication):***

* ***the 1st paragraph (P555L01) and figures 35-24 & 35-25.***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

An example of cross-link group addressed BU indication is shown in AF.9 (Example of cross-link group address BU indication).

**35.3.21.2 TDLS direct link over a single link**

***TGbe editor: Please update the 12th paragraph in this subclause as follows:***

Due to the nature of multi-link operation, it is possible that a Data frame sent by a STA3 which is directed towards the non-AP MLD (MLD\_S), is relayed on a different link when it traverses the AP MLD (MLD\_A). As a result, it is possible that the TDLS Discovery Request frame (which is a Data frame) sent by STA3 is received on link 2. Figure 35-38 (Example of TDLS discovery initiated by a STA to a non-AP MLD) illustrates this case. The capabilities of each device are the same as described in Figure 35-36 (Example A of TDLS discovery initiated by a non-AP MLD) and Figure 35-37 (Example B of TDLS discovery initiated by a non-AP MLD).

***TGbe editor: After the above update is made, please move the following from this subclause to AF.10 (Examples of frame exchanges for TDLS discovery and setup involving a non-AP MLD):***

* ***all paragraphs starting the 10th paragraph (P584L35) along with all the figures (i.e., Figures 35-36 thru 35-42).***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

Examples of TDLS discovery and setup involving a non-AP MLD are shown in AF.10 (Examples of frame exchanges for TDLS discovery and setup involving a non-AP MLD).

**35.3.22 Proxy ARP service in AP MLDs**

***TGbe editor: Please move the following from this subclause to AF.11 (Example of proxy ARP service provided by an AP MLD):***

* ***the 1st & 2nd paragraphs (P589L01 & L29) and Figure 35-43.***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

An example of the proxy ARP service provided by the AP MLD is shown in AF.11 (Example of proxy ARP service provided by an AP MLD).

**35.3.24.2 Individual TWT agreements**

***TGbe editor: Please move the following from this subclause to AF.12 (Example of TWT agreement negotiation for multiple links):***

* ***the 1st & 2nd paragraphs (P591L43 & L62) and Figure 35-44.***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

An example of TWT agreements negotiated for multiple links is shown in AF.12 (Example of TWT agreement negotiation for multiple links).

**35.3.16.3 Simultaneous transmit and receive (STR) operation**

***TGbe editor: Please move the following from this subclause to AF.13.1 (Example of MLD operation over an STR link pair):***

* ***the 4th paragraph (P559L46) and figure 35-26.***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

An example of an AP MLD and a non-AP MLD operating over an STR link pair is shown in AF.13.1 (Example of MLD operation over an STR link pair).

**35.3.16.5 PPDU end time alignment on an NSTR link pair**

**35.3.16.5.1 General**

***TGbe editor: Please move the following from this subclause to AF.13.2 (Example of PPDU end time alignment on an NSTR link pair):***

* ***the paragraph starting P562L15 and figure 35-27.***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

An example of the relationship between the end times of DL PPDUs sent over NSTR link pairs is shown in AF.13.2 (Example of PPDU end time alignment on an NSTR link pair).

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

***TGbe editor: Please move the following from this subclause to AF.13.3 (Example of end time alignment of response PPDUs using SRS Control field):***

* ***the paragraph starting P563L35 and figure 35-28.***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

An example of the usage of SRS Control for end time alignment of response PPDUs is shown in AF.13.3 (Example of end time alignment of response PPDUs using SRS Control field).

**35.3.16.8.3 AP assisted medium synchronization recovery procedure**

***TGbe editor: Please move the following from this subclause to AF.13.4 (Example of AP assisted medium synchronization recovery procedure):***

* ***the paragraph starting P568L32 and figure 35-29.***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

An example of AP assisted medium synchronization recovery procedure is shown in AF.13.4 (Example of AP assisted medium synchronization recovery procedure).

**35.3.17 Enhanced multi-link single radio operation**

***TGbe editor: Please move the following from this subclause to AF.14 (Examples of enhanced multi-link single radio operation):***

* ***the paragraph starting P573L32***
* ***the paragraph starting P573L48***
* ***Figure 35-30***
* ***Figure 35-31***
* ***the paragraph starting P574L43***
* ***Figure 35-32***
* ***NOTE 10 following Figure 35-32***
* ***Figure 35-33***
* ***Figure 35-34***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

Examples of frame exchanges during EMLSR operation are shown in AF.14 (Examples of enhanced multi-link single radio operation).

**35.3.18 Enhanced multi-link multi-radio operation**

***TGbe editor: Please move the following from this subclause to AF.15 (Examples of enhanced multi-link multi-radio operation):***

* ***the paragraph starting P578L42***
* ***Figure 35-35***

***TGbe editor, please add the following paragraph in place of the moved content after the above-described move is made:***

An example of frame exchanges during EMLMR operation is shown in AF.15 (Examples of enhanced multi-link multi-radio operation).