IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Proposed spec text for MU EDCA parameters | | | | |
| Date: 2016-09-01 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Laurent Cariou |  |  |  | laurent.cariou@intel.com |
| Robert Stacey | Intel | 2111 NE 25th Ave, Hillsboro OR 97124, USA | +1-503-724-893 | robert.stacey@intel.com |
| Shahrnaz Azizi |  |  |  | shahrnaz.azizi@intel.com |
| Po-Kai Huang |  |  |  | po-kai.huang@intel.com |
| Qinghua Li |  |  |  | quinghua.li@intel.com |
| Xiaogang Chen |  |  |  | xiaogang.c.chen@intel.com |
| Chitto Ghosh |  |  |  | chittabrata.ghosh@intel.com |
| Yaron Alpert |  |  |  | yaron.alpert@intel.com |
| Assaf Gurevitz |  |  |  | assaf.gurevitz@intel.com |
| Ilan Sutskover |  |  |  | ilan.sutskover@intel.com |
| Feng Jiang |  |  |  | feng1.jiang@intel.com |
| Minho Cheong | Newracom | 9008 Research Dr.  Irvine, CA 92618 |  | minho.cheong@newracom.com |
| Reza Hedayat |  | reza.hedayat@newracom.com |
| Young Hoon Kwon |  | younghoon.kwon@newracom.com |
| Yongho Seok |  | yongho.seok@newracom.com |
| Daewon Lee |  | daewon.lee@newracom.com |
| Yujin Noh |  | yujin.noh@newracom.com |
| Ron Porat | Broadcom |  |  | rporat@broadcom.com |
| Sriram Venkateswaran |  |  |  |
| Matthew Fischer |  |  | mfischer@broadcom.com |
| Zhou Lan |  |  |  |
| Leo Montreuil |  |  |  |
| Andrew Blanksby |  |  |  |
| Vinko Erceg |  |  |  |
| Thomas Derham |  |  |  |
| Mingyue Ji |  |  |  |
| Robert Stacey | Intel | 2111 NE 25th Ave, Hillsboro OR 97124, USA | +1-503-724-893 | robert.stacey@intel.com |
| Shahrnaz Azizi |  | shahrnaz.azizi@intel.com |
| Po-Kai Huang |  | po-kai.huang@intel.com |
| Qinghua Li |  | quinghua.li@intel.com |
| Xiaogang Chen |  | xiaogang.c.chen@intel.com |
| Chitto Ghosh |  | chittabrata.ghosh@intel.com |
| Laurent Cariou |  | laurent.cariou@intel.com |
| Yaron Alpert |  | yaron.alpert@intel.com |
| Assaf Gurevitz |  | assaf.gurevitz@intel.com |
| Ilan Sutskover |  | ilan.sutskover@intel.com |
| Feng Jiang |  | feng1.jiang@intel.com |
| Hongyuan Zhang | Marvell | 5488 Marvell Lane, Santa Clara, CA, 95054 | 408-222-2500 | hongyuan@marvell.com |
| Lei Wang |  | Leileiw@marvell.com |
| Liwen Chu |  | liwenchu@marvell.com |
| Jinjing Jiang |  | jinjing@marvell.com |
| Yan Zhang |  | yzhang@marvell.com |
| Rui Cao |  | ruicao@marvell.com |
| Sudhir Srinivasa |  | sudhirs@marvell.com |
| Bo Yu |  | boyu@marvell.com |
| Saga Tamhane |  | sagar@marvell.com |
| Mao Yu |  | my@marvel..com |
| Xiayu Zheng |  | xzheng@marvell.com |
| Christian Berger |  | crberger@marvell.com |
| Niranjan Grandhe |  | ngrandhe@marvell.com |
| Hui-Ling Lou |  | hlou@marvell.com |
| Alice Chen | Qualcomm | 5775 Morehouse Dr. San Diego, CA, USA |  | alicel@qti.qualcomm.com |
