IEEE P802.11
Wireless LANs

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| Minutes for TGbe MAC Ad-Hoc teleconferences in May and July 2020 |
| Date: 2020-05-11 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Liwen Chu | NXP |  |  |  |
| Jeongki Kim | LG Electronics |  |  |  |
|  |  |  |  |  |

Abstract

This document contains the meeting minutes for the TGbe MAC ad hoc teleconferences held in May 2020 and July 2020.

Revisions:

* Rev0: Added the minutes from the telephone conferences held on May 11, 2020.
* Rev1: Added the minutes from the telephone conferences held on May 18, 2020.
* Rev2: Added the minutes from the telephone conferences held on May 20, 2020.
* Rev3: Added the minutes from the telephone conferences held on May 21, 2020.

**Monday 11 May 2020, 19:00 – 22:00 ET (TGbe MAC ad hoc conference call)**

Chairman: Jeongki Kim (LG Electronics)

Secretary: Liwen Chu (NXP)

This meeting took place using a webex session.

**Introduction**

1. The Chair (Jeongki, LG) calls the meeting to order at 19:04 EDT. The Chair introduces himself and the Secretary, Liwen Chu (NXP)
2. The Chair goes through the 802 and 802.11 IPR policy and procedures and asks if there is anyone that is aware of any potentially essential patents. Nobody speaks up.
3. The Chair recommends using IMAT for recording the attendance.
	* Please record your attendance during the conference call by using the IMAT system:
		1. 1) login to [imat](https://imat.ieee.org/attendance), 2) select “802.11 Telecons (<Month>)” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “TGbe <MAC/PHY/Joint> conference call that you are attending.
	* If you are unable to record the attendance via [IMAT](https://imat.ieee.org/attendance) then please send an e-mail to Jeongki Kim (jeongki.kim@lge.com) and Liwen Chu (liwen.chu@nxp.com)

