IEEE P802.11
Wireless LANs

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| Resolution for CC36 QoS related and Misc. Topics |
| Date:April, 2022 |
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 Abstract

This submission proposes resolutions for the following CIDs (with various topics) for TGbe (CC36).

* **Architecture and terms:** 4917(A), 5638(Rej), 5639(Rej), 5640(Rej), 6186(A)
* **QoS, SCS:** 4920(Rej), 5774(Rej), 6522(Rev), 6523(Rev), , 7844(Rej), 7870(Rej)
* **Security:** 51829(Rej)
* **rTWT**: 4921(Rej), 5881(Rej), , 5952(Rev)

Legend:

A – Accepted,

Rej – Rejected

Rev - Revised

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: removed CID 5951 and modified the resolution of CID 5952
* Rev 2: clarified the resolution of CID 4921
* Rev 3: revised the resolution of CID 6898 because the commenter clarified the comment was for real-time traffic delay feedback, not about the delay bound QoS parameter in the QoS Characteristics element.

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 TGaxbe 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** | **Section** | **Comment** | **Proposed Change** | **Resolution** |
| 4917 | Duncan Ho | 10.2 | MLD architecture is not clear and lacks details | Explain the architecture of MLD in more details - adopt the latest revision of 21/577 | **Revised**The 21/577 has been adopted in D1.4 so no further actions are needed. |
| 4920 | Duncan Ho | 35.6.2 | The relationship between Restricted TWT, SCS and TSPEC is not clear | Mandate SCS support for EHT STAs that support low-lat operation. Allow rTWT Req to include TSPECs or SCSIDs depending on the STA's/AP's SCS support - contribbutiuon to follow | **Rejected**Since the rTWT Req already includes the TID(s) for which the rTWT applies to, and the SCS streams also specify the TID(s) used for the stream, there’s no need to include the TPSEC (or QoS characteristics element) or SCSID in the rTWT Request. The QoS characteristics and SCS can be set up independently from rTWT Req. The TID can be used to tie the rTWT and the SCS stream. |
| 4921 | Duncan Ho | 35.6.4.1 | Restricted TWT, all STAs should reset their RBOs and draw a new one at the start of a rTWT SP | A non-AP EHT STA that supports rTWT shall draw a new RBO counter at the start of a rTWT SP - contribution to follow | **Rejected**There was some offline discussion but the group did not reach consensus. |
| 5182 | Guogang Huang | 12.7.2 | (#2290)For MLO, the non-AP MLD shall include a MLO Link KDE containing the LinkID field and affiliated STA MAC address for each link included in the Association Request frame.This sentence is incorrect. Because the links that are advertised in the Multi-link element included in the (Re)Assocaition Request frame may be rejected by the AP MLD. Furthermore, it is not neccessary to include a MLO Link KDE corresponding the reporting link | Modify this sentence, e.g.(#2290)For MLO, the non-AP MLD shall include a MLO Link KDE containing the LinkID field and affiliated STA MAC address for each accepted link that is advertised in the Multi-link element included in the Association Response frame. | **Rejected**The sentence in the spec is correct i.e., the AP needs to verify the same info included in msg2 is the same as what was sent in the (Re)Assoc. |
| 5638 | Joseph Levy |   | The term "device" is currently used in the IEEE Std. 802.11-2020 to describe a physical device. An entity that may "contain" a STA, set of STAs, or a group of logical entities (e.g. see Figure 4-10 which shows a device consisting of a mesh STA and an AP STA or Figures 4-28 and 4-29 which show multi-band capable devices). Another example of this is the following statemen (IEEE Std. 802.11-2020 page 224): "It is possible for one device to offer both the functions of an AP and a portal. For example, a portal to a wired IEEE 802 LAN is shown in Figure 4-6." In addition the standard defines multiple "device types" (see Table 9-206-Device Type definitions) which are all physical devices that "contain" one or more 802.11 entities). "Device" is also used when the 802.11 specification addresses operation in some regulatory domains (e.g. TVBD, WSD) to describe the physical device that contains one or more 802.11 entities). Note there are currently ~ 700 uses of the term device in IEEE Std. 802.11-2020. Therefore I think the term MLD (Multi Link Device) is poorly named and confusing as it defines a "logical device" which is then referred to as simply a device. This is not good specification practice and will cause confusion as to the meaning of the term device. Therefore, the logical entity currently named MLD should be renamed to remove issue. | Rename "MLD" so it is does not use the term device as an "MLD" is not an entity that contains multiple 802.11 entities, it is simply an 802.11 logical entity. It should be noted that an "AP MLD" will likely be contained in a device that also contains multiple APs, but this doesn't make an "MLD" a device. | **Rejected**The definition of this term was debated heavily during the draft development and the group settled with the current definition in the spec. |
