IEEE P802.11
Wireless LANs

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| MLO – CC36 resolution to CIDs related to 35.3.6.1.1 |
| Date: 2021-09-20 |
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| **CID** | **Commenter** | **Clause Number(C)** | **Page** | **Comment** | **Proposed Change** | **Resolution** |
| 5244 | Insun Jang | 35.3.6.1.1 | 258.08 | TID-to-link-mapping mechanism can be also allowed during multi-link setup by using the corresponding element. Therefoere, "performed multi-link setup" is not enough. We need to add the case "during multi-link setup" | As in the comment |  Revised -agree with the commenter. Apply the changes marked as #5244 in this document |
| 5607 | John Wullert | 35.3.6.1.1 | 258.08 | Statement effectively says that TID-to-link mapping allows mapping of TIDs to links, which is not very informative. | Revise sentence as: "The TID-to-link mapping mechanism allows an AP MLD and a non-AP MLD that performed multi-link setup to determine how to assign UL and DL QoS traffic to the links that have been set up." |  Revised – agree with the commenter. Apply the changes marked as #5607 in this document  |
| 6549 | Patrice Nezou | 35.3.6.1.1 | 258.08 | The TID-to-Link mapping mechanism considers only UL and DL traffics. A TID may be related to a peer-to-peer link. Add a mechanism to include the peer-to-peer communication in the TID-to-link mapping | As in comment | Reject – the scope of TID-mapping should be limited to traffic within the BSS. |
| 6643 | Pooya Monajemi | 35.3.6.1.1 | 258.08 | TID to link negotiation can be mandatory in certain cases, however not in all. AP needs to be able to signal that a negotiation is required. | Add signaling in operation element indicating the need to perform negotiation. |   |
| 4825 | Dibakar Das | 35.3.6.1.1 | 258.09 | There seems to be an incosistency as REVme definition of TID has 16 values while the range of the TID-To-Link Mapping element is for 8 values which I assume to correspond to the Traffic Categories (TC). | Add a sentence clarifying that the term "TID" in this clause is limited to the TID values between 0-7. |  Revised – agree with the commenter. Apply the changes marked as #4825 in this document. |
| 7060 | Sigurd Schelstraete | 35.3.6.1.1 | 258.14 | "each TID can be mapped to the same or different link set". Same or different as what? Is the intention to say "to a specific link or multiple links"? | Clarify |  Revised – agree with the commenter. The procedure in 35.3.6.1.3 will define the restrictions so this sentence should just refer to this subclause. However, it can be useful here to define what a link set is. Apply the changes marked as #7060 in this document |
| 5754 | Laurent Cariou | 35.3.6.1.1 | 258.16 | clarify the definition of link set here. | as in comment |  Revised – agree with the commenter. Apply the changes marked as #5754 in this document |
| 6730 | Rojan Chitrakar | 35.3.6.1.1 | 258.16 | What is the definition of a "link set"? | It is not clear what does a "link set" mean here. Provide a definition for the term "link set" or simplify as link. |  Revised – agree with the commenter. Apply the changes marked as #6730 in this document |
| 5213 | Huizhao Wang | 35.3.6.1.1 | 258.18 | If a link has broadcast/mcast frames transmitted from time to time, this link is "enabled" link or not? | Redefine the definition of "enabled" link: the link is "enabled" that the non-AP STA uses it for unicast frame exchanges. The linke is "disabled" that the non-AP STA does not use it for any unicast frame exchanges. |  Revised – agree with the commenter. Clarify that if a TID is mapped to a set of links, it is for individually addressed frames. Apply the changes marked as #5213 in this document |
| 6280 | Ming Gan | 35.3.6.1.1 | 258.18 | Enable/Disable is defined by using TID-to-link mapping. TID is only related to MSDUs or A-MSDUs. However, based on P258 L28, Enable/Disable is also related to Management frame. | Please decouple enable/disable from TID to link Mapping |  Revised – clarify the rules for management frames whether they are allowed on disabled links. Apply the changes marked as 6280 in this document |
| 4051 | Abhishek Patil | 35.3.6.1.1 | 258.20 | Elaborate what does admission control have to do with TID mapping. | Either provide clarification or delete the "unless admission control" part in the sentence. |  Revised – original motion text had mention of this. I assume it’s because admission control can restrict some TIDs. But anyway, agree with the commenter that those functions are orthogonal and we don’t need to mention admission control here. Apply the changes marked as #4051 in this document |
| 5245 | Insun Jang | 35.3.6.1.1 | 258.20 | Is admission control a general term in baseline? If not, we need to elaborate it, e.g., adding any reference or enough descriptions | As in the comment |  Revised – following resolution of CID4051, we no longer consider the need to describe admission control. Apply the changes marked as #5245 in this document |
| 5682 | kaiying Lu | 35.3.6.1.1 | 258.20 | When admission control is used, a TID shall also always be mapped to at least one setup link subject to admission control mechanism for channel access. | Please clairify it |  Revised – agree with the commenter. Apply the changes marked as #5682. |
| 6577 | Payam Torab Jahromi | 35.3.6.1.1 | 258.20 | The sentence "At any point in time, a TID shall always be mapped to at least one setup link, unless admission control is used." is not enforceable, and does not define a behavior for any STA or MLD. | Spec could recommend to map each TID to at least one link and define what happens if a TID is not mapped to any link (no MPDus with that TID flowing). |  Revised – modify the sentence to clarify that the negotiation of TID-to-link mapping is made unsucceful if at least one TID has a link set made of zero setup links. Apply the changes marked as #6577 in this document |