**Recorded attendance through Imat and e-mail:**

|  |  |  |
| --- | --- | --- |
| Timestamp | Name | Affiliation |
| 5/11 | Adachi, Tomoko | TOSHIBA Corporation |
| 5/11 | Akhmetov, Dmitry | Intel Corporation |
| 5/11 | Andersdotter, Amelia | None - Self-funded |
| 5/11 | Au, Kwok Shum | Huawei Technologies Co., Ltd |
| 5/11 | Bredewoud, Albert | Broadcom Corporation |
| 5/11 | Cariou, Laurent | Intel Corporation |
| 5/11 | Carney, William | Sony Corporation |
| 5/11 | CHAN, YEE | Facebook |
| 5/11 | Cheng, Paul | MediaTek Inc. |
| 5/11 | CHERIAN, GEORGE | Qualcomm Incorporated |
| 5/11 | Chitrakar, Rojan | Panasonic Asia Pacific Pte Ltd. |
| 5/11 | Chu, Liwen | NXP Semiconductors |
| 5/11 | Das, Dibakar | Intel Corporation |
| 5/11 | Das, Subir | Perspecta Labs Inc. |
| 5/11 | Derham, Thomas | Broadcom Corporation |
| 5/11 | de Vegt, Rolf | Qualcomm Incorporated |
| 5/11 | Ding, Baokun | Huawei Technologies Co. Ltd |
| 5/11 | Dong, Xiandong | Xiaomi Inc. |
| 5/11 | Fang, Yonggang | ZTE TX Inc |
| 5/11 | Fischer, Matthew | Broadcom Corporation |
| 5/11 | Gan, Ming | Huawei Technologies Co., Ltd |
| 5/11 | Garg, Lalit | Broadcom Corporation |
| 5/11 | Guo, Qiang | InfomTechnologies |
| 5/11 | Guo, Yuchen | Huawei Technologies Co., Ltd |
| 5/11 | Gwak, Yongsu | Personnel |
| 5/11 | Hamilton, Mark | Ruckus/CommScope |
| 5/11 | Han, Jonghun | SAMSUNG |
| 5/11 | Han, Zhiqiang | ZTE Corporation |
| 5/11 | Ho, Duncan | Qualcomm Incorporated |
| 5/11 | Hu, Chunyu | Facebook |
| 5/11 | Huang, Guogang  | Huawei |
| 5/11 | Huang, Po-Kai | Intel Corporation |
| 5/11 | Inoue, Yasuhiko | Nippon Telegraph and Telephone Corporation (NTT) |
| 5/11 | Jang, Insun | LG ELECTRONICS |
| 5/11 | Jiang, Jinjing | Apple, Inc. |
| 5/11 | Jung, hyojin | Hyundai Motor Company |
| 5/11 | Kain, Carl | USDoT |
| 5/11 | Kandala, Srinivas | SAMSUNG |
| 5/11 | kim, namyeong | LG ELECTRONICS |
| 5/11 | Kim, Sang Gook | LG ELECTRONICS |
| 5/11 | Kim, Sanghyun | WILUS Inc |
| 5/11 | Kim, Yongho | Korea National University of Transportation |
| 5/11 | Kishida, Akira | Nippon Telegraph and Telephone Corporation (NTT) |
| 5/11 | Kneckt, Jarkko | Apple, Inc. |
| 5/11 | Kondo, Yoshihisa | Advanced Telecommunications Research Institute International (ATR) |
| 5/11 | Kwon, Young Hoon | NXP Semiconductors |
| 5/11 | Lalam, Massinissa | SAGEMCOM BROADBAND SAS |
| 5/11 | Levy, Joseph | InterDigital, Inc. |
| 5/11 | Li, Yiqing | Huawei Technologies Co. Ltd |
| 5/11 | Li, Yunbo | Huawei Technologies Co., Ltd |
| 5/11 | Liu, Yong | Apple, Inc. |
| 5/11 | Lou, Hanqing | InterDigital, Inc. |
| 5/11 | Lu, Liuming | ZTE Corporation |
| 5/11 | Lv, kaiying | MediaTek Inc. |
| 5/11 | Monajemi, Pooya | Cisco Systems, Inc. |
| 5/11 | NANDAGOPALAN, SAI SHANKAR | Cypress Semiconductor Corporation |
| 5/11 | Nezou, Patrice | Canon Research Centre France |
| 5/11 | Ouchi, Masatomo | Canon |
| 5/11 | Park, Minyoung | Intel Corporation |
| 5/11 | Park, Sung-jin | LG ELECTRONICS |
| 5/11 | Patil, Abhishek | Qualcomm Incorporated |
| 5/11 | Patwardhan, Gaurav | Hewlett Packard Enterprise |
| 5/11 | Raissinia, Alireza | Qualcomm Incorporated |
| 5/11 | Rosdahl, Jon | Qualcomm Technologies, Inc. |
| 5/11 | Seok, Yongho | MediaTek Inc. |
| 5/11 | Son, Ju-Hyung | WILUS Inc. |
| 5/11 | Song, Taewon | LG ELECTRONICS |
| 5/11 | Sun, Li-Hsiang | InterDigital, Inc. |
| 5/11 | Sun, Yanjun | Qualcomm Incorporated |
| 5/11 | Tanaka, Yusuke | Sony Corporation |
| 5/11 | Torab Jahromi, Payam | Facebook |
| 5/11 | Wang, Lei | Huawei R&D USA |
| 5/11 | Wang, Xiaofei | InterDigital, Inc. |
| 5/11 | Wu, Hao | XGIMI Technology Co.,Ltd |
| 5/11 | Yano, Kazuto | Advanced Telecommunications Research Institute International (ATR) |
| 5/11 | Yee, James | MediaTek Inc. |
| 5/11 | yi, yongjiang | Futurewei Technologies |
| 5/11 | Yukawa, Mitsuyoshi | Canon, Inc. |
| 5/11 | Zhou, Yifan | Huawei Technologies Co., Ltd |

1. The Chair reminds that the agenda can be found in 11-20/735r0. The chair add an item about the time of additional MAC teleconference. The Chair asked for the comments bout the agenda. Hui-Zhao announced he will postpone his contribution 11-20/115. Kaiying announced her presentation 11-19/1547 was already presented. So 11-19/1547, 11-20/115 were removed from the agenda of today.
2. Discussuin of schedule time of additional teleconference:
	* Prefer 7:00om or 10:00am on Friday
	* Prefer 10:00am since it is better for Europe people.
	* It was announced in last week’s call. And there was no objection in the teleconference. It is better to comment when announcing/discussing the teleconference.
	* Zhou mentioned that his 292 is about R1, R2 discussion. It is better to move it to the session about R1, R2 discussion.
	* Tgbe chair said that it will happen in joint meeting in next week.
	* It is better in joint session since there is sone dependency between MAC PHY.
	* There was one request to defer the presentation 11-20/105 since the quthor can’t attend this meeting. 11-20/105 was removed from today’s agenda.
	* MAC chair runs the straw poll about rotating the time betweem 10:00am and 7:00