IEEE P802.11  
Wireless LANs

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| CC50 CR Prioritized EDCAs | | | | |
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Abstract

This document contains proposed resolutions to comments received on 802.11bn D0.1.

185 186 214 477 478 479 856 857 858 879 1044 1387 1426 1427 1483 1484 1488 1489 1490 1778 1805 1816 1846 1847 1858 2378 2379 2380 2381 2382 2383 2384 2385 2386 2545 2548 2622 2644 2645 2646 2793 2966 3151 3250 3315 3354 3355 3356 3435 3436 3944 3966

# 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 of the document using 11-24/2007r6 as a baseline |
| 1 | Added CID879 resolution previously missing in r0 |
| 2 | Minor editorial changes |
| 3 | Removed “Rejected” resolution for CID on which group did not reach consensus/did not discuss the change for CIDs: 477 2378 3250 3355  Added clarification on l5p15 “participated in the P-EDCA contention but”  Added an entry for dot11PEDCAOptionImplemented in Dot11UHRStationConfigEntry |
| 4 | Minor editorial changes in Table 37-1 |
| 5 | Minor editorial changes |
| 6 | Editorial changes to some comments resolution reasons  Changed resolution for 477, 2378, 3250, 3355, 479, 1426, 1483, 1490, 1840, 1847, 2548 |
| 7 | Provided resolutions for remaining TBDs in the document  Changed resolution for 2644, 2645 and 879 |
| 8 | Incorporated editorial changes/suggestions received after r7 |
| 9 | Minor editoria changes following r8 presentation. Fixed some typos, deleted duplicate paragraph, added 2 additional row with parameters totable 37-1 |
| 10 | Editorial changes following r9 discussion. |

