**IEEE P802.11
Wireless LANs**

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| **CC36 Comment Resolution for 35.6.1 and 3.1 CIDs** |
| **Date:** 2022-01-28 |
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**Abstract**

This submission proposes resolutions for following CIDs (26) for TGbe CC36:

7730, 4120, 5727, 6333, 7462, 6508, 6513, 4711, 5660, 5661, 4152, 7083

7082

5642, 6477, 7676, 7875, 4092, 5643, 7485, 7677,

6509, 5663, 5662, 5359, 6479

Revisions:

* Rev 0: Initial version of the document
* Rev 1: Few editorial updates in clause 4.5.6.3 based on offline feedback. Added comments showing existing definitions in D1.4 for r-TWT terms for comparison with updated definition text.
* Rev 2: Some clarification edits to resolution description in the table.
* Rev 3: Edits based on TGbe call on March 17, 2022.
* Rev 4:
	+ Text revision for CID 7082. Added dot11RestrictedTWTOptionImplemented MIB attribute in Annex C.
	+ Removed LST definition from 3.1 and moved description for latency sensitive traffic to new clause 4.5.6.3.
	+ Updated resolution description for some CIDs. Grouping of related CIDs.
* Rev 5: Edits for CID tagging, editorial fixes in resolution column.

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.***

***TGbe editor: The baseline for this document is P802.11be D1.4.***

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| **CID** | **Commenter** | **Clause** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 7730 | Xiaofei Wang | 35.6 | 298.62 | "Traffic originating from many real time applications has stringent latency requirements (e.g., very low average latency and worst case latency of the order of a few to tens of milliseconds, and small jitter, all of which can have certain reliability constraints as well). Such traffic is referred to as latency sensitive traffic in this subclause." these sentences do not belong in normative texts and is for general background. either delete or move to clause 4 | as in comment | **Revised.**Agree in principle. Moved relevant text from 35.6.1 to a generic subclause 4.5.6.3 (Support for predictable latency). TGbe editor, please make changes labelled as #7730 in this doc. |
| 4120 | Akira Kishida | 35.6.1 | 297.03 | The term "latency-sensitive traffic" is limited to this subclause. However, terminology "latency sensitive traffic (LST)" should be defined for generic in the IEEE 802.11be because other low latency features such as TSN possibly be defined in R2. | Terminology "latency sensitive traffic" should be defined in 3. Definitions, acronyms, and abbreviations - 3.1 Definitions as follows:latency sensitive traffic (LST) : Traffic originating from many real time applications has stringent latency requirements (e.g., very low average latency and worst case latency of the order of a few to tens of milliseconds, and small jitter, all of which can have certain reliability constraints as well) | **Revised.**Agree in principle – moved the relevant text to a generic subclause 4.5.6.3 (Support for predictable latency).TGbe editor, please make changes labelled as #4120 in this doc. |
| 5727 | KENGO NAGATA | 35.6.1 | 297.03 | The term "latency sensitive traffic" is limited to this subclause. However, terminology "latency sensitive traffic (LST)" should be defined for generic in the IEEE 802.11be because other low latency features such as TSN possibly be defined in R2. | Terminology "latency sensitive traffic" should be defined in 3. Definitions, acronyms, and abbreviations - 3.1 Definitions as follows:latency sensitive traffic (LST) : Traffic originating from many real time applications has stringent latency requirements (e.g., very low average latency and worst case latency of the order of a few to tens of milliseconds, and small jitter, all of which can have certain reliability constraints as well) | **Revised.**Agree in principle. Moved relevant text from 35.6.1 to a generic subclause 4.5.6.3 (Support for predictable latency). TGbe editor, please make changes labelled as #5727 in this doc. |
| 6333 | Ming Gan | 35.6.1 | 298.62 | The first paragraph is not only for rTWT, but also for other low latency operation, such MLO, SCS..., please move this to general clause for low latency | as in the comment | **Revised.**Agree in principle. Moved relevant text from first paragraph in 35.6.1 to a generic subclause 4.5.6.3 (Support for predictable latency).TGbe editor, please make changes labelled as #6333 in this doc. |