| 4050 | Abhishek Patil | 35.3.6.1.1 | 258.22 | Most of the content is a duplicate of the 1st sentence in 2nd para. | Delete one of them and modify the text to say by default all links are in enabled state. |  Revised – agree with the commenter. Apply the changes marked as #4050 in this document |
| 5365 | Jay Yang | 35.3.6.1.1 | 258.24 | please clarify how non-qos data frame and groupcast data/mgmt frame delivery. | groupcast frame may be delivered on the disable link. Seems only QoS data frame is constrained by the disable link.Non-QoS frame can be delivered on all links.Or we can consider rewording the disable/enable link concept. |  Revised – agree with the commenter. Clarify that enable/disable is for a non-AP MLD and applies to individually addressed frames. For group address frames, add a note to clarify the rules. Apply the changes marked as #5365 in this document. |
| 6282 | Ming Gan | 35.3.6.1.1 | 258.24 | Based on this paragraph, enable is not only related with TIDs, but also related Management frame and Contrl frame. | Please remove "Only MSDUs or A-MSDUs with TIDs mapped to an enabled link may be transmitted on that link. Management frames and Control frames may be sent only on enabled links" since "frame exchange" is enough |  Revised – clarify the meaning of enable regarding individually addressed frames. It may be useful to allow class 1 and class 2 frames on disabled links. Clarify what management frames are allowed on disabled links. Apply the changes marked as #6282 in this document. |
| 5922 | Li-Hsiang Sun | 35.3.6.1.1 | 258.25 | "Only MSDUs or A-MSDUs with TIDs mapped to an enabled link may be transmittedon that link." The requirement does not seem to apply to group addressed frames or TDLS frames | add exception for group addressed frames and TDLS frames |  Revised – agree with the commenter. Add a note to clarify this and qualify the restriction to individually addressed frame. Apply the changes marked as #5922 in this document. |
| 6579 | Payam Torab Jahromi | 35.3.6.1.1 | 258.25 | Define what happens if/when all links that a TID is ampped to are gone as a result of AP removal. |   |    |
| 8236 | Yuxin LU | 35.3.6.1.1 General | 258.25 | "with TIDs mapped to an enabled link", the logic seems circular since a link is enabled if TIDs are mapped | Change "with TIDs mapped to an enabled link" to "with TIDs mapped to a link" |  Revised – agree with the commenter. Merge the 2 sentences in order to make things non redundant and consistent. Apply the changes marked as #8236 in this document. |
| 6887 | Rubayet Shafin | 35.3.6.1.1 | 258.26 | "Management frames and Control frames may be sent only on enabled links"--did you intend to mean on "any" enabled links? P.S.: the next sentence says frames can't be exchanged on disabled links anyway | Please clarify the intention. |  Revised – agree with the commenter. Apply the changes marked as #6887 in this document. |
| 5683 | kaiying Lu | 35.3.6.1.1 | 258.28 | Control frames shall not be sent on disabled links. Please clarify it. | As in comment |  Revised – clarify that individually addressed class 3 control frames shall not be sent on disabled links. Apply the changes marked as #5683 in this document |
| 5778 | Laurent Cariou | 35.3.6.1.1 | 258.28 | Clarify what happens to per-link negotiated agreements, for instance TWT agreement, when a link becomes disable. Logic would be that those agreements are ended. | as in comment |  Revised – agree with the commenter that this needs to be defined. Clarify that if the link is disabled, the STA/AP does not need to maintain a power state and power mode. Apply the changes marked as #5778 in this document. |
| 6731 | Rojan Chitrakar | 35.3.6.1.1 | 258.28 | "If a link is disabled, it shall not be used for frame exchange, including Management frames for both DL and UL."I guess this statement is more for non-APs, I assume APs will continue to transmit beacon frames on a disabled link if the link is enabled for at least one non-AP STA.This is excessively restrictive; there may be cases where for any reasons the sole enabled link may be down; at least class 1, 2 frames should be allowed to be transmitted on disabled links (for example to transmit keepalive frames within Max Idle Period). | Clarify that this sentence applies only to non-AP STAs. Allow at least class 1, 2 frames and may be certain class 3 frames (e.g. TID-to-link mapping request/response) to be transmitted on disabled links by non-AP STAs. |  Revised – agree with the commenter. This makes sense. Apply the changes marked as #6731 in this document. |
| 5144 | Geonjung Ko | 35.3.6.1.1 | 258.29 | It is unclear whether management frames from QMF STAs are transmitted subject to QMF policy under TID-to-link mapping. | Add a clarification. |  Reject – procedure for QMF has not been defined for multi-link. |
| 6281 | Ming Gan | 35.3.6.1.1 | 258.29 | Control frame is missing | Please make it complete as in the comment |  Revised – agree with the commenter. Apply the changes marked as #6281 in this document |
| 6361 | Morteza Mehrnoush | 35.3.6.1.1 | 258.29 | The Control frames cannot also be send over the disabled link, so please add it to this sentense like below."If a link is disabled, it shall not be used for frame exchange, including Management and Control frames both for DL and UL." | as in comment |  Revised - agree with the commenter. Apply the changes marked as #6361 in this document |
| 6455 | namyeong kim | 35.3.6.1.1 | 258.29 | If a link is disabled, all frames shall not be used for frame exchange (including control frames). Is there reason to restrict to "including Management frames" in this sentence? If not, remove "including Management frames". | Please remove "including Management frames" in the sentence. |  Revised – the sentence is restructured to be more specific, and only a few management frames and control frames are proposed to be allowed on disabled links. Apply the changes marked as #6455 in this document. |
