IEEE P802.11
Wireless LANs

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| CC36 CR for subclause 35.3.13 |
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Abstract

This submission proposes resolutions of comments received from TGbe comment collection CC36 based on TGbe D1.4.

* 4073 4115 4278 4280 5339 5340 5378 5379 5380 6648 6661 6936 6633 6634 5694 6376 6644 8245 6646 6647 8044 8246 8247 (23 CIDs)

Revisions:

* Rev 0: Initial version of the document.
1. **Introduction**

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. The introduction and the explanation of the proposed changes are 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 802.11be 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** | **Page** | **Comment** | **Proposed Change** | **Resolution** |
| 4073 | Abhishek Patil | 35.3.13.1 | 273.24 | An AP may not have buffered group address frames at every DTIM beacon. Furthermore, the DTIM beacon is with respect to the transmitting AP (i.e., DTIM beacon on that link). | The sentence needs to be reworded as: "Each AP affiliated with an AP MLD that has one or more buffered group addressed frames shall schedule for transmission of the buffered group addressed frame(s) immediately after the next DTIM Beacon frame that it transmits except for a TWT scheduling AP affiliated with the AP MLD. A TWT scheduling AP affiliated with an AP MLD that has one or more buffered group addressed frames shall schedule for transmission of the buffered group addressed frame(s) during the broadcast TWT SPs located within the Beacon interval during which the DTIM Beacon frame is transmitted by the AP (also see 26.8.3.2 (see 26.8.3.2 (Rules for TWT scheduling AP))." | Revised-"Buffered" implicitly means there is one or more pending group addressed BU at the AP side. Please refer to the same wording in the bullet f) in subclause 11.2.3.6 (AP operation) of P802.11REVme Draft 1.0. There is no need to add "that has one or more buffered group addressed frames" again since it is redudant. For the TWT scheduling AP, agree with the comment, and propose to split this long sentence into two parts.TGbe editor to make the changes shown in 22/0201r1 under all headings that include CID 4073. |
| 4115 | Abhishek Patil | 35.3.13.1 | 273.36 | Data frame - 'D' needs to be upper case | Fix the typo. Fix the same issue on P251L6 | Accepted- |
| 4278 | Alfred Asterjadhi | 35.3.13.1 | 273.24 | Specify that group addressed delivery rules defined here do not apply to soft AP MLD. And add reference to where they are defined. | As in comment. | Revised-Agree with the comment in principle. Proposed resolution accounts for the suggested change.TGbe editor to make the changes shown in 22/0201r1 under all headings that include CID 4278. |
| 4280 | Alfred Asterjadhi | 35.3.13.2 | 274.15 | What if all STAs decide to stay awake? In that case you need to specify that at most one of them shall elect to receive and the rest discard them. | As in comment. | Revised-In case that more than one affiliated STA is awake to receive group addressed Data frames and may detect duplicate group addressed data frames based MLD level SN, it could discard the duplicate frames. Add a note to clarify this.TGbe editor to make the changes shown in 22/0201r1 under all headings that include CID 4280. |
| 5339 | Jarkko Kneckt | 35.3.13 | 273.21 | Currently, AP may change group addressed frames transmission PPDU type or transmission rates without signalign the coming change to the associated STAs/non-AP MLDs. If AP changes to higher rates, some non-AP STAs in non-AP MLD may not be able to receive group frames transmitted at the new rate. If these non-AP MLDs would get this information prior the change, the non-AP MLDs could select to receive group frames from a link that transmits them reliably and in short duration. | Please allow AP to signal coming group addressed frame type/MCS changes in order to let associated non-AP MLDs to prepare for coming change and to select a link in which they can receive group frames the most power efficiently and reliably. | Rejected-Usually, AP chooses a rate included in the BSSBasicRateSet parameter for reliability. However, because there exists interference, collisions, or time-varying channel properties, it increases the possibility of the lost frame. The proposed change can't address it. On the other hand, if AP intends to change rate of the group addressed frames, it will try to keep a low possibility of lost frame and this algorithm belongs to an implementation. In this case, extra signaling is not needed. |