| 7462 | Thomas Derham | 35.6.1 | 0.00 | This subclause's description is overreaching, implying that the only/main mechanism to achieve low(est) latency is to use (restricted) TWT. This is not necessarily the case, especially in unlicensed spectrum where other users might not be following the same (reservation) rules. | Move general descriptions of low latency traffic into a more general subclause (clause 4 or something), and cross-ref the various 11be mechanisms that can be used to achieve the QoS requirements for that traffic - including but not limited to rTWT, also SR, 11be MU and/or EDCA enhancements, etc | **Revised.**Moved the general description of latency sensitive traffic to a generic subclause 4.5.6.3 (Support for predictable latency). TGbe editor, please make changes labelled as #7462 in this doc. |
| 6508 | Pascal VIGER | 35.6.1 | 297.63 | Latency sensitive traffic is not really defined. There shall have examples of such traffics, as several profiles or applications can be used and mixed on a given STA. | as in comment. | **Revised.**Moved relevant text from first paragraph in 35.6.1 to a generic subclause 4.5.6.3 (Support for predictable latency). TGbe editor, please make changes labelled as #6508 in this doc. |
| 6513 | Pascal VIGER | 3.1 | 37.24 | Latency sensitive traffic is not defined | as in comment, please define this. | **Revised.**Description of latency sensitive traffic is moved under a new generic subclause 4.5.6.3. Group did not reach consensus on adding definition for Latency sensitive traffic in 3.1.TGbe editor, please make changes labelled as #6513 in this doc. |
| 4711 | Chittabrata Ghosh | 35.6.1 | 297.62 | It would be better to clarify that the average latency and worst case latency are referred to a link and not end-to-end. | Replace the current text with underlined text "Traffic originating from many real time applications has stringent latency requirements over any one of the link (e.g., very low average latency and worst case latency of the order of a few to tens of milliseconds, and small jitter, all of which can have certain reliability constraints as well)." | **Revised.**Agree in principle – revised accordingly.TGbe editor, please make changes labelled as #4711 in this doc. |
| 5660 | Julien Sevin | 35,6,1 | 297.63 | The notion of latency is not clearly in the standard | Definition of the term "latency" in the section 3,1 and a means for computing it. | **Revised.**Clarified in subclause 4.5.6.3 that latency is specific to the wireless link.TGbe editor, please make changes labelled as #5660 in this doc. |
| 5661 | Julien Sevin | 35,6,1 | 297.64 | The terms "few to tens of milliseconds", "small" and "all of which can have certain reliability constraints as well" used for specifying the notion of latency and reliability for low latency traffics are not clear | Specify explicit values for each parameter which defines a low latency traffic in terms of low latency characteristics and low latency QoS requirements. | **Revised.**The text for defining latency sensitive traffic is revised to be more generic in clause 4.5.6.3. Don’t see a need to define explicit values for QoS parameters for latency sensitive traffic The QoS characteristics element is defined to provide traffic characteristics for latency sensitive traffic streams to the AP. TGbe editor, please make changes labelled as #5661 in this doc. |
| 4152 | Alfred Asterjadhi | 35.6 | 298.02 | I think the right verb here is "enables" rather than " allows. Also there is nothing that ties low latency traffic to R-TWT at this point of the description. So probably better to say "for wireless traffic, including latency sensitive traffic". | As in comment. | **Revised.**Agree on the first suggestion and updated text. For the second part, keeping the "for latency sensitive traffic" as it's the intended purpose for r-TWT and reflected in the latest draft.TGbe editor, please make changes labelled as #4152 in this doc. |
| 7083 | Sigurd Schelstraete | 35.6.1 | 298.22 | 35.6.2 is essentially an empty section. We need a full definition . | Define Restricted TWT agreement setup | **Revised.**This comment is about 35.8.2 rTWT agreement setup. No change is needed in D1.4 as this comment is already addressed by 11-21/462r9 and text included in D1.2.TGbe editor: No further changes required for the resolution of this CID. |