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| **CID** | **Commenter** | **Comment** | **Proposed Change** | **Resolution** |
| 185 | Yonggang Fang | "Prioritized" in the P-EDCA is not clear. What is to be prioritized? It needs to clarify that P-EDCA is used to prioritize the data being pending in the transmission queue and approaching to its target delivery due. | See the comment | Rejected.  P-EDCA is a mechanism that aims at improving channel access delay latency that is buffered to AC\_VO. We have no SP/motions that speak about “approaching target delivery due” |
| **Balance the impact** | | | | |
| 186 | Yonggang Fang | The TBD rules of balance the impact on the STAs that do not use P-EDCA should be specified clearly. For example, a STA with pending LL data should use P-EDCA only when the time is approaching its target delivery time. | See the comment | Revised – agree with the commenter, provided rules to balance the impact.in this subclause Please apply changes marked as #186 in this document |
| 478 | Peshal Nayak | What is the meaning of balancing the impact? | Provide details on the meaning of balancing the impact | Revised – agree with the commenter. Provided rules in this subclause that limit uncontrolled P-EDCA operations to. Please apply changes marked as #478 in this document |
| 858 | Tomoko Adachi | How the balance is achieved needs to be described. | As in comment. | Revised – agree with the commenter. Provided rules in this subclause that limit uncontrolled P-EDCA operations. Please apply changes marked as #858 in this document |
| 879 | John Wullert | The text for Prioritized EDCA indicates that it should balance the impact on STAs not using P-EDCA. It should also carry forward the medium access characteristics of existing features built on EDCA, including MU-EDCA and EPCS. | Describe how the medium access characteristics of MU-EDCA and EPCS will be applied under P-EDCA. | Revised.  Agree that clarification on how P-EDCA is used along with EPCS and MU EDCA.  Added corresponding text  Please apply changes marked as #879 in this document |
| 1044 | Matthew Fischer | Incorrect use of "should" - should is a normative verb and therefore must be attached to a subject which is some entity for which the amendment describes normative behavior. For example, the amendment can say "A STA should xxxx" or "An EDCAF should xxxx" or even, "the GAS exchange should occur after the expiration of the timer". The use here does not have an identifiable subject and it does not have an umabiguously identifiable/measurable metric by which it can be determined that the recommended behavior has been followed. | Remove the sentence: "The use of P-EDCA by a UHR STA should balance the impact on STAs that do not use P-EDCA with TBD rules." | Revised .  Provided rules that limit uncontrolled P-EDCA operations and removed the “should” language.. Please apply changes marked as #1044 in this document |
| 2379 | Ahmadreza Hedayat | The use of TBD rules to balance the impact on the legacy devoces need to be specified. | As in comment | Revised .  Provided rules that limit uncontrolled P-EDCA operations. in this subclause.. Please apply changes marked as #2379 in this document |
| 2545 | Jinjing Jiang | "The use of P-EDCA by a UHR STA should balance the impact on STAs that do not use P-EDCA with TBD rules" is NOT a clear requirement. There are two choices: the P-EDCA \*\*SHALL\*\* not sacrifice other STAs' QoS, in other words, the TBD rules shall reflect the "MAX-MIN fairness"; or the TBD rules shall create a network-wise better QoS in the sense of "proportional fairness". "Balance" is a very vague word. | State clearly what "balance" means and design the TBD rules based on the selected fairness rule. | Revised .  Provided rules that limit uncontrolled P-EDCA operations. in this subclause.. Please apply changes marked as #2545 in this document |
| 1858 | Sanghyun Kim | A detailed procedure for ensuring balance should be defined. | As in comment | Revised .  Provided rules that limit uncontrolled P-EDCA operations. in this subclause.. Please apply changes marked as #1858 in this document |
| 1816 | Juseong Moon | The current text does not define detailed rules to reduce imapcts by PEDCA operation. For better fairness and reducing impacts, 11bn should define more detailed fairness-related rules for PEDCA operation. | Please add detailed fairness-related rules for PEDCA.  E.g., Rules that restricts PEDCA when a STA had successfully transmitted a low latency frame via PEDCA, etc., | Revised .  Agree in general. Provided rules that limit uncontrolled P-EDCA operations. in this subclause. Please apply changes marked as #1816 in this document |
| 1427 | Akira Kishida | The concrete impact and KPIs for the balance are ambiguous regarding the context of "The use of P-EDCA by a UHR STA should balance the impact on STAs that do not use P-EDCA with TBD rules." | Please consider to clarify. | Revised .  Provided rules that limit uncontrolled P-EDCA operations. in this subclause.. Please apply changes marked as #1427 in this document |
| 1488 | Kotaro NAGANO | Restrictions on the use of P-EDCA and methods to ensure fairness with non-UHR terminals are unclear. It's not clear what "balance" means. (The handling of non-low-latency traffic on non-preferred and UHR terminals is unclear.) | In order to ensure fairness in transmission opportunities, the method of handling non-priority traffic within non-priority terminals and UHR terminals should be specified. | Revised .  Provided rules that limit uncontrolled P-EDCA operations. in this subclause.. Please apply changes marked as #1488 in this document |
