IEEE P802.11
Wireless LANs

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| PDT for Low Latency Indication |
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Abstract

This document contains Proposed Draft Text (PDT) for the LL Indication topic of the proposed TGbn (UHR, Ultra High Reliability) amendment to the 802.11 standard

# Revision information

The following is a summary of the important changes that occurred within each revision of this document:

|  |  |
| --- | --- |
| **Revision** | **Major changes** |
| 0 | Initial revision |
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# Introduction

The proposed changes to the 802.11 TGbn draft 0.1 within this document are based on the following

SP by the TGbn task group:

* [SP ]
* **Define or improve an existing mechanism so that a non-AP STA that is a TXOP responder can indicate its low latency needs (for traffic between the TxOP responder and the TxOP Holder) in a control response frame that is an M-BA frame. The TXOP holder should consider the indication in determining subsequent actions. Subsequent actions related to this indication are out of the scope of the standard.**
	+ **Note: whether an AP can Indicate its Low latency needs is TBD**
	+ **The Low Latency Indication is included in the Feedback field of the Feedback Per AID TID Info field (the one that carries control feedback).**
* **The Feedback Type field is set to 1**
	+ **Note: Feedback Type field set to 0 is used for DUO feedback.**
* **TBD bits in 4-octet Block Ack Bitmap field is defined to provide the low latency need.**

Example relevant IEEE documents:

<https://mentor.ieee.org/802.11/dcn/25/11-25-0439-00-00bn-further-details-on-uhr-low-latency.pptx>

[*https://mentor.ieee.org/802.11/dcn/24/11-24-0389-00-00bn-preemption-for-low-latency.pptx*](https://mentor.ieee.org/802.11/dcn/24/11-24-0389-00-00bn-preemption-for-low-latency.pptx)

[*https://mentor.ieee.org/802.11/dcn/24/11-24-0168-00-00bn-txop-preemption-in-11bn.pptx*](https://mentor.ieee.org/802.11/dcn/24/11-24-0168-00-00bn-txop-preemption-in-11bn.pptx)

[*https://mentor.ieee.org/802.11/dcn/24/11-24-0416-01-00bn-target-sta-prioritization-in-edca-based-preemption-mechanisms-during-a-dl-txop.pptx*](https://mentor.ieee.org/802.11/dcn/24/11-24-0416-01-00bn-target-sta-prioritization-in-edca-based-preemption-mechanisms-during-a-dl-txop.pptx)

[*https://mentor.ieee.org/802.11/dcn/24/11-24-0442-03-00bn-latency-reduction-for-immediate-real-time-application-traffic-transmission.pptx*](https://mentor.ieee.org/802.11/dcn/24/11-24-0442-03-00bn-latency-reduction-for-immediate-real-time-application-traffic-transmission.pptx)

[*https://mentor.ieee.org/802.11/dcn/24/11-24-1195-01-00bn-indication-techniques-for-urgent-traffic.pptx*](https://mentor.ieee.org/802.11/dcn/24/11-24-1195-01-00bn-indication-techniques-for-urgent-traffic.pptx)

[*https://mentor.ieee.org/802.11/dcn/24/11-24-0264-01-00bn-timing-information-sharing-for-next-generation-wlans.pptx*](https://mentor.ieee.org/802.11/dcn/24/11-24-0264-01-00bn-timing-information-sharing-for-next-generation-wlans.pptx)

[*https://mentor.ieee.org/802.11/dcn/23/11-23-1886-03-00bn-preemption-techniques-to-meet-low-latency-ll-targets.pptx*](https://mentor.ieee.org/802.11/dcn/23/11-23-1886-03-00bn-preemption-techniques-to-meet-low-latency-ll-targets.pptx)

 <https://mentor.ieee.org/802.11/dcn/24/11-24-1156-00-00bn-initial-control-frame-exchange-for-low-latency.pptx>

<https://mentor.ieee.org/802.11/dcn/24/11-24-1871-03-00bn-erd-enhanced-reverse-direction-protocol-to-support-txop-sharing-and-low-latency-traffic-exchange.pptx>

<https://mentor.ieee.org/802.11/dcn/24/11-24-1074-00-00bn-preemption-txop.pptx>

<https://mentor.ieee.org/802.11/dcn/23/11-23-1909-01-00bn-transmission-method-of-low-latency-traffic.pptx>

<https://mentor.ieee.org/802.11/dcn/24/11-24-0131-00-00bn-signaling-of-preemption.pptx>

<https://mentor.ieee.org/802.11/dcn/23/11-23-0045-01-0uhr-urgency-based-delivery-of-latency-sensitive-traffic.pptx>