**4. General description**

**4.5 Overview of the services**

**4.5.6 Traffic differentiation and QoS support**

TGbe editor: insert the following new subclause 4.5.6.3:

**4.5.6.3 Support for predictable latency** (#7730, #4120, #5727, #6333, #6508, #7462)

(#5661) (#6513) Traffic originating from many real time applications has stringent requirements in terms of latency and its jitter along with certain reliability constraints. Such traffic is referred to as *latency sensitive traffic*. Latency sensitive traffic requires packets to be delivered with predictable latency in terms of both its average and the worst case over the (#5660) (#4711) wireless link. Such traffic typically shows periodic pattern with burst arrival of packets.

This standard defines mechanism(s) such as restricted TWT (35.8 (Restricted TWT (r-TWT)) to enable the BSS to use enhanced medium access protection and resource reservation to provide predictable latency with higher reliability for latency sensitive traffic (#4711) over the wireless link.

**35.8 Restricted TWT (r-TWT)
35.8.1 General**

TGbe editor: change the first paragraphs in 35.8.1 as follows:

(#7730, #6333, #7462, #4120, #5727, #6508) Restricted TWT operation described in this subclause (#4152) enables the BSS to use enhanced medium access protection and resource reservation mechanisms for delivery of latency sensitive traffic.

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| 7082 | Sigurd Schelstraete | 35.6.1 | 298.06 | "An EHT STA that supports restricted TWT operation shall set dot11RestrictedTWTOptionImplemented to true and the Restricted TWT Support subfield in transmitted EHT Capabilities elements to 1;". I don't think the STA gets to set the MIB parameter. Better to say "An EHT STA supports restricted TWT operation if dot11RestrictedTWTOptionImplemented is set to true. When dot11RestrictedTWTOptionImplemented is true, the Restricted TWT Support subfield in transmitted EHT Capabilities elements shall be set to 1" | See Comment | **Revised.**Agree with the suggestion and revised the text.Also added definition for the dot11RestrictedTWTOptionImplemented MIB attribute in Annex C based on the discussion in the TGbe call.TGbe editor, please make changes labelled as #7082 in this doc. |

**35.8 Restricted TWT (r-TWT)
35.8.1 General**

TGbe editor: change the second paragraphs in 35.8.1 as follows:

(#7082) An EHT STA that supports restricted TWT operation has dot11RestrictedTWTOptionImplemented set to true, otherwise, the EHT STA has dot11RestrictedTWTOptionImplemented set to false. An EHT STA with dot11RestrictedTWTOptionImplemented equal to true shall set the Restricted TWT Support subfield in transmitted EHT Capabilities elements to 1; otherwise, the EHT STA shall set the Restricted TWT Support subfield in transmitted EHT Capabilities elements to 0.

**Annex C**

**C.3 MIB Detail**

TGbe editor: add the dot11RestrictedTWTOptionImplemented to the Dot11StationConfigEntry as follows:

Dot11StationConfigEntry ::= SEQUENCE

{

dot11StationID MacAddress,

…

(#7082)dot11RestrictedTWTOptionImplemented, TruthValue

}

TGbe editor: add the following for the dot11RestrictedTWTOptionImplemented MIB attribute in the dot11StationConfig TABLE:

(#7082)dot11RestrictedTWTOptionImplemented OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is a capability variable.

Its value is determined by device capabilities.

This attribute, when true, indicates the ability of the EHT STA to support the restricted TWT operation. If the attribute is false, the EHT STA does not support the restricted TWT operation."