| 2966 | Mark RISON | "The use of P-EDCA by a UHR STA should balance the impact on STAs that do not use P-EDCA with TBD rules." -- "should" is for requirements on the implementation, not for requirements on the people writing the spec | Either make into an Editor's note, or make into a "NOTE---The use of P-EDCA by a UHR STA has been designed to balance the impact on STAs that do not use P-EDCA (with TBD rules)." and add a similar NOTE to all the subclauses that define new UHR functionality | Revised .  Provided rules that limit uncontrolled P-EDCA operations in this subclause and removed the should converting the statement into a declarative one. Please apply changes marked as #2966 in this document |
| 3315 | Prabodh Varshney | Rules that balance impact of P-EDCA on devices that do not use P-EDCA are TBD. | Define rules so that the impact of P-EDCA on legacy devices or on UHR devices not using P-EDCA is minimal. | Revised .  Provided rules that limit uncontrolled P-EDCA operations. in this subclause.. Please apply changes marked as #3315 in this document |
| 3354 | Mohamed Abouelseoud | "The use of P-EDCA by a UHR STA should balance the impact on STAs that do not use P-EDCA with TBD rules." balance the impact is unclear | please define what is meant by "balance the impact" | Revised .  Provided rules that limit uncontrolled P-EDCA operations. in this subclause.. Please apply changes marked as #3354 in this document |
| 3356 | Mohamed Abouelseoud | "The use of P-EDCA by a UHR STA should balance the impact on STAs that do not use P-EDCA with TBD rules." | define TBD rules to limit the effect on legacy STAs and STAs not using P-EDCA | Revised .  Provided rules that limit uncontrolled P-EDCA operations in this subclause. Please apply changes marked as #3356 in this document |
| 3966 | John Coffey | "The use of P-EDCA by a UHR STA should balance the impact on STAs that do not use P-EDCA with TBD rules." I assume (or at least hope) that this will not be a mere "should". Basic coexistence with legacy requires some strict requirements to make sure that legacy devices are not starved of medium access. As a more minor point, they will not be "rules" if there is no need to follow them; they would at most be recommendations. | Change "should" to "shall". | Revised .  Provided rules that limit uncontrolled P-EDCA operations in this subclause. Removed should from this sentence as the rules provided in the subsequent paragraphs are more stringent and precise. Please apply changes marked as #3966 in this document |
| 1778 | Chaoming Luo | The use of P-EDCA by a UHR STA should balance the impact on STAs that do not use P-EDCA with MU-EDCA mechanism. | As in comment. | Revised .  Provided rules that limit uncontrolled P-EDCA operations. operations in this subclause. Please apply changes marked as #3966 in this document |
| **Other cases are TBD, VI** | | | | |
| 477 | Peshal Nayak | The mechanism should also provide means to reduce the access delay distribution for other types of traffic. E.g., VI, BE where real time gaming/cloud gaming traffic is typically mapped to. | Provide mechanism for other Acs as well | Revised  P-EDCA is intended for low latency traffic in AC\_VO. Enablement for other EDCAFs needs careful evaluation that can be done in subsequent amendments.  Please apply changes marked as #477 in this document |
| 2378 | Ahmadreza Hedayat | The TBD for other ACs need to be resolved. Given other ACs have less priority that AC\_VO, it does not make sence to allow other access categories to use P-EDCA. Suggest to remove this TBD. | As in comment | Revised  Agree in principle. Removed the “(other cases are TBD)”  Please apply changes marked as #2378 in this document |
| 3250 | GEORGE CHERIAN | Remove "other cases are TBD)." | As in the comment | Revised  Agree in principle. Removed the “(other cases are TBD)”  Please apply changes marked as #3250 in this document |
| 3355 | Mohamed Abouelseoud | "(other cases are TBD)." Unclear what are the other cases | please define what are the other cases if needed | Revised  Removed the “(other cases are TBD)”  Please apply changes marked as #3355 in this document |
| 479 | Peshal Nayak | The term STAs that do not use P-EDCA is unclear. Does it include legacy STAs that do not support P-EDCA as well or only UHR STAs that do not use P-EDCA because their traffic does not need the mechanism to meet its low latency requirements? | Provide the details on the meaning of the term 'STAs that do not use P-EDCA' | Revised  Replaced “do not use” with “do not support” |
| 856 | Tomoko Adachi | It is not clear what the low latency AC\_VO traffic means. Is it low latency traffic that uses AC\_VO? Is AC\_VO traffic expected to be delivered in low latency always? When AC\_VO was introduced in 11e, it was the later intention. But for P-EDCA, it seems that only a portion of the AC\_VO traffic meant to be the case. | Clarify the description. | Revised.  Agree in principle with the commenter. The intention is to enable traffic for the traffic buffered to AC\_VO  Please apply changes marked as #856 in this document |
| **Describe how PEDCA work** | | | | |
| 857 | Tomoko Adachi | How P-EDCA works needs to be described. | As in comment. | Revised.  Text related to motion 272, 339, 340 and 341 added to describe P-EDCA framework. Please apply changes marked as #857 in this document |
| 1387 | Dmitry Akhmetov | Provide rules for P-EDCA operations including enablement, initiation and termination of P-EDCa contention, P-EDCA contention parameters, rules of transmission of initial control frame and retransmission attempts for control frame | as in comment | Revised.  Text related to motion 272, 339, 340 and 341 added to describe P-EDCA framework. Please apply changes marked as #1387 in this document |
| 1805 | Patrice Nezou | Please clarify the operations and the goals of the Prioritizaed EDCA mechanism | as in comment | Revised.  Text related to motion 272, 339, 340 and 341 added to describe P-EDCA framework. Please apply changes marked as #1805 in this document |
| 2380 | Ahmadreza Hedayat | Specify the rules and conditions that a STA is allowed to transmit a DS frame. | As in comment | Revised.  Text related to motion 272, 339, 340 and 341 added to describe P-EDCA framework. Please apply changes marked as #1387 in this document |