<https://mentor.ieee.org/802.11/dcn/25/11-25-0439-00-00bn-further-details-on-uhr-low-latency.pptx>

***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).***

# Text to be adopted begins here:

**9.3.1.8 BlockAck frame format**

**9.3.1.8.6 Multi-STA BlockAck variant**

***TGbn editor: please change subclause 9.3.1.8.6 as follows***

*[#M141, 151]* If a Per AID TID Info field has the Ack Type subfield equal to 0 and the TID subfield equal to 13 then:

* It includes feedback information instead of Acknowledgement status (see Table 9-39 (Context of the Per AID TID Info subfield and presence of optional subfields if the AID11 subfield is not 2045) ).
* The AID11 subfield of the AID TID Info subfield is set to the AID of a UHR STA that is the intended receiver of the feedback information or to 2008 if the feedback information is intended for all receiving UHR STAs.
* A Feedback subfield is included in the Per AID TID Info field instead of a Block Ack Bitmap subfield and the Feedback subfield has a length defined in Table 9-40 (Fragment Number subfield encoding for the Multi-STA BlockAck variant).
* The Starting Sequence Control subfield has the format shown in Figure 9-xx (Starting Sequence Control subfield format for the Multi-STA BlockAck variant if the AID11 subfield is not 2045 and if the combination of the Ack Type subfield is equal to 0 and the TID subfield is equal to 13 respectively), where the Feedback Type subfield indicates the type and format of feedback carried in the Feedback subfield as defined in Tabe 9-xx (Feedback field Type subfield encoding for the Multi-STA BlockAck variant if the AID11 subfield is not 2045 and if the combinatiuon of the Ack Type subfield is equal to 0 and the TID subfield is equal to 13 respectively).

|  |  |  |  |
| --- | --- | --- | --- |
|  | B0 Bx-1 | Bx By | By+1 16 |
|  | Reserved | Feedback Type | Reserved |
| bits: | TBD | TBD | TBD |

Figure 9-xx—Starting Sequence Control subfield format for the Multi-STA BlockAck variant if the AID11 subfield is not 2045 and if the combination of the Ack Type subfield is equal to 0 and the TID subfield is equal to 13, respectively

**Table 9-xx – Feedback Type subfield encoding for the Multi-STA BlockAck variant if the AID11 subfield is not 2045 and if the combination of the Ack Type subfield is equal to 0 and the TID subfield is equal to 13, respectively**

|  |  |
| --- | --- |
| **Starting Sequence Number subfield** | **Feedback subfield type** |
| 0 | Unavailability feedback |
| 1 | Low latency feedback |
| 2-15 | reserved |

* If the Feedback Type subfield is 0, the Feedback subfield has the format defined in Figure 9-xx (Feedback subfield format for unavailability feedback) and includes unavailability feedback information instead of Acknowledgement status (see Table 9-39 (Context of the Per AID TID Info subfield and presence of optional subfields if the AID11 subfield is not 2045)). [M140, 142] The Unavailability Target Start Time subfield indicates the value of TSF[15:7] at the time when the STA transmitting the Multi-STA BlockAck frame becomes unavailable (see 11.2.1 **(**General**)**). The Unavailablity Duration subfield indicates the duration in units of 64 µs over which the STA transmitting the Multi-STA BA is not available.

|  |  |  |  |
| --- | --- | --- | --- |
|  | B0 B8 | B9 B17 | B18 Variable |
|  | Unavailability Target Start Time | Unavailability Duration | Reserved |
| bits: | 9 | 9 | variable |
| Figure 9-xx----Feedback subfield format for unavailability feedback *[#M140, 142]* |

* If the Feedback Type subfield is 1, the feedback subfield has the format defined in Figure 9-xx (feedback subfield formate for low latency feedback) and includes low latency feedback information instead of the Acknowledgement status (see Table 9-39 (Context of the Per AID TID Info subfield and presence of optional subfields if the AID11 subfield is not 2045)). The Low Latency Indication subfield indicates the type of low latency need request. The encoding of the Low Latency indication subfield is TBD.

|  |  |
| --- | --- |
| B0 Bx | Bx+1 Variable |
| Low Latency Indication | Reserved |
| TBD | variable |