| Albert Van Zelst | Straatweg 66-S Breukelen, 3621 BR Netherlands |  | allert@qti.qualcomm.com |
| Alfred Asterjadhi | 5775 Morehouse Dr. San Diego, CA, USA |  | aasterja@qti.qualcomm.com |
| Bin Tian | 5775 Morehouse Dr. San Diego, CA, USA |  | btian@qti.qualcomm.com |
| Carlos Aldana | 1700 Technology Drive San Jose, CA 95110, USA |  | caldana@qca.qualcomm.com |
| George Cherian | 5775 Morehouse Dr. San Diego, CA, USA |  | gcherian@qti.qualcomm.com |
| Gwendolyn Barriac | 5775 Morehouse Dr. San Diego, CA, USA |  | gbarriac@qti.qualcomm.com |
| Hemanth Sampath | 5775 Morehouse Dr. San Diego, CA, USA |  | hsampath@qti.qualcomm.com |
| Lin Yang | 5775 Morehouse Dr. San Diego, CA, USA |  | linyang@qti.qualcomm.com |
| Lochan Verma | 5775 Morehouse Dr. San Diego, CA USA |  | lverma@qti.qualcomm.com |
| Menzo Wentink | Straatweg 66-S Breukelen, 3621 BR Netherlands |  | mwentink@qti.qualcomm.com |
| Naveen Kakani | 2100 Lakeside Boulevard Suite 475, Richardson TX 75082, USA |  | nkakani@qti.qualcomm.com |
| Raja Banerjea | 1060 Rincon Circle San Jose CA 95131, USA |  | rajab@qit.qualcomm.com |
| Richard Van Nee | Straatweg 66-S Breukelen, 3621 BR Netherlands |  | rvannee@qti.qualcomm.com |
| Rolf De Vegt | Qualcomm | 1700 Technology Drive San Jose, CA 95110, USA |  | rolfv@qca.qualcomm.com |
| Sameer Vermani | 5775 Morehouse Dr. San Diego, CA, USA |  | svverman@qti.qualcomm.com |
| Simone Merlin | 5775 Morehouse Dr. San Diego, CA, USA |  | smerlin@qti.qualcomm.com |
| Tevfik Yucek | 1700 Technology Drive San Jose, CA 95110, USA |  | tyucek@qca.qualcomm.com |
| VK Jones | 1700 Technology Drive San Jose, CA 95110, USA |  | vkjones@qca.qualcomm.com |
| Youhan Kim | 1700 Technology Drive San Jose, CA 95110, USA |  | youhank@qca.qualcomm.com |
| Jianhan Liu | Mediatek  USA | 2860 Junction Ave, San Jose, CA 95134, USA | +1-408-526-1899 | jianhan.Liu@mediatek.com |
| Thomas Pare |  |  | thomas.pare@mediatek.com |
| ChaoChun Wang |  |  | chaochun.wang@mediatek.com |
| James Wang |  |  | james.wang@mediatek.com |
| Tianyu Wu |  |  | tianyu.wu@mediatek.com |
| Russell Huang |  |  | russell.huang@mediatek.com |
| James Yee | Mediatek | No. 1 Dusing 1st Road, Hsinchu, Taiwan | +886-3-567-0766 | james.yee@mediatek.com |
| Frank Hsu |  |  | frank.hsu@mediatek.com |
| Joonsuk Kim | Apple |  |  | joonsuk@apple.com |
| Aon Mujtaba |  |  | mujtaba@apple.com |
| Guoqing Li |  |  | guoqing\_li@apple.com |
| Eric Wong |  |  | ericwong@apple.com |
| Chris Hartman |  |  | chartman@apple.com |
| Jarkko Kneckt |  |  | jkneckt@apple.com |
| David X. Yang | Huawei | F1-17, Huawei Base, Bantian, Shenzhen |  | david.yangxun@huawei.com |
| Jiayin Zhang | 5B-N8, No.2222 Xinjinqiao Road, Pudong, Shanghai | +86-18601656691 | zhangjiayin@huawei.com |