| 2381 | Ahmadreza Hedayat | Missing MIB variable dot11PEDCAOptionImplemented. Add it | As in comment | Revised  Please apply changes marked as #2381 in this document |
| 2382 | Ahmadreza Hedayat | Specify the TBD control frame that is used for DS transmission. Motion 272. | As in comment | Revised.  Text related to motion 272, 339, 340 and 341 added to describe P-EDCA framework. Please apply changes marked as #2382 in this document |
| 2383 | Ahmadreza Hedayat | Specify any attribute of the TBD control frame that is important for P-EDCA operation, e.g. the duration field, address field of the DS frame. Motion 272. | As in comment | Revised.  Text related to motion 272, 339, 340 and 341 added to describe P-EDCA framework. Please apply changes marked as #2383 in this document |
| 2384 | Ahmadreza Hedayat | Specify the attributes of the short contention interval: AIFSN, CWmin and CWmax. Motion 272. | As in comment | Revised.  Text related to motion 272, 339, 340 and 341 added to describe P-EDCA framework. Please apply changes marked as #2384 in this document |
| 2385 | Ahmadreza Hedayat | Specify the attributes for contending to transmit after DS frame transmission: AIFSN, CWmin and CWmax. | As in comment | Revised.  Text related to motion 272, 339, 340 and 341 added to describe P-EDCA framework. Please apply changes marked as #2385 in this document |
| 2386 | Ahmadreza Hedayat | Specify the max number of times that a HP EDCA STA can transmit a DS frame untill it succeeds establishing a TXOP. | As in comment | Revised.  Text related to motion 272, 339, 340 and 341 added to describe P-EDCA framework. Please apply changes marked as #2386 in this document |
| 2644 | Mikhail Liubogoshchev | The procedure for AP enabling P-EDCA is undefined | Allow the AP to enable P-EDCA for particular traffic streams of the STAs using SCS/MSCS framework | Revised  P-EDCA is enabled by the AP by setting a bit in corresponding field of a beacon frame  Please apply changes marked as#2644 in this document |
| 2645 | Mikhail Liubogoshchev | The criteria for a STA to be eligible for P-EDCA aren't defined | UHR shall define the criteria for a STA to be eligible for P-EDCA | Revised  Provided description of eligibility to use P-EDCA  Please apply changes marked as#2645 in this document |
| 3944 | Binita Gupta | For Prioritized EDCA, there should be management and control from the AP to avoid misuse of HiP EDCA feature. AP should advertise its policy for the use of HiP EDCA and also need to enable negotiation for use of HiP EDCA for specific TIDs/ACs/ SCS streams (for specific flows based on TCLAS). AP policy could indicate conditions for using HiP EDCA e.g. after N failure for a frame, list of allowed ACs or TIDs for HiP EDCA, SCS stream based negotiation required for HiP EDCA etc. Secondly, for each SCS stream requiring low-latency QoS, there should be negotiation as part of SCS setup for use of HiP EDCA. A STA should use HiP EDCA only if permitted to use HiP EDCA per AP policy and/or negotiation.  Additionally, the set of parameters used for HiP EDCA protected contention should be announced by the AP, so there is no misuse by the STAs and fairness is maintained for legacy STAs by AP controlling these parameters for HiP EDCA supporting STAs. | Define a way for AP to advertise its policy for use of HiP EDCA and parameters related to HiP EDCA protected contention. Enhance SCS to enable negotiation for use of HiP EDCA when needed. | Revised  Provided description (per motion 272) how AP enable P-EDCA in the BSS by setting a bit in the field of the beacon frame.  The group did not reach conclusion on enhancing SCS for the use of P=-EDCA |
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| 1426 | Akira Kishida | Though in this subclause (Prioritized EDCA), only AC\_VO traffic is treated as low latency traffic, the precise definition of low latency traffic should be clarified by creating another section for that. | Delete the sentence "AC\_VO traffic (other cases are TBD)." and refer to the section defining low latency traffic. | .Revised  Motions 123 and 272 state the low latency traffic is treated as VO with the intention to constrain operation to traffic buffered to AC\_VO  Focusing on AC\_VO traffic. So removing low latency.  Please apply changes marked as #1426 in this document |
| 1483 | Akira Kishida | Regarding the sentence "... that reduces the access delay distribution tail for low latency AC\_VO traffic (Other cases are TBD)." There should not be limited to AC\_VO for the target low latency traffic. | Different ACs or low latency traffic with latency requirements different from the AC\_VO traffic should be handled in this feature. | . Revised  Motion 123 and 272 clearly speak only about AC\_VO. “other cases are TBD” still under discussion and group did not reach any conclusion  Focusing on AC\_VO traffic. So removing low latency. And also removing the TBD.  Please apply changes marked as #1483 in this document |
| 1484 | Akira Kishida | A precise definition of how to handle AC\_VO traffic should be clarified. For instance, AC\_VO traffic from legacy STAs, AC\_VO traffic from UHR STAs that support P-EDCA, and AC\_VO traffic from UHR STAs that do not support P-EDCA should be clarified. | Please consider to clarify. | . Revised  STAs that do not support P-EDCA rely strictly on legacy EDCA mechanism to deliver traffic buffered to AC\_VO. STAs that support P-EDCA may use both P-EDCA and legacy EDCA to deliver traffic buffered to AC\_VO, interchangeably. Proposed rules clarify this.  Please apply changes marked as #1484 in this document |
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| 1489 | Kotaro NAGANO | It is better to define features that can handle traffic with different delay requirements. | ACs should be more subdivided and mechanisms for handling them should be added. | Rejected.  Commenter failed to identify technical issue |