| 8237 | Yuxin LU | 35.3.6.1.1 General | 258.29 | Change "both for DL and UL" to "either for DL or UL" since the sentence is in the negative tone | As in comment |  Revised – agree with the commenter that the text is not clear on this point. Define a link as disabled if no TID is mapped to this link both in DL and UL. Enabled otherwise. Apply the changes marked as #8237 in this document. |
| 8340 | Zhiqiang Han | 35.3.6.1.1 | 258.29 | Also control frames cannot transmitted in the disabled link. | Please clarify it |  Revised – agree with the commenter. Based on other comments, some control frames and management frames are now allowed. Apply the changes marked as #8340 in this document. |
| 4451 | Arik Klein | 35.3.6.1.1 | 258.32 | Revise the language of the sentence for clarity, as proposed:"....then the non-AP MLD can use any link within this set of enabled links to transmit frames carrying MSDUs or A-MSDUs \*with\* that TID" | Revise the sentence as follows::"....then the non-AP MLD can use any link within this set of enabled links to transmit frames carrying MSDUs or A-MSDUs \*corresponding to\* that TID" |  Revised – agree with the commenter. Apply the changes marked as #4451 in this document. |
| 5157 | GEORGE CHERIAN | 35.3.6.1 | 258.36 | The procedure on what happens to the TID to Link mapping when one of the link is disabled/removed by the AP, is not defined. Please clarify in the text | As in the comment |   |
| 5749 | Laurent Cariou | 35.3.6.1.1 | 258.36 | Clarify that management frames that are not measurement frames can be retrieved in any links. | as in comment |  Revised – this has indeed been agreed and is clearly captured in subclause 35.3.10.4. This also needs to be captured in this subclause. Apply the changes marked as #5749 in this document. |
| 5750 | Laurent Cariou | 35.3.6.1.1 | 258.36 | if a link is disabled, management frames can not be sent. Check if there would be a need for exception for some specific management frames | as in comment |  Revised – as suggested by some other commenters, some management frames such as TID-to-link mapping request/response/teardown could be allowed. Apply the changes marked as #5750 in this document. |
| 5751 | Laurent Cariou | 35.3.6.1.1 | 258.36 | If a link is disabled, clarify that the non-AP MLD does not need to maintain PS state, and other variables. | as in comment |  Revised – agree with the commenter. Apply the changes marked as #5751 in this document. |
| 5752 | Laurent Cariou | 35.3.6.1.1 | 258.36 | If a link is disabled, and a TWT agreement was setup, the TWT agreement should be torn down or at least suspended | as in comment |  Revised – agree with the commenter. Apply the changes marked as #5752 in this document. |
| 5753 | Laurent Cariou | 35.3.6.1.1 | 258.36 | Clarify that if a STA of a non-AP MLD is in active mode on a link, the associated AP of the AP MLD shall send directly to the STA any data and management frames | as in comment |  Revised – agree with the commenter. Apply the changes marked as #5753 in this document |
| 4052  | Abhishek Patil | 35.3.6.1.1 | 258.41 | Are there any other restrictions other than power-state of the corresponding non-AP STA? Delete the note and explicitly mention "...subject to non-AP STA's power-save state..." | As in comment |  Revised – agree with the commenter. Apply the changes marked a #4052 in this document |
| 5077 | Gaurav Patwardhan | 35.3.6.1.1 | 258.41 | Reference missing for "existing restrictions'. If none available, please create one for the clarification of the reader. | As in comment. |  Revised – agree with the commenter. Only one restriction which is power state of the STA. Clarify that. Apply the changes marked a #4052 in this document |
| 4053 | Abhishek Patil | 35.3.6.1.1 | 258.46 | The text in NOTE 2 is duplicate of normative text in other paragraphs within this subclause. | Delete NOTE 2 |  Revised – remove duplicated normative text and extend the note to indicate that the AP can recommend a link. Apply the changes marked as #4053 in this document |
| 5608 | John Wullert | 35.3.6.1.1 | 258.46 | First statement in Note 2 is repeated above (line 20) and below (line 53). | Delete first sentence of Note 2. |  Revised – remove duplicated normative text and extend the note to indicate that the AP can recommend a link. Apply the changes marked as #5608 in this document |
| 8341 | Zhiqiang Han | 35.3.6.1.1 | 258.47 | What is the corresponding non-AP STA? | Please clarify it |  Revised – the sentence is modified to avoid misunderstanding. Apply the changes marked as #8341 in this document. |
| 5684 | kaiying Lu | 35.3.6.1.1 | 258.48 | The non-AP MLD can have the corresponding non-AP STA wake up on any setup link to receive BUs buffered by the AP MLD. | Please change "any link" to "any setup link" |  Revised – agree with the commenter. Apply the changes marked as #5684 in this document. |
| 6504 | Pascal VIGER | 35.3.6.1 | 258.06 | According to Table 9-13--Ack policy, No Ack row "is not used for QoS Data frames with a TID forwhich a block ack agreement exists".Therefore all traffic of a TID shall follow same ACK policy, which is a pity when only subset of traffic is latency sensitive.There shall be a means to avoid ACK for latency sensitive data. | Provide a no-ack delivery for latency sensitive data only, as example by a no-ack link reserved for Low latency traffic. |   |
| 6524 | Pascal VIGER | 35.3.6.1 | 258.06 | A single STA can support more than one traffic (local applications) for a given traffic type (filling a AC queue or TID).Especially, the low latency traffic is a specific traffic that shall be considered independently of a traffic class (TID) that it could belong to. | According to SCS mechanism, a TSPEC could provide parameters that describe the LL traffic characteristics. The SCSID is to be used to discriminate LL data in order to be handled by LL medium access mechanisms: e.g. MU triggering, rTWT use.There is a need to identify which link(s) the SCS can use. |   |