| 5340 | Jarkko Kneckt | 35.3.13 | 273.21 | All associated non-AP MLDs should detect, if an affiliated AP changes its group addressed frames transmission parameters in otfer to receive the frames from a link that transmits the frames reliably and in short duration. | Please add group frame transmission parameter modification as a criteria to add AP specific Change Sequence Counter to let all associated non-AP MLDs to detect the link specific group addressed frames parameters change. | Rejected-Usually, AP chooses a rate included in the BSSBasicRateSet parameter for reliability. However, because there exists interference, collisions, or time-varying channel properties, it increases the possibility of the lost frame. The proposed change can't address it. On the other hand, if AP intends to change rate of the group addressed frames, it will try to keep a low possibility of lost frame and this algorithm belongs to an implementation. In this case, extra signaling is not needed. |
| 5378 | Jay Yang | 35.3.13 | 273.19 | 11be shall define a mechanism to address the constraint issue between two non-AP MLDs that elect different links to receive groupcast data frame and operate others into PS mode, and the similar issue between non-AP MLDs and legacy STAs.e.g. non-AP MLD1 and non-AP MLD2 set up multiple link connection with AP MLD on link1 and link2, non-AP MLD1 elects link1 on awake state to receive groupcast data frame, let link2 enter PS mode. while non-AP MLD2 keep awake on link2 to receive groupcast data frame, and let link1 enter PS mode. The groupcast frame will be buffered on both links and cause a higher delay issue. | In order to address the groupcast data frame delay issue caused by non-AP MLD ,AP MLD may not buffer the groupcast data frame on the link where the associated non-AP MLD doesn't intend to receive the groupcast data frame. | Rejected-There is no consensus based on the discussion about 21/1261r3 in the group. |
| 5379 | Jay Yang | 35.3.13 | 273.19 | groupcast data frame delivery among multiple links in GCR-BA mode is missing, 11be group shall define a mechanism to address it . | the commenter will provide a contribution on this. | 　 |
| 5380 | Jay Yang | 35.3.13.2 | 274.05 | 11be shall define a mechanism to detect the missing issue or duplicated issue before non-AP MLD intends to switch the groupcast data frame indicated link at any time. | SN is a simple tool and is widely used to detect the duplicated issue according to 802.11 SPEC, suggest using MLD SN for groupcast data frame to address to duplicate or missing issue, which the MLD SN carried in MGMT frame can facilitate the non-AP MLD detect in advance. | Revised-The issue was addressed by the 21/1260r1. All group addressed Data frames share MLD level SN space based on the 802.11be draft 1.3. The STA could disgard the duplicate group addressed frames based on this MLD level SN.Note to TGbe editor, there is no any text change for this CID |
| 6648 | Prabodh Varshney | 35.3.13.2 | 274.05 | Define a mechanism to detect the missing issue or duplicated issue before non-AP MLD intends to switch the groupcast data frame indicated link at any time. | SN is a simple tool and is widely used to detect the duplicated issue. Suggest using MLD SN for groupcast data frame to address to duplicate or missing issue, which the MLD SN carried in MGMT frame can facilitate the non-AP MLD detect in advance. | Revised-The issue was addressed by the 21/1260r1. All group addressed Data frames share MLD level SN space based on the 802.11be draft 1.3.Note to TGbe editor, there is no any text change for this CID |
| 6661 | Qi Xue | 35.3.13.1 | 273.24 | The defined duplicate avoidance procedure for Group Address delivery is vulnerable to duplicate packets in an asymmetric link configuration. Add mechanisms for more robust duplicate detection | 　 | RevisedThe issue was addressed by the 21/1260r1. All group addressed Data frames share MLD level SN space based on the 802.11be draft 1.3.Note to TGbe editor, there is no any text change for this CID |
| 6936 | Saju Palayur | 35.3.13.2 | 274.12 | Current normative do not prevent groupcast frame duplications. Groupcast frames can be transmitted and received in different times on different VAPs. | Define a rule in which AP indicate to all its associated non-AP MLDs which link it should receive its groupcast frames and which link groupcast need to be ignored.AP MLD will be required to deliver all groupcast/multicast related frames for non-AP MLDs in the specified link. Non-AP MLD is required to discard all groupcast/multicast received on the other links. | Revised-The issue was addressed by the 21/1260r1. All group addressed Data frames share MLD level SN space based on the 802.11be draft 1.3. The STA could disgard the duplicate group addressed frames based on this MLD level SN.Note to TGbe editor, there is no any text change for this CID |
| 6633 | Po-Kai Huang | 35.3.13.2 | 274.07 | Sugget to provide guidance on how non-AP MLD can avoid miss the opportunity to receive group addressed data frame when try to elect a different link to receive group addressed data frame. | Add the following: If a non-AP MLD elects to receive group-addressed frames and elects to switch the selected link to receive group addressed data frame, the non-AP MLD should switch right after seeing the corresponding AP of the current selected link indicates there is no buffered group addressed BUs for the corresponding AP to avoid missing reception of group addressed data frame. | Revised-The issue was addressed by the 21/1260r1. All group addressed Data frames share MLD level SN space based on the 802.11be draft 1.3.Note to TGbe editor, there is no any text change for this CID |