| 1490 | Kotaro NAGANO | Not sure if AC\_VO traffic is always sent with P-EDCA. It is not clear whether it is transmitted separately from conventional AC\_VO. | The handling of AC\_VO when P-EDCA is enabled should be specified. | . Revised  Delivery of a traffic buffered to AC\_VO is handled by legacy EDCA mechanism. P-EDCA is used only when certain conditions are met and P-EDCA defines a procedure to access the medium in such cases. P-EDCA STA can use them interchangeably. Proposed rules clarify this.  Please apply changes marked as #1490 in this document |
| 1846 | Yusuke Tanaka | Consideration should be given to cases where hidden nodes interfere with HIP EDCA STA such as dense environments. | Please define measures against hidden terminals. For example, define a mode that transmits a response signal from the receiving AP, such as RTS/CTS. | .Revised  A mode that may require confirmation to the transmitted frame already exists today. If STA receive a confirmation to the transmitted frame, it may continue a frame exchange as defined in current version of the standard. Hidden node problems that may occur in P-EDCA contention are addressed with backoff procedure and mandatory RTS/CTS exchange.  Please apply changes marked as #1486 in this document |
| 1847 | Yusuke Tanaka | Consideration should be given to cases where multiple competing nodes using HIP EDCA exist. | Please define measures against contention between multiple STAs using HIP EDCA. Repeat protected short contention multiple times, or define mechanism that uses randomness such as frequency axis (like UORA). | .Revised  Text related to motion 272, 339, 340 and 341 added to describe P-EDCA framework. It is possible for more than 1 STA to compete using P-EDCA contention. A STA that did not deliver traffic using P-EDCA may initiate another P-EDCA contention. RTS/CTS is required for P-EDCA STAs.  Please apply changes marked as #1487 in this document. |
| 2548 | Behnam Dezfouli | P-EDCA must minimize additional channel usage by avoiding extra frame transmissions (e.g., Defer Signal), particularly when the data to be sent is below a defined threshold. | Instead of transmitting a Defer Signal (along with RTS and CTS), a STA may use a shorter timeout duration to detect transmission failure and then compete for channel access again. If the channel is detected as idle during the timeout interval, the STA can immediately compete for channel access without waiting for a response frame. However, if the channel is detected as busy, the STA must wait either to receive a frame or until the channel becomes idle. | RevisedThe P-EDCA contention can only be started by sending a DS-CTS frame and therefore cannot be omitted. |
| 2622 | Yue Qi | Ambiguity in "Access delay distribution tail", since this reduction is not based on theoretical analysis, the wording can be misleading if no explicit probability distribution is given. However, "access delay tail" avoid statistical assumptions. | Propose to change "Access delay distribution tail" to "tail behavior of the access delay distribution" or "likelihood of access delay distribution tail" | Rejected  The is no ambiguity:  The “tail of the distribution” is/are the part of the distribution that are farther away from the mean and represent extreme values.  The sentence “mechanism that reduces the access delay distribution tail for the traffic buffered to AC\_VO” clearly link reduction of “tail of distribution” and distribution is “distribution of channel access delays”. |
| 2646 | Mikhail Liubogoshchev | P-EDCA doesn't provide high QoS to many contending LL stations | UHR shall define a mechanism to ensure low collision rate in P-EDCA contention | Rejected.  Commenter failed to identify technical reason.  P-EDCA is not aimed to provide high QoS, it is aimed at reduction of channel access tail latency |
| 2793 | Daniel Verenzuela | To balance the impact of P-EDCA the AP should be involved in the frame exchange that leads to a P-EDCA period | P-EDCA can be started by a frame exchange similar to RTS CTS so that the AP can control its usage. The commenter will provide a contribution with details |  |
| 3151 | Behnam Dezfouli | P-EDCA must balance the tail latency of all LL STAs, regardless of their signal quality and distance from the AP. | P-EDCA should take signal quality into account when determining its operation and deciding when a STA is allowed to transmit a Defer Signal. | Rejected.  Commenter failed to identify technical reason.  Signal quality imbalance due to distance/obstacles/channel variation is not unique to P-EDCA but a known problem for WiFi |
| 3435 | Muhammad Kumail Haider | "..that reduces the access delay distribution tail for low-latency AC\_VO traffic". Reduces in some/most/all cases? Can we quantitatively prove that. Further what's distribution tail here? | Claim should be modified to "helps/aims to reduce access delay..". Further, some elaboration on "distribution tail" should be provided (e..g., P75/P90 latency and above) | Rejected  The “tail of the distribution” is/are the part of the distribution that are farther away from the mean and represent extreme values.  The sentence “mechanism that reduces the access delay distribution tail for the traffic buffered to AC\_VO” clearly link reduction of “tail of distribution” and distribution is “distribution of channel access delays. |
| 3436 | Muhammad Kumail Haider | "Low-latency AC\_VO traffic" This phrase implies that all low latency traffic is AC\_VO and vice versa. Low latency traffic may be mapped to AC\_VI as well for example. | Suggest to use "low latency" qualifier as a use case scenario (e.g., when low-latency traffic is mapped to AC\_VO) rather than stating it as the norm | Revised.  Agree in principle.  Removed qualifier  Motions 123 and 272 use “Low latency is treated as AC\_VO” bullet to make that mechanism is for AC\_VO  Please apply changes marked as #3436 in this document |