1. **Introduction**
2. **Proposed spec text**

***TGbe editor: Modify subclause 35.3.6 Link management as shown below:***

* + 1. **Link management**
			1. **TID-to-link mapping**
				1. **General**

(#5244, #5607, #4825)The TID-to-link mapping mechanism allows an AP MLD and a non-AP MLD that performed or are performing multi-link setup to determine how UL and DL QoS traffic corresponding to TID values between 0 and 7 will be assigned to the setup links for the non-AP MLD.

(#7060, #5754, #6730) By default, all TIDs shall be mapped to all setup links for (#2068)both DL and UL (see [35.3.6.1.2 (Default](#bookmark21) [mapping mode)](#bookmark21)). When both MLDs have explicitly negotiated a TID-to-link mapping by following the procedure defined in [35.3.6.1.3 (Negotiation of TID-to-link mapping)](#bookmark22), a TID can be mapped to a link set(#2908), which is a subset of setup links, spanning from only one setup link to all the setup links, with restrictions defined in [35.3.6.1.3 (Negotiation of TID-to-link mapping)](#bookmark22).

(#8237) A setup link is defined as enabled for a non-AP MLD if at least one TID is mapped to that link either in DL or in UL and is defined as disabled if no TIDs are mapped to that link both in DL and UL. At any point in time, a TID shall always be mapped to at least one setup link (#8237) both in DL and UL(#4051, #5245, #5682) (#6577), which means that a TID-to-link mapping change is only valid and successful if it will not result in having a single TID for which the link set is made of zero setup links. By default, (#4050)all setup links shall be enabled (see [35.3.6.1.2 (Default mapping mode)](#bookmark21)).