| 6634 | Po-Kai Huang | 35.3.13.2 | 274.07 | Sugget to provide guidance on how non-AP MLD can avoid miss the opportunity to receive group addressed data frame when try to elect a different link to receive group addressed data frame. | Add the following: If a non-AP MLD elects to receive group-addressed frames and elects to switch the selected link to receive group addressed data frame, the non-AP MLD should switch right after seeing the corresponding AP of the current selected link indicates there is no buffered group addressed BUs and seeing the corresponding AP of the target link indicates there is no buffered group addressed BUs for the to avoid duplicate reception of group addressed data frame. | Revised-The issue was addressed by the 21/1260r1. All group addressed Data frames share MLD level SN space based on the 802.11be draft 1.3.Note to TGbe editor, there is no any text change for this CID |
| 5694 | kaiying Lu | 35.3.13.1 | 273.49 | The bits in the Partial Virtual Bitmap field of the TIM element for the other AP(s) in the same AP MLD shall be contiguous. Clarify that these bits are not including the bit for the reporting AP. | Please clairify it | Rejected-Further clarification is not needed since contiguous bits are for the other AP(s) and the other AP(s) don't contain the reporting AP. Moreover, there is a note for reporting AP. |
| 6376 | Morteza Mehrnoush | 35.3.13.1 | 273.56 | Please fix the typo in "nontrasnmitted" | as in comment | Revised-Agree with the comment, proposed resolution accounts for the suggested change.TGbe editor to make the changes shown in 22/0201r1 under all headings that include CID 6376 |
| 6644 | Pooya Monajemi | 35.3.13.1 | 273.37 | There is no point in sending a group addressed data frame to a link that is set up but disabled | Change to "all the enabled links setup with the non-AP MLD" | Accepted- |
| 8245 | Yuxin LU | 35.3.13.1 Group addressed frame delivery | 273.37 | I suppose only enabled links can be used for data delivery. Suggest to change "the links setup with the non-AP MLD" to "the links enabled by the non-AP MLD" | As in comment | Revised-Agree with the comment in principle, proposed resoltution accounts for the suggested change.TGbe editor to make the changes shown in 22/0201r1 under all headings that include CID 8245 |
| 6646 | Prabodh Varshney | 35.3.13 | 273.19 | Define a mechanism to address the constraint issue between two non-AP MLDs that elect different links to receive groupcast data frame and operate others into PS mode, and the similar issue between non-AP MLDs and legacy STAs. | In order to address the groupcast data frame delay issue caused by non-AP MLD ,AP MLD may not buffer the groupcast data frame on the link where the associated non-AP MLD doesn't intend to receive the groupcast data frame. | Rejected-There is no consensus based on the discussion about 21/1261r3 in the group. |
| 6647 | Prabodh Varshney | 35.3.13 | 273.19 | Define a mechanism to address groupcast data frame delivery among multiple links in GCR-BA mode. | Contriibution to be provided. | 　 |
| 8044 | Yuchen Guo | 35.3.13.2 | 274.15 | What if the group addressed BUs on the other link is group addressed data frame? Since group addressed data frames are duplicated in all the setup links, does the STA on the other link need to wake up to receive the group addressed data frame? | Please clarify | Revised-In case that more than one affiliated STA is awake to receive group addressed data frames and may detect duplicate group addressed data frames based MLD level SN, it could discard the duplicate frames. Add a note to clarify this.TGbe editor to make the changes shown in 22/0201r1 under all headings that include CID 8044. |
| 8246 | Yuxin LU | 35.3.13.2 Group addressed frame reception | 274.09 | It is not clear which link is "the corresponding link" due to lack of explanation/definition. Remove this term would not affect the meaning | Suggest to remove "on the corresponding link" | Revised-Proposed resolution accounts for the comment, by changing "the AP" to "its associated AP" and deleting "on the corresponding link" in the sentenceTGbe editor to make the changes shown in 22/0201r1 under all headings that include CID 8246. |
| 8247 | Yuxin LU | 35.3.13.2 Group addressed frame reception | 274.16 | It is not clear which link is "that link" due to lack of explanation/definition. | Define/explain which link is "that link", such as change to "the link that the STA is operating on" | Revised-Agree with the comment in principle, proposed resoltution accounts for the suggested change.TGbe editor to make the changes shown in 22/0201r1 under all headings that include CID 8247 |