# 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 TGbn Draft. The abstract, revision information, introduction, explanation of the proposed changes and references sections are not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGbn Draft (i.e., they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

## Explanation of the proposed changes:

The proposed changes to the 802.11 TGbn draft within this document are based on the following motions adopted by the TGbn task group:

### Relevant passed motions:

[Motion 123, [1] doc #11-24/0171r19 ,SP2 – Channel Access, doc 11-24/1667r13]

**Do you agree to improve EDCA to reduce tail access delay of Low Latency traffic in multi-BSS dense scenarios in presence of best effort traffic?**

* The solution to improve EDCA is distributed
* The impact on legacy device has to be balanced
* Low Latency traffic is treated as AC\_VO traffic. Other cases are TBD

[Motion 272, [2] doc #11-25-0014r7, SP – Channel Access: doc 11-24/2074r18

**Do you agree to define PEDCA in UHR where a STA with Low Latency traffic may be allowed, based on TBD conditions, to send a Defer Signal (it is TBD whether RTS or CTS frame is used) to start a protected short contention for pending LL data**

* Conditions to be allowed to send a Defer Signal is TBD
* STA in PEDCA always use RTS/CTS as initial frame exchange and retry.
* Duration of protected short contention is TBD.
* Access parameters (AIFSN, CW and the expansion rules) used to transmit the Defer Signal are TBD.
* The retry count where the Defer Signal is allowed to be sent is TBD
* Contention parameters for the protected short contention are TBD. The STAs that transmitted a Defer Signal but did not win the protected short contention will initiate a new retry.
* Low Latency traffic is treated as AC\_VO traffic. Other cases are TBD.
* The solution would provide control on the degree of collisions that may occur while using it and, allows for autonomous randomness or/and controlled by the AP
* No new mandatory synchronization requirement on STA side
* HIP EDCA is used by the STA in a BSS only when this feature is enabled by the AP

[Motion 339, [3] doc #11-25-0014r13, SP – Channel Access: doc 11-24/0221r10

11bn defines CTS as Defer Signal to start protected short contention for the pending LL data

[Motion 340, [3] doc #11-25-0014r13, SP – Channel Access: doc 11-24/0221r10

* TGbn defines the reference value for the Protected Duration of the protected short contention
  + The default value is equal to AIFSN[2] + 7 slots (97 us)
  + The Defer Signal frame carry that Protected Duration in the Duration field
  + UHR AP may advertise values other than default

[Motion 341, [3] doc #11-25-0014r13, SP – Channel Access: doc 11-24/0221r10

* Define default parameters for P-EDCA for AC\_VO to be used during protected short contention period as follows:
  + P-EDCA CWmin=7, P-EDCA CWmax=7
  + P-EDCA AIFSN=2
  + An UHR AP may advertise values other than default

# Text to be adopted begins here:

**3.2 Definitions specific to IEEE 802.11**

***TGbn editor: Please modify the body of subclause 3.2 (Definitions specific to IEEE 802.11) as follows:***

**defer signal clear to send (CTS) frame: [DS-CTS]** A CTS frame transmitted by a station (STA) to start prioritized enhanced distributed channel access (P-EDCA) contention.

* UHR Capabilities element
* General
* UHR MAC Capabilities Information field

***TGbn editor: Please update UHR MAC Capabilities in 11bn D0.1 to add P-EDCA Support field as below***

The format of the UHR MAC Capabilities Information field is defined in Figure 9-aa5 (UHR MAC Capabilities Information field format).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B4 | B5 | B6 | B7 | B8 Bx |
|  | DPS Support | DPS Assisting Support | Multi-Link Power Management | NPCA Supported | BSR Enhancement Support | DBE Support | P-EDCA Support | Reserved |
| Bits: | 1 | 1 | 1 | 1 | 1 | 1 | 1 | x-8 |
| * UHR MAC Capabilities Information field format | | | | | | | | |

|  |  |  |
| --- | --- | --- |
| * Subfields of the UHR MAC Capabilities Information field (continued) | | |
| Subfield | Definition | Encoding |
| … | … | … |
| P-EDCA Support | Indicates whether or not P-EDCA is supported | Set to 1 if dot11PEDCAOptionActivated is true (see 37.2 (Prioritized EDCA)).  Set to 0 otherwise. |