::= { StationConfigEntry <Last assigned + 1> }

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| 5642 | Joseph Levy | 3.1 | 37.24 | Restricted target wake time is a definition specific to 802.11, so it should be in clause 3.2. | Move the restricted TWT definition to clause 3.2. Also provide a reference to clause 35.6 where restricted TWT is described. | **Revised.**Agree in principle. Moved restricted TWT definition to clause 3.2 and added a reference to clause 35.8.TGbe editor, please make changes labelled as #5642 in this doc. |
| 6477 | Osama Aboulmagd | 3.1 | 37.24 | The term “enhanced medium access protection” in the definition P37L25. What does “enhanced” mean and enhanced with respect to what? | As in comment | **Revised.**Added a reference to 35.8 (Restricted TWT (r-TWT)) which defines rTWT operation and the channel access rules for r-TWT SPs are defined in 35.8.4.TGbe editor, please make changes labelled as #6477 in this doc. |
| 7676 | Xiaofei Wang | 3.1 | 37.24 | In restricted TWT, is the restriction for latency sensitive traffic? It may be better to explain what the restriction is in the definition | as in comment | **Revised.**Added reference to 35.8 (Restricted TWT (r-TWT)) in the definition. Clause 35.8.4 (Traffic delivery) captures details on traffic prioritization during r-TWT SP. Don’t think we need to add those details in the definition itself. TGbe editor, please make changes labelled as #7676 in this doc. |
| 7875 | Yongho Kim | 3.1 | 37.24 | Since legacy TWT operation is based on the IEEE 802.11 operation, restricted TWT should also be the definition specific to IEEE 802.11 | Move the definition of ‘restricted target wake time’ and ‘restricted target wake time service period’ to clause 3.2 (Definitions specific to IEEE 802.11) | **Revised.**Agree with the suggestion. Moved restricted TWT related definitions to clause 3.2.TGbe editor, please make changes labelled as #7875 in this doc. |
| 4092 | Abhishek Patil | 3.1 | 37.25 | The definition and the medium access protection mechanism is specific to a particular scheme. Hence, provide reference to clause on rTWT. | Append “as defined in 35.6” at the end of the sentence. | **Revised.**Agree with the suggestion. Added a reference to clause 35.8 (Restricted TWT (r-TWT)) in the definition of restricted TWT.TGbe editor, please make changes labelled as #4092 in this doc. |
| 5643 | Joseph Levy | 3.1 | 37.28 | Restricted target wake time service period is a definition specific to 802.11, so it should be in clause 3.2. | Delete the definition for “restricted TWT service period” as the term is only used 4 times in the amendment and all reference are in clause 35.6.2 and clause 35.6.4 so use of the term is restricted to a limited location in the draft. | **Revised.**Agree with the suggestion. Moved restricted TWT service period definition to clause 3.2.TGbe editor, please make changes labelled as #5643 in this doc. |
| 7485 | Tomoko Adachi | 3.1 | 37.28 | The restricted TWT definition mentions the latency sensitive traffic. So the restricted TWT service period should be also defined in relation with the latency sensitive traffic. | Change it to “A restricted period of time that an EHT AP announces to allow stations (STAs) under restricted TWT agreement to transmit and/or receive latency sensitive traffic as defined in 35.6 (Restricted TWT).” | **Revised.**Agree with the commenter to define rTWT SP in relation with the latency sensitive traffic. Revised the definition text to reflect this.TGbe editor, please make changes labelled as #7485 in this doc. |
| 7677 | Xiaofei Wang | 3.1 | 37.28 | assuming restricted TWT SP can only take place during a restricted TWT, If so, it may be better to clearly state that | as in comment | **Revised.**Clarified the r-TWT SP definition to indicate that the r-TWT SP is negotiated using r-TWT setup.TGbe editor, please make changes labelled as #7677 in this doc. |

**3.1 Definitions**

TGbe editor: remove the following two definitions:

**(#5642, #7875) ~~restricted target wake time (r-TWT):~~** ~~TWT with enhanced medium access protection and resource reservation for latency sensitive traffic.~~

**(#5643, #7875) ~~restricted target wake time (r-TWT) service period (SP):~~** ~~A restricted period of time during which certain
stations (STAs) can transmit and/or receive frames as defined in 35.8 (Restricted TWT (r-TWT)).~~

**3.2 Definitions specific to IEEE 802.11**

TGbe editor: insert the following two definitions:

**(#5642, #7875) restricted target wake time (r-TWT):** TWT with enhanced medium access protection and resource reservation for delivery of latency sensitive traffic (#4092) (#6477) (#7676) as described in 35.8 (Restricted TWT (r-TWT)).