(#1496)(#5213, #5365, #5922, #8236, #5683, #6887, #6282)If a link is enabled for a non-AP MLD, it may be used for individually addressed frame exchange, subject to the power state of the non-AP STA operating on that link and only MSDUs or A-MSDUs with TIDs mapped to that link may be transmitted on that link between the corresponding STA and AP of the non-AP MLD and AP MLD in the direction (DL/UL) corresponding to the TID-to-link mapping. Individually addressed Management frames and Control frames may be sent on any enabled links between the corresponding STA and AP of the non-AP MLD and AP MLD (#8237) both in DL and UL.

(#5213, #5365, #5922, #5683, #6281, #6361, #6455, #8340, #5750, #6280, #6282)If a link is disabled for a non-AP MLD, it shall not be used for individually addressed frame exchange between the corresponding STA and AP of the non-AP MLD and AP MLD, (#6731) except for class 1 frames and class 2 Management frames, and TID-to-link Mapping Request, TID-to-link Mapping Response and TID-to-link Mapping Teardown frames as part of procedures initiated by the non-AP MLD.

(#5365) NOTE - Group addressed frames delivery procedure is defined in 35.3.14 (Multi-link group addressed frame delivery and reception).

If a TID is mapped in UL to a set of enabled links for a non-AP MLD, then the non-AP MLD may use any link within this set of enabled links to transmit individually addressed (#5213, #5365) MSDUs or A-MSDUs (#4451) corresponding to that TID.

(#4052, #5077, #5749) If a TID is mapped in DL to a set of enabled links for a non-AP MLD, then:

* (#1226)The non-AP MLD may retrieve individually addressed (#5213, #5365) buffered BUs buffered at the AP MLD that are MSDUs or A-MSDUs corresponding to that TID on any link within this set of enabled links.
* The AP MLD may use any link within this set of enabled links to transmit individually addressed (#5213, #5365) MSDUs or A-MSDUs corresponding to that TID, subject to the power state of the non-AP STA on each of these links.

(#1788)(#1680)(#4053, #5608,#8341, #5684) NOTE —If the default mode is used, the non-AP MLD can retrieve BUs buffered by the AP MLD on any setup link but the AP MLD can recommend a link as defined in 35.3.10.4 (Traffic indication).

(#4052, #5077, #5749) A non-AP MLD may retrieve buffered BUs that are MMPDUs buffered at the AP MLD on any enabled link. An AP MLD may use any enabled links to transmit individually addressed bufferable management frames that are not measurement MMPDUs, subject to the power state of the non-AP STA on each of the links.

(#5753) If a STA affiliated with a non-AP MLD is in active mode on a link with a set of TIDs mapped for DL transmission, its associated AP affiliated with the AP MLD shall transmit to the STA:

* MSDUs/A-MSDUs with that set of negotiated TIDs for the non-AP MLD
* and MMPDUs that are not measurement MMPDUs for the non-AP MLD or its affiliated STAs.

Unless it is transmitted to another STA affiliated with the same non-AP MLD and in active mode.

NOTE: Operation with STAs affiliated with a non-AP MLD in power save mode are defined in 35.3.10.4 (Traffic indication).

***TGbe editor: add subclause 35.3.6.1.5 Power state after disablement as shown below (#5778, #5752, #5751):***

**35.3.6.1.5 Power state after disablement**

When a link becomes disabled for a non-AP MLD:

* The TWT agreements and APSD scheduled SPs of the STA affiliated with the non-AP MLD and operating on the link shall be deleted.
* The STA affiliated with the non-AP MLD and operating on the link may not maintain a power state and power management mode.
* The AP associated to the STA affiliated with the non-AP MLD and operating on the link may not maintain a Power Management status that indicates in which power management mode the STA is currently operating.

A STA of a non-AP MLD that has transmitted a frame to the AP affiliated with its associated AP MLD on a disabled link, if allowed by the rules defined in 35.3.6.1.1 (General) and from which it expects a response shall remain in the awake state until such a response is received or until the procedure has timed out.

**Further discussion on CID 6731**

Options

On a disabled link between 2 MLDs:

1. Individually addressed management frames transmissions are not allowed (as currently in D1.3)
2. Among individually addressed management frames, only class 1 frames, class 2 management frames and TID-mapping Req/Resp frames are allowed (previous SP: 31Y, 16N)
3. All individually addressed management frames are allowed (procedure initiated by non-AP MLD)