***TGbn editor: please make changes to the following subclause:***

37.2 Prioritized EDCA[#M123]

Prioritized EDCA (P-EDCA) is an enhancement of the EDCA mechanism (see 10.23.2 (HCF contention based channel access (EDCA)) that reduces the access delay distribution tail for [#856, 1426, 3436] AC\_VO traffic [#2378 #3250 # 477 #3355 #1483] The use of P-EDCA by a UHR STA balances the impact on STAs that do not support P-EDCA by the rules and restrictions that are defined below. [#186 478 858 879 1044 2379 2545 1858 1816 1427 1488 2966 3315 3354 3356 3966 479]***TGbn editor: please insert the following paragraphs:***

[#857 1387 1805 2380 2381 2382 2383 2384 2385 2386 1484 1490] A STA that has dot11PEDCAOptionActivated equal to true is called a P-EDCA STA and shall set the P-EDCA Support subfield of the UHR MAC Capabilities Information field of the UHR Capabilities element to 1, otherwise the STA shall set the P-EDCA Support subfield to 0.

An AP that has enabled P-EDCA operation shall set the P-EDCA Enabled field in UHR operation element to 1.

P-EDCA STAs shall maintain a P-EDCA station retry counter, PSRC[AC\_VO]. The initial value for PSRC[AC\_VO] shall be 0. PSRC[AC\_VO] shall be incremented by 1 with every transmission of the DS-CTS frame. PSRC[AC\_VO] shall be set to 0 when QSRC[AC\_VO] is set to 0.

A P-EDCA STA may start a P-EDCA contention if all of the following conditions are satisfied:

* [#2644 2645 3944] P-EDCA is enabled by the AP in the BSS and the P-EDCA non-AP STA has notified the AP of its intent to use P-EDCA on the link.
* The P-EDCA STA has pending AC\_VO buffered traffic
* QSRC[AC\_VO] is equal or greater than dot11PEDCARetryThreshold and PSRC[AC\_VO] is not greater than dot11PEDCAConsecutiveAttempt

To start the P-EDCA contention, the P-EDCA STA shall transmit [#339] a Defer Signal CTS (DS-CTS) frame.

The DSAIFS[AC\_VO] is a duration derived from the relation:

DSAIFS[AC\_VO] = aSIFSTime + (AIFSN + DSr) × aSlotTime

where AIFSN is 2 and DSr is an integer value chosen randomly with a uniform distribution taking values in the range 0 to CWds[AC\_VO] for every transmission of DS-CTS frame. The transmission of the [#339] DS-CTS frame shall occur at the DSAIFS[AC\_VO] slot boundary if the STA’s CS mechanism (see 10.3.2.1 (CS mechanism)) determines that the medium is idleThe [#339] DS-CTS frame shall be transmitted in a non-HT PPDU or non-HT PPDU duplicate format, using 6 Mb/s data rate, and SCRAMBLER\_INITIAL\_VALUE is fixed. The RA field shall be set to the unicast MAC address with OUI 00:0F:AC and the remaining bits set by ANA ~~TBD~~, and the Duration field shall be set to the value of the P-EDCA contention duration in Table 37-1.

The P-EDCA contention shall start immediately after the end of the transmitted [#339] DS-CTS frame and shall follow the random backoff procedure defined in 10.23.2.4 (Obtaining an EDCA TXOP) except that:

* Only EDCAF[AC\_VO] shall be allowed to contend during the P-EDCA contention. Operation of the other EDCAFs is suspended.
* [#341] The EDCAF[AC\_VO] shall initialize AIFSN, CWmin, and CWmax with the values of P-EDCA AIFSN, P-EDCA CWmin, and P-EDCA CWmax respectively. CW[AC\_VO] shall be initialized to CWmin[AC\_VO].
* The EDCAF[AC\_VO] shall set the backoff counter to an integer value chosen randomly with a uniform distribution taking values in the range 0 to CW[AC\_VO].

Table 37-1 (Default P-EDCA parameter set) defines the default P-EDCA parameter used by a P-EDCA STA when the AP does not advertise a P-EDCA parameter set for the P-EDCA contention, for the transmission of a DS-CTS frame, and for the conditions to start P-EDCA. If the AP advertises P-EDCA parameter set for the parameters in Table 37-1, then the P-EDCA STA shall update the P-EDCA parameter set to the most recent received P-EDCA parameter set.

A P-EDCA STA that initiates a TXOP (see 10.23.2.4) during a P-EDCA contention shall transmit an RTS frame as initial frame in the TXOP [#1486 1487].