**Discussion:** None.

***TGbe editor: Please update the subclause as shown below***

**35.3.15 Multi-link group addressed frame delivery and reception**

**35.3.15.1 Group addressed frame delivery**

Each AP affiliated with an AP MLD shall schedule for transmission all buffered group addressed frames immediately after every DTIM beacon it transmits except for a TWT scheduling AP affiliated with that AP MLD. A TWT scheduling AP affiliated with that AP MLD shall schedule for transmission all buffered group addressed frames during the broadcast TWT SPs located within the beacon interval during which the DTIM Beacon frame is transmitted by the AP (see 26.8.3.2(Rules for TWT scheduling AP)). (CID #4073)

An AP MLD that broadcasts the group addressed MPDU received from an associated non-AP MLD shall set the SA field of the broadcast group addressed MPDU to the MLD MAC address of the non-AP MLD.

Each AP affiliated with an AP MLD shall schedule:

—the transmission of the buffered group addressed Management frames independently from the transmission of buffered group addressed Management frames of other AP(s) affiliated with the same AP MLD.

—the transmission of the buffered group addressed Data (CID #4115) frames that are expected to be received by a non-AP MLD in all the enabled (CID #6644 8245)links setup with the non-AP MLD.

If an AP affiliated with an AP MLD is not part of a multiple BSSID set or the AP corresponds to a transmitted BSSID in a multiple BSSID set, then the AP shall indicate if each of the other AP(s) affiliated with(#) the same AP MLD has buffered group addressed frames by using a bit in the Partial Virtual Bitmap field of the TIM element after the last bit corresponding to a nontransmitted BSSID (if any) (maximum possible number of BSSIDs -1) which is in the same multiple BSSID as the AP.

—The indication is in the DTIM beacon sent by the AP and is based on the latest information about the other APs that the AP has when the AP schedules the DTIM beacon.

—These bits in the Partial Virtual Bitmap field of the TIM element for the other AP(s) affiliated with(#) the same AP MLD shall be contiguous.

NOTE—The AP indicates the presence of its buffered group addressed frames following 11.2.3.6 (AP operation).

If an AP affiliated with an AP MLD is a nontransmitted BSSID in a multiple BSSID set, then the AP that corresponds to the transmitted BSSID in the same multiple BSSID set shall indicate if each of the other AP(s) affiliated with(#) the same AP MLD as the nontransmitted (CID #6376) BSSID has buffered group addressed frames by using a bit in the Partial Virtual Bitmap field of the TIM element after the last bit corresponding to the nontransmitted BSSID (if any) (maximum possible number of BSSIDs – 1) which is in the same multiple BSSID as the AP.

—The indication is in the DTIM beacon corresponding to that nontransmitted BSSID sent by the transmitted BSSID of the same multiple BSSID set as the nontransmitted BSSID and is based on the latest information about the other APs affiliated with(#) the AP MLD that the transmitted BSSID has when it schedules the DTIM beacon.

—These bits in the Partial Virtual Bitmap field of the TIM element for the other AP(s) affiliated with(#) the same AP MLD shall be contiguous.

**35.3.15.2 Group addressed frame reception**

A non-AP STA affiliated with a non-AP MLD shall follow the item (e) defined in 11.2.3.7 (Receive operation for STAs in PS mode) to receive the group addressed BUs sent by its associated AP affiliated with the associated AP MLD(CID #8246).

If an indication of buffered group addressed frames in the TIM element about an AP affiliated with(#) an AP MLD is received by any STA affiliated with a non-AP MLD, the STA affiliated with the non-AP MLD that is associated with the AP and that stays awake to receive group addressed BUs shall elect to receive all group addressed frames that are scheduled for delivery in the link that the STA is operating on (CID #8247).

A non-AP MLD shall filter out the group addressed MPDU with the SA field set to the MLD MAC address of the non-AP MLD.

NOTE 1—A non-AP STA affiliated with a non-AP MLD may detect duplicate group addressed Data frames according to 10.3.2.14.3 (Receiver requirements) and discard them. (CID #4280, 8044)

NOTE 2— Additional and exceptional rules of group addressed frame delievery and reception for NSTR mobile AP MLD are defined in 35.3.18 (NSTR mobile AP MLD operation) (CID #4278)