| Jun Luo | 5B-N8, No.2222 Xinjinqiao Road, Pudong, Shanghai |  | jun.l@huawei.com |
| Yi Luo | F1-17, Huawei Base, Bantian, Shenzhen | +86-18665891036 | Roy.luoyi@huawei.com |
| Yingpei Lin | 5B-N8, No.2222 Xinjinqiao Road, Pudong, Shanghai |  | linyingpei@huawei.com |
| Jiyong Pang | 5B-N8, No.2222 Xinjinqiao Road, Pudong, Shanghai |  | pangjiyong@huawei.com |
| Zhigang Rong | 10180 Telesis Court, Suite 365, San Diego, CA  92121 NA |  | zhigang.rong@huawei.com |
| Jian Yu | F1-17, Huawei Base, Bantian, Shenzhen |  | ross.yujian@huawei.com |
| Ming Gan | F1-17, Huawei Base, Bantian, Shenzhen |  | ming.gan@huawei.com |
| Yuchen Guo | F1-17, Huawei Base, Bantian, Shenzhen |  | guoyuchen@huawei.com |
| Yunsong Yang | 10180 Telesis Court, Suite 365, San Diego, CA  92121 NA |  | yangyunsong@huawei.com |
| Junghoon Suh | 303 Terry Fox, Suite 400 Kanata, Ottawa, Canada |  | Junghoon.Suh@huawei.com |
| Peter Loc |  |  | peterloc@iwirelesstech.com |
| Edward Au | 303 Terry Fox, Suite 400 Kanata, Ottawa, Canada |  | edward.ks.au@huawei.com |
| Teyan Chen | F1-17, Huawei Base, Bantian, Shenzhen |  | chenteyan@huawei.com |
| Yunbo Li | F1-17, Huawei Base, Bantian, Shenzhen |  | liyunbo@huawei.com |
| David X. Yang | Huawei | F1-17, Huawei Base, Bantian, Shenzhen |  | david.yangxun@huawei.com |
| Jiayin Zhang | 5B-N8, No.2222 Xinjinqiao Road, Pudong, Shanghai | +86-18601656691 | zhangjiayin@huawei.com |
| Jun Luo | 5B-N8, No.2222 Xinjinqiao Road, Pudong, Shanghai |  | jun.l@huawei.com |
| Yi Luo | F1-17, Huawei Base, Bantian, Shenzhen | +86-18665891036 | Roy.luoyi@huawei.com |
| Yingpei Lin | 5B-N8, No.2222 Xinjinqiao Road, Pudong, Shanghai |  | linyingpei@huawei.com |
| Jiyong Pang | 5B-N8, No.2222 Xinjinqiao Road, Pudong, Shanghai |  | pangjiyong@huawei.com |
| Zhigang Rong | 10180 Telesis Court, Suite 365, San Diego, CA  92121 NA |  | zhigang.rong@huawei.com |
| Jian Yu | F1-17, Huawei Base, Bantian, Shenzhen |  | ross.yujian@huawei.com |
| Ming Gan | F1-17, Huawei Base, Bantian, Shenzhen |  | ming.gan@huawei.com |
| Yuchen Guo | F1-17, Huawei Base, Bantian, Shenzhen |  | guoyuchen@huawei.com |
| Yunsong Yang | 10180 Telesis Court, Suite 365, San Diego, CA  92121 NA |  | yangyunsong@huawei.com |
| Junghoon Suh | 303 Terry Fox, Suite 400 Kanata, Ottawa, Canada |  | Junghoon.Suh@huawei.com |
| Peter Loc |  |  | peterloc@iwirelesstech.com |
| Edward Au | 303 Terry Fox, Suite 400 Kanata, Ottawa, Canada |  | edward.ks.au@huawei.com |
| Teyan Chen | F1-17, Huawei Base, Bantian, Shenzhen |  | chenteyan@huawei.com |
| Yunbo Li | F1-17, Huawei Base, Bantian, Shenzhen |  | liyunbo@huawei.com |
| Jinmin Kim | LG Electronics | 19, Yangjae-daero 11gil, Seocho-gu, Seoul 137-130, Korea |  | Jinmin1230.kim@lge.com |
| Kiseon Ryu |  |  | kiseon.ryu@lge.com |