**Table 37-1 — [#M341] Default P-EDCA parameter set**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| AC | P-EDCA CWmin | P-EDCA CWmax | P-EDCA AIFSN | P-EDCA contention duration | CWds | P-EDCA PSRC threshold | P-EDCA QSRC threshold |
| AC\_VO | 7 | 7 | 2 | 97 µs | 0 | 1 | 2 |
| NOTE 1— The NAV set by the Duration field of the DS-CTS frame protects the medium for the maximum P-EDCA contention duration: aSifsTime + (AIFSN + CWMax) \* aSlotTime. Hence, the values relate as follows: 97 µs = 16 µs + (2 + 7) × 9 µs  NOTE 2—The value of the P-EDCA contention duration is fixed and is not advertised by the AP | | | | | | | |

A P-EDCA STA that successfully (as defined in 10.23.2.2 EDCA Backoff procedure) delivered one or more pending MPDUs in a TXOP obtained during P-EDCA contention shall not start P-EDCA contention until conditions to start P-EDCA are satisfied. Additionally, the EDCAF[AC\_VO] shall update AIFSN, CWmin, and CWmax with the values in dot11EDCATable (dot11QAPEDCATable for the AP) and an operation of EDCAF[AC\_VI], EDCAF[AC\_BE], EDCAF[AC\_BK] is resumed.

NOTE 1— After successful delivery of one or more pending MPDUs the STA resets QSRC[AC\_VO], therefore conditions to start P-EDCA contention are no longer satisfied.

A P-EDCA STA that participated in a P-EDCA contention but did not initiate a TXOP (see 10.23.2.4) during the P-EDCA contention or that initiated a TXOP but did not receive the CTS frame in response to the RTS frame used to initiate the TXOP may start another P-EDCA contention by sending the DS-CTS frame at DSAIFSN[AC\_VO] slot boundary if the STA’s CS mechanism (see 10.2.3.1 (CS mechanism)) determines that the medium is idle, for up to dot11PEDCAConsecutiveAttempt. If PSRC[AC\_VO] reaches dot11PEDCAConsecutiveAttempt transmission attempts , the P-EDCA STA shall not attempt to start P-EDCA contention until the QSRC[AC\_VO] counter is reset and all the conditions to start P-EDCA defined in this subclause are satisfied. Additionally, the EDCAF[AC\_VO] shall update the AIFSN, CWmin, and CWmax with the values in dot11EDCATable (dot11QAPEDCATable for the AP) and an operation of the EDCAF[AC\_VI], EDCAF[AC\_BE], EDCAF[AC\_BK] is resumed.

NOTE 2— The STA follows the EIFS, CTSTimeout, and NAVTimeout deferral rules before attempting to transmit a DS-CTS to start a P-EDCA contention.

﻿**Annex C**

**C.3 MIB Detail**

***TGbn editor: Please add the following new MIB variable***

Dot11UHRStationConfigEntry ::=

SEQUENCE {

dot11CoRTWTOptionImplemented TruthValue,

dot11NPCAOptionImplemented TruthValue,

dot11DUOOptionImplemented TruthValue,

dot11UHRBSROptionImplemented TruthValue,

[#2381]dot11PEDCAOptionActivated TruthValue,

}

[#2381]dot11PEDCAOptionActivated OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a control variable

It is written by an external management entity or the SME.

Changes take effect as soon as practical in the implementation.

This attribute, when true, indicates that the station supports P-EDCA. If false, then the station does not support P-EDCA

::= { dot11UHRStationConfigEntry <ana> }

dot11PEDCARetryThreshold OBJECT-TYPE

SYNTAX Unsigned32 (1..65535)

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a control variable.

It is written by an external management entity.

Changes take effect as soon as practical in the implementation.

This attribute indicates the maximum number of transmission attempts of a frame that are made before a condition to initiate P-EDCA contention is indicated."

DEFVAL { 2 }

::= { dot11UHROperationEntry <ana> }

dot11PEDCAConsecutiveAttempt OBJECT-TYPE

SYNTAX Unsigned32 (1..65535)

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a control variable.

It is written by an external management entity.

Changes take effect as soon as practical in the implementation.

This attribute indicates the maximum number of allowed consecutive P-EDCA contention attempts"

DEFVAL { 1 }

::= { dot11UHROperationEntry <ana> }

**Text to be adopted ends here.**

**SP: Do you agree** **to incorporate the proposed text changes for P-EDCA in 11-24/0627r10 to the latest TGbn draft?**

**References:**

1. [11-24-0171r21](https://mentor.ieee.org/802.11/dcn/24/11-24-0171-21-00bn-tgbn-motions-list-part-1.pptx): 11-24-0171-21-00bn-tgbn-motions-list-part-1, Alfred Asterjadhi (Qualcomm Inc.)
2. [11-25-0014-r7](https://mentor.ieee.org/802.11/dcn/25/11-25-0014-07-00bn-tgbn-motions-list-part-2.pptx): 11-25-0014-07-00bn-tgbn-motions-list-part-2, Alfred Asterjadhi (Qualcomm Inc.)