**Figure 9-xx --Feedback subfield formate for low latency feedback**

***TGbn editor: please change subclause 9.7.3 as follows***

**9.7.3 A-MPDU contents**

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| **Table 9-660—A-MPDU contexts** |
| **Name of Context** | **Definition of Context** | **Table defining****permitted contents** |
| Control Response | The A-MPDU is transmitted by a STA that is neither a TXOPholder nor an RD responder, (11ax) or the A-MPDU istransmitted by an HE AP in response to an HE TB PPDU, and the transmitter also needs to transmit one of the followingimmediate response frames:— Ack frame— BlockAck frame with a TID for which an HT-immediateblock ack agreement exists— Multi-STA BlockAck frame for acknowledging multi-TID A-MPDU(11ax) or reporting feedback | Table 9-663 (A-MPDU contents in the control response context) |

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| **Table****9-663 — A-MPDU contents in the control response context** |
| **MPDU** | **Conditions** |
| Ack | Ack frame transmitted in response to an MPDU that requires an Ack frame. | (11ax)One of Ack and compressed BlockAck frame is present at the start of the A-MPDU between two STAs that are not both HE STAs; these are not present other than at the start of the A-MPDU.(11ax)One of Ack, Compressed BlockAck, and Multi-STA BlockAck frame is present at the start of the A-MPDU between two HE STAs; these are not present other than at the start of the A-MPDU. |
| BlockAck | (11ax)Compressed BlockAck frame with a TID that corresponds to an HT-immediate block ack agreement. See NOTE. (11ay)(11ax)Multi-STA BlockAck frame if the preceding PPDU:- is ~~either~~ an HE TB PPDU that solicits an immediate response (see 26.4.4.5 (Responding to an HE TB PPDU with an SU PPDU)), - or an HE PPDU that carries a multi-TID A-MPDU or ack-enabled multi-TID A-MPDU (see 26.6.3 (Multi-TID A-MPDU and ack-enabled single-TID A-MPDU))~~.~~,- or if any preceding PPDU in the TXOP carried a BSRP Trigger frame addressing a STA that is operation in a mode that enables sending feedback in the Mult-STA BlockAck frame.(see 37.11.2 Dynamic Unavailability Operation (DUO) mode and 37.16.1 Low Latency Indication (LLI)).- or if any preceding PPDU in the TXOP requires a BlockAck frame and is addressing a STA that is operation in a mode that enables sending feedback in the Multi-STA BlockAck frame. |
| EDMG Multi-TID BlockAck (11ay) | If the preceding PPDU that carried a multi-TID A-MPDU contains an implicit or explicit block ack requests for multiple TIDs for which an HT-immediate block ack agreement exists, one or several copies of the same EDMG Multi-TID BlockAck frame. (11ay) |
| Action No Ack | (11ax)In an A-MPDU between two STAs that are not both HE STAs:BRP +HTC frames. Action No Ack +HTC frames containing an explicit feedback response.Action No Ack frames that are Flow Suspension frames or Flow Resumption frames.(11ax)In an A-MPDU between two HE STAs: Action No Ack frames. |  |
| (11ax)QoS Null frame with No Ack ack policy | If sent to an HE STA. QoS Null frames with No Ack ack policy.If solicited by an UHR AP’s BSRP Trigger frame that allows inclusion of feedback (see 37.11.2 Dynamic Unavailability Operation (DUO) mode and 37.16.1 Low Latency Indication (LLI)) then an additional Multi-STA BlockAck frame is allowed. |  |
| NOTE—This condition is applicable for BlockAck variants established by block ack agreements and is not applicable for the EDMG Multi-TID BlockAck where the condition depends on a preceding PPDU. (11ay)  |  |  |

***TGbn editor: Please add the following new subclause 37.x Low Latency Indication to the 802.11bn draft D0.1:***

37.16 Low Latency Indication (LLI)

37.16.1 General

Low latency indication (LLI) enables a TXOP responder to inform the TXOP holder regarding its low latency needs. The low latency needs are related to buffered low latency traffic between the TXOP responder and the TXOP holder. The detailed definition of low latency needs is TBD.

A STA that supports low latency indication shall have dot11LowLatencyIndicationActivated equal to true and shall set the Low Latency Indication Support field of the UHR MAC Capability Information field of the UHR Capability element to 1.

A TXOP responder non-AP STA may indicate its low latency needs to the TXOP holder in a multi-STA BlockAck control response frame sent to the TXOP holder if the TXOP holder has set the Low Latency Indication Support field of transmitted UHR Capabilities elements to 1. Upon receiving the low latency indication in the control response frame, the TXOP holder should consider the low latency indication in determining subsequent actions within the current TXOP or subsequent TXOPs. The subsequent actions taken by the TXOP holder after receiving the low latency indication are out of scope of the standard.

Whether a TXOP responder AP may indicate its low latency needs to a TXOP holder non-AP STA is TBD.

# Text to be adopted ends here.