| 5639 | Joseph Levy |   | The term "link" is used in the IEEE Std. 802.11-2020 non-PHY clauses and other 802 specifications to be a MAC SAP to MAC SAP link. The term "link" is used in the PHY clauses to describe an RF link (WM link) which is appropriate in the PHY clauses. The use of this 802 reserved term in the PHY section to mean something other than a 802 link is confusing, but is tolerated as it is consistently used in the PHY section in this manner. However, MLO is now using the PHY definition of link outside of the PHY clauses. This is a problem as it is not clear what type of link is being referred to in the non-PHY clauses. Is it the 802 link, a MAC SAP to MAC SAP link, used by 802.11 to provide the MAC service to higher layers or the physical over the air link (WM link). It would be best to use a different term to refer to the MLO link and allow the term link used in the non-PHY clauses to only be used to describe an 802 MAC SAP to MAC SAP link. | Consider how the term "link" is used in the amendment and restrict the use of "link" in the non-PHY clauses to mean an 802 link (A MAC SAP to MAC SAP link) and replace the term "link" by "WM link" when ever it is used to mean a link between "lower-MAC/PHY" entities over the WM or a WM link to be WM link. | **Rejected**The definition of this term was debated heavily during the draft development and the group settled with the current definition in the spec. |
| 5640 | Joseph Levy |   | TGbe has "agreed" a way to describe the operation and entities associated with "MLO". However, these agreements are causing confusion and are redefining terms that are currently used in the IEEE Std. 802.11-2020 and IEEE Std. 802.11ax-2021, making it necessary to introduce additional requirement for "MLO" related entities in many (if not most) clause in the existing specification. These additions are requires to make it clear that existing requirements apply to "MLO" entities (e.g. MLDs). I believe this is the wrong approach. It would be much simpler if the "MLO" entities that provide the 802.11 service to higher layers (the MAC SAP to MAC SAP service) simply be defined as STAs and the entities currently defined as affiliated STAs be renamed so the entity is not confused with a STA. As a STA is defined as "A logical entity that is a singly addressable instance of a medium access control (MAC) andphysical layer (PHY) interface to the wireless medium (WM)." It should be noted that an "MLD" is a logical entity and that an "MLD" is singly addressable instance of a MAC, as all traffic intended for an "MLD" is provided at the MAC SAP addressed to the MLD MAC address. It has been agreed that there is only one MAC address for an MLD at its MAC SAP. Also, an 'MLD' has a PHY interface to the WM, the "MLD" PHY interface consists of one or more "lower MACs" and "PHYs" in the current MLD architecture. Noted that these "lower MACs" and "PHYs" are not STAs (as they are not singly addressable MAC entities). It should also be noted that when an "MLD" is looked at from a hardware or PHY perspective a "MLD" seems to contain multiple entities, but from a 802.11 service perspective it is a single entity providing the transfer of MSDUs from one "MLD" MAC SAP to an other "MLD" MAC SAP via the WM. Which is exactly what a STA does. Hence, if an "MLD" is defined to be a STA (a STA that is capable of using one or more WM channels), then all the rules and requirements currently specified for STAs would apply to "MLDs", therefore there would be no need to add text to say that STA behavior also applies to "MLDs" for the majority of STA the specifications, requirements, and behavior. The only clauses that would require additional text or modification would be the clauses standardizing "MLD" set up, "MLD" configuration, "MLD" advertisement (beacon information), "MLD" security, "MLD" PS operation, and other "MLD" specific features or behaviors. Taking this approach would greatly reduce the number of clauses that will need to be touched to add "MLO" requirements, reduce the size of the 802.11be amendment, provide better consistency with the existing 802.11 specification and greatly reduce confusion about "MLO". | Define an "MLD" to be a STA that supports multiple WM links. This definition should be adequate for both non-AP MLDs and MLD APs. As the current definitions of an AP and a non-AP are correct and adequate if an MLD is defined as a STA. Note, this is a simple example of how defining an MLD as a STA can simplify the specification and reduce the number of clauses that need to be modified. | RevisedThere are descriptions in sections 4.9 and 5.1.5 that were added to clarify the functionalities of the different entities involved in the MLO architecture. No further changes are needed in the draft. |
| 5774 | Laurent Cariou | 35.6.2.1 | SCS should be mandatory for STAs supporting rTWT. | as in comment | **Rejected**There was some offline discussion, but there was not enough consensus within the group at this stage. |
| 5881 | Liangxiao Xin | 35.6.2.1 | SCS setup is a mechanism to differentiate the latency sensitive traffic from other trafic | reference SCS in section 35.6.2.1 | **Rejected**Such reference was added and discussed in 22/1902r4 but there was no consensus for that document at this stage. |
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| 5952 | Liuming Lu | 35.6.2 | The latency sensitive traffic can be identified by the TIDs with the corresponding traffic categories (TCs) or UPs(user priorities), and it can also be identified by TSID as the traffic stream (TS) with a particular traffic specification (TSPEC) for parameterized quality of service (QoS). The TSID information has not been included in Restricted TWT Traffic Info field of Broadcast TWT Parameter Set field. | Suggest to add the TSID informtion in Restricted TWT Traffic Info field of Broadcast TWT Parameter Set field | **Revised**Currently the UL and DL TID bitmaps are already included in the Restricted TWT Traffic Info field of Broadcast TWT Parameter Set field. No further action is needed for the spec. |