| Jinyoung Chun |  |  | jiny.chun@lge.com |
| Jinsoo Choi |  |  | js.choi@lge.com |
| Jeongki Kim |  |  | jeongki.kim@lge.com |
| Dongguk Lim |  |  | dongguk.lim@lge.com |
| Suhwook Kim |  |  | suhwook.kim@lge.com |
| Eunsung Park |  |  | esung.park@lge.com |
| JayH Park |  |  | Hyunh.park@lge.com |
| HanGyu Cho |  |  | hg.cho@lge.com |
| Bo Sun | ZTE | #9 Wuxingduan, Xifeng  Rd., Xi'an, China |  | sun.bo1@zte.com.cn |
| Kaiying Lv |  |  | lv.kaiying@zte.com.cn |
| Yonggang Fang |  |  | yfang@ztetx.com |
| Ke Yao |  |  | yao.ke5@zte.com.cn |
| Weimin Xing |  |  | xing.weimin@zte.com.cn |
| Brian Hart | Cisco Systems | 170 W Tasman Dr, San Jose, CA 95134 |  | brianh@cisco.com |
| Pooya Monajemi |  |  | pmonajem@cisco.com |
| Fei Tong | Samsung | Innovation Park,  Cambridge CB4 0DS (U.K.) | +44 1223 434633 | f.tong@samsung.com |
| Hyunjeong Kang | Maetan 3-dong; Yongtong-Gu Suwon; South Korea | +82-31-279-9028 | hyunjeong.kang@samsung.com |
| Kaushik Josiam | 1301, E. Lookout Dr,  Richardson TX 75070 | (972) 761 7437 | k.josiam@samsung.com |
| Mark Rison | Innovation Park,  Cambridge CB4 0DS (U.K.) | +44 1223 434600 | m.rison@samsung.com |
| Rakesh Taori | 1301, E. Lookout Dr,  Richardson TX 75070 | (972) 761 7470 | rakesh.taori@samsung.com |
| Sanghyun Chang | Maetan 3-dong; Yongtong-Gu Suwon; South Korea | +82-10-8864-1751 | s29.chang@samsung.com |
| Yasushi Takatori | NTT | 1-1 Hikari-no-oka, Yokosuka, Kanagawa 239-0847 Japan | +81 46 859 3135 | takatori.yasushi@lab.ntt.co.jp |
| Yasuhiko Inoue | +81 46 859 5097 | inoue.yasuhiko@lab.ntt.co.jp |
| Shoko Shinohara | +81 46 859 5107 | Shinohara.shoko@lab.ntt.co.jp |
| Yusuke Asai | +81 46 859 3494 | asai.yusuke@lab.ntt.co.jp |
| Koichi Ishihara | +81 46 859 4233 | ishihara.koichi@lab.ntt.co.jp |
| Junichi Iwatani | +81 46 859 4222 | Iwatani.junichi@lab.ntt.co.jp |
| Akira Yamada | NTT DOCOMO | 3-6, Hikarinooka, Yokosuka-shi, Kanagawa, 239-8536, Japan | +81 46 840  3759 | yamadaakira@nttdocomo.com |
| Masahito Mori | Sony Corp. |  |  | Masahito.Mori@jp.sony.com |
| Yusuke Tanaka |  |  | YusukeC.Tanaka@jp.sony.com |
| Yuichi Morioka |  |  | Yuichi.Morioka@jp.sony.com |
| Kazuyuki Sakoda |  |  | Kazuyuki.Sakoda@am.sony.com |
| William Carney |  |  | William.Carney@am.sony.com |
| Sigurd Schelstraete | Quantenna |  |  | Sigurd@quantenna.com |
| Huizhao Wang |  |  | hwang@quantenna.com |
| Narendar Madhavan | Toshiba |  |  | narendar.madhavan@toshiba.co.jp |
| Masahiro Sekiya |  |  |  |
| Toshihisa Nabetani |  |  |  |
| Tsuguhide Aoki |  |  |  |
| Tomoko Adachi |  |  |  |
| Kentaro Taniguchi |  |  |  |
| Daisuke Taki |  |  |  |
| Koji Horisaki |  |  |  |
| David Halls |  |  |  |
| Filippo Tosato |  |  |  |
| Zubeir Bocus |  |  |  |
| Fengming Cao |  |  |  |