**(#5643, #7875) restricted target wake time (r-TWT) service period (SP):** A period of time negotiated using (#7677) r-TWT setup (35.8.2 r-TWT agreement setup) during which r-TWT member stations (STAs) (#7485) prioritize delivery of latency sensitive traffic.

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| 6509 | Pascal VIGER | 35.6.1 | 297.63 | Latency sensitive traffic is not really and completely defined. It shall be added that retransmissions of such traffic is at most useless (or even worst, disastrous for sequences next following a retransmission). | as in comment.Address the ACK issue for latency sensitive data. | **Rejected.**The group didn’t reach consensus on a set of changes that would satisfy the commenter. Also CID 6504 referring to the same issue was resolved as rejected in 22/0508r2.  |
| 5663 | Julien Sevin | 35,6,1 | 297.65 | At the current stage, only one low latency traffic is specified whereas the characteristics can be very different as it has been observed by the 802,11 RTA TIG report (for instance between gaming traffic and virtual reality traffic) | Introduce the notion of type of low latency traffic in order to apply different transmission policies according to the type of traffic. | **Rejected.**In D1.3, QoS Characteristics element has been defined for STA to provide traffic characteristics for latency sensitive traffic streams as part of SCS. AP can consider QoS characteristics information for SCS streams in its scheduling. Don’t see the need to define type of low latency traffic. |
| 5662 | Julien Sevin | 35,6,1 | 297.65 | The terms "Low Latency traffic" is not defined clearly. The traffic characteristics should be explicitly specified (in terms of data rate, latency, jitter, Packet delivery ratio) in order that each station applies the same strategy for the same traffic. In particular, which entity decides which traffic is a low latency traffic or not.. | Define an announcement protocol for announcing clearly at each station the constraints that a traffic should be fulfilled to be considered as low latency | **Rejected.**The group didn’t reach consensus on a set of changes that would satisfy the commenter. |
| 5359 | Jay Yang | 3.1 | 37.24 | restricted target wake time (TWT): TWT with enhanced medium access protection and resource reservation for latency sensitive traffic. Resource in here is not clear, do you mean radio resource or others, please clarify. | As the comment. | **Rejected.**Resource is a well understood term used in 802.11 referring to time/ frequency/spatial stream resource. No additional clarification needed for r-TWT.  |
| 6479 | Osama Aboulmagd | 3.1 | 37.28 | From the baseline: restricted access window (RAW): A medium access interval for a group of stations (STAs) during which aSTA in the RAW group indicated by the RAW parameter set (RPS) element is allowed to contend for accessto the medium. This RAW definition looks awfully close to the definition in P37L28 (Restricted TWT). Is the group adding similar mechanisms for no justification. | Need to have an explanation why is the need for new mechanism and how is it different from other mechanisms that are already in the baseline. | **Rejected.**Technical analysis comparing RAW vs rTWT captured below:1) RAW is explicitly designed for a greenfield band. For latency sensitive traffic we need a mechanism that works well with legacy devices. rTWT is built on top of bTWT which is extensively developed in 11ax for all mainstream bands. 2) RAW is AP-centric with complex and dynamic slot-based scheduling and requires STAs to wake up every beacon interval. rTWT inherits power saving features of bTWT. 3) RAW does not support negotiation between STA and AP, whereas bTWT provides flexibility for STA to negotiate schedule with the AP. 4) bTWT natively supports MU operation from 11ax, whereas RAW needs to be extended for MU.  |