| 6186 | Michael Montemurro | 4 | MLO provides a significant addition to AP/STA behavior and should include a reference model description. Also clauses 5 and 7 need to be updated to explain MLO. | Provide a reference as described in https://mentor.ieee.org/802.11/dcn/21/11-21-0577-02-00be-cr-mld-architecture.docx | **Revised**The proposed changes in 21/577 have already been adopted in D1.4 so no further actions are needed. |
| 6522 | Pascal VIGER | 11.25.2 | There is plan to add TSPEC based signaling to provide parameters that describe traffic characteristics within the SCS procedure, especially the low latency (LL) parameters, so that AP shall be able to create an optimal schedule .SCS procedure shall be able to trigger only data for a SCSID (in order not to trigger 'normal' data, which would be unfair) | A TSPEC for UL data has to be considered, and the UL triggering shall be based on the specific SCS traffic identified by the SCSID. | **Revised**The spec has adopted the QoS characteristics element (in D1.5) (included in an SCS Request) for the STA to convey the QoS info of the UL data to the AP.Regarding the SCS-based trigger, it has been discussed in the group but some expressed concerns about complexity because currently the BSR, grant, a flow are all TID/AC based. No consensus was reached at this stage.Note to editor: No further changes to the draft are needed. |
| 6523 | Pascal VIGER | 35.4.2 | There is plan to add TSPEC based signaling to provide parameters that describe traffic characteristics within the SCS procedure, especially the low latency (LL) parameters, so that AP shall be able to create an optimal schedule .SCS procedure shall be able to trigger only data for a SCSID (in order not to trigger 'normal' data, which would be unfair) | A TSPEC for UL data has to be considered, and the UL triggering shall be based on the specific SCS traffic identified by the SCSID (instead of Preferred AC recommendation). | **Revised**The spec has adopted the QoS characteristics element (in D1.5) (included in an SCS Request) for the STA to convey the QoS info of the UL data to the AP.Regarding the SCS-based trigger, it has been discussed in the group but some expressed concerns about complexity because currently the BSR, grant, a flow are all TID/AC based. No consensus was reached at this stage.Note to editor: No further changes to the draft are needed. |
| 6898 | Rubayet Shafin | 35.6.1 | Traffic delay can be defined as the duration between the time when a packet arrives at the AP/non-AP STA and time when it is successfully transmitted by the AP/non-AP STA. This delay is determined based on queuing delays at the AP/non-AP STA, contention time, delay from deferring to other STAs and number of retransmissions (e.g., due to collisions on the wireless channel). Knowledge of traffic delay as well as its components can be helpful in a number of scenarios. Due to the lack of traffic delay information at the TWT Requesting STA-side or rTWT scheduled STA side, the TWT Requesting STA or rTWT scheduled STA cannot set appropriate parameters for TWT operation resulting in large latency due to delayed start of TWT SP. Currently, there is no provision that allows the request and exchange of traffic delay information between the AP-STA and non-AP STA for this delay offset alignment. This may cause serious issue for latency sensitive applications. | The spec needs to define some procedure/mechanism for enabling request and exchange of traffic delay information between the AP-STA and non-AP STA, and between AP MLD and non-AP MLD. | **Rejected**There was discussion on this topic but the group didn’t reach consensus. The point of debate was mainly around whether a mechanism is needed or not. |
| 7844 | Yonggang Fang | 9.4.2.29 | The support of priority access for time sensitive traffic is in 802.11be PAR. However, there is no specific traffic profile defined for the time sensitive traffic. | Please define a traffic profile for time sensitive traffic in TSPEC to support reliable transmission within delay bound. | RevisedIn the current spec D1.5, there are already a few features to support time sensitive traffic (e.g., r-TWT and SCS Req + QoS characteristics element)Note to editor: No further changes to the draft are needed. |
| 7870 | Yongho Kim |   | Some ACs can only be designated as trigger-enabled using TSPEC negotiation. Trigger enabled AC for UL and trigger enabled AC for DL can be different and different TIDs(ACs) can be mapped to different links. Since TIM element and Multi-link Traffic element are not transmitted for only trigger-enabled AC, after transmission of a trgger frame, a non-AP MLD doesn't know which link will be used for buffered BU transmission. A procedure for ACs designated as trigger enabled only needs to be defined. | Define a procedure for ACs designated as trigger enabled U-APSD only. | **Rejected**MLO does not use the TSPEC but it uses the QoS characteristics element instead so the comment does not apply. |

Do you agree to the resolution provided in doc 11-22/0547r4 for the following CIDs?

* **Architecture and terms:** 4917, 5638, 5639, 5640, 6186
* **QoS, SCS:** 4920, 5774, 6522, 6523, 7844, 7870
* **Security:** 5182
* **rTWT**: 4921, 5881, 5952