Abstract

This document provides proposals for spec changes for adding MU EDCA parameters.

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 TGax 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 TGax Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGax Editor: Editing instructions preceded by “TGax Editor” are instructions to the TGax editor to modify existing material in the TGax draft. As a result of adopting the changes, the TGax editor will execute the instructions rather than copy them to the TGax Draft.***

1. **Explanation of the proposed changes**

Propose to define 2 sets of EDCA parameters (one being the current legacy EDCA parameters, one new set called MU EDCA parameters) for non-AP HE-STA.

* MU EDCA parameters are signaled with a new IE called MU EDCA Parameter Set element:
* This IE includes for each AC the following parameters:
  + CWmin/Cwmax, AIFSN
* A specific value of AIFSN defines no EDCA access

The STA operating with MU EDCA parameters can switch back to the legacy EDCA parameters:

* if the STA has not been scheduled after a pre-defined TimeOut after the last time the STA was scheduled by Basic variant Trigger frame in UL MU.
* timeout starts from end of basic variant Trigger

1. **Proposed changes**

***TGax editor: Add a new line for spatial reuse parameter set element in Table 9-76—Element IDs.***

***TGax editor: Insert a new subclause (Spatial reuse parameter set element) in 9.4.2***

**9.4.2.216 MU EDCA parameter set element**

The MU EDCA Parameter Set element provides information needed by non-AP STAs that are in MU mode (see 25.5.2 (UL MU operation) for proper operation of the QoS facility during the CP. The format of the MU EDCA Parameter Set element is defined in Figure 9-ax6 (MU EDCA Parameter Set element).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Element ID Extension | MU QoS Info | MU EDCA Timer | MU AC\_BE Parameter  Record | MU AC\_BK Parameter  Record | MU AC\_VI Parameter  Record | MU AC\_VO Parameter  Record |
| Octets: | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |

**Figure 9-ax6- MU EDCA parameter set element**

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1 (General).

For an infrastructure BSS, the MU EDCA Parameter Set element is used by the AP to establish policy (by changing default MIB attribute values), to change policies when accepting new STAs or new traffic, or to adapt to changes in offered load. The most recent MU EDCA Parameter Set element received by a STA is used to update the appropriate MIB values.

The format of the MU QoS Info field is the same as the field defined in 9.4.1.17 (QoS Info field). The MU QoS Info field contains the EDCA Parameter Set Update Count subfield, which is initially set to 0 and is incremented each time any of the MU AC parameters changes. This subfield is used by non-AP STAs to determine whether the MU EDCA parameter set has changed and requires updating the appropriate MIB attributes.

The MU EDCA Timer indicates the duration of time, in units of 8TUs, for which the provided MU EDCA parameters are used by an HE STA after reception of a basic variant Trigger frame.

The formats of MU AC\_BE, MU AC\_BK, MU AC\_VI, and MU AC\_VO Parameters fields are identical and are illustrated in Figure 9-ax7 (MU AC\_BE, MU AC\_BK, MU AC\_VI, and MU AC\_VO Parameter Record field format).

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  | ACI/AIFSN | ECWmin/ECWmax |
| Octets: | 1 | 1 |

**Figure 9-ax7 – MU AC\_BE, MU AC\_BK, MU AC\_VI, and MU AC\_VO Parameter Record field format**

The format of the ACI/AIFSN field is illustrated in Figure 9-262 (ACI/AIFSN field) and the encoding of its subfields is as defined in 9.4.2.29 (EDCA Parameter Set element), except that a value 0 of the AIFSN field indicates that the AIFS is equal to the value of the MU EDCA Timer.

The format of the ECWmin/ECWmax field is illustrated in Figure 9-263 (ECWmin and ECWmax fields) and the encoding of its subfields is as defined in 9.4.2.29 (EDCA Parameter Set element).

**10.2.4.2 HCF contention based channel access (EDCA)**

***TGax editor: Change the paragraph below as follows:***

The QoS AP shall announce the EDCA parameters in selected Beacon frames and in all Probe Response and (Re)Association Response frames by the inclusion of the EDCA Parameter Set element using the information from the MIB entries in dot11ECDATable. If no such element is received, a STA(#1289) shall use the default values for the parameters. The fields following the QoS Info field in the EDCA Parameter Set element shall be included in all Beacon frames occurring within two (optionally more) delivery traffic indication map (DTIM) periods following a change in AC parameters, which provides all STAs an opportunity to receive the updated EDCA parameters. If any associated STAs are in WNM sleep(#5381) mode(#3369) or using FMS, these fields should be included by the AP for as many DTIM periods as needed to exceed the longest interval any STA is expected to not receive Beacon frames.(#2461) A QoS STA shall update its MIB attributes that correspond to fields in an EDCA Parameter Set element(#5411) within an interval of time equal to one beacon interval after receiving an updated EDCA parameter set. QoS STAs update the MIB attributes and store the EDCA Parameter Set update count value in the QoS Info field.

An AP may change the EDCA access parameters by changing the EDCA Parameter Set element in the Beacon frame, Probe Response frame, and (Re)Association Response frame. However, the AP should change them only rarely. A QoS STA shall use the EDCA Parameter Set Update Count Value subfield in the QoS Capability element of all Beacon frames to determine whether the STA is using the current EDCA Parameter Values. If the EDCA Parameter Set update count value in the QoS Capability element is different from the value that has been stored, the QoS STA shall query the updated EDCA parameter values by sending a Probe Request frame to the AP.

In addition, an HE AP may temporarily change the EDCA access parameters for HE non-AP STAs that are UL MU capable, by including an MU EDCA Parameter Set element in the Beacon frame, Probe Response frame, and (Re-) Association Response frame. An HE non-AP STA that receives an MU EDCA Parameter Set element from its associated AP follows the rules defined in 25.5.2.3 (STA behavior).

***TGax editor: Add a new section 25.2.2***

**25.2.2 Obtaining an EDCA TxOP for UL MU capable STAs**

An HE non-AP UL MU capable STA that receives a Basic variant Trigger frame that contains a Per User Info field with the AID of the STA, and that receives an immediate response from the AP for the transmitted Trigger-based PPDU, shall:

* update its CWmin[AC], CWmax[AC], AIFSN[AC], state variables to the values contained in the most recently received MU EDCA Parameter Set element sent by the AP to which the STA is associated, for all the ACs from which QoS Data frames were transmitted in the trigger-based PPDU.
* Update its HEMUEDCATimer state variable to the values contained in the most recently received MU EDCA Parameter Set element sent by the AP to which the STA is associated.

The HEMUEDCATimer shall uniformly count down to 0 when its value is nonzero.

NOTE—A non-AP STA that sends a frame to the AP with an OMI A-Control field containing a value of 1 in the UL MU Disable field does not participate in UL MU operation, as such it is exempt from updating its EDCA access parameters to the values contained in the MU EDCA Parameter Set element.

An HE non-AP UL MU capable STA may update its CWmin[AC], CWmax[AC], and AIFSN[AC] for all ACs to the values contained in the most recently received EDCA Parameter Set element sent by the AP to which the STA is associated or to the default dot11EDCATable when an EDCA Parameter Set element has not been received when the HEMUEDCATimer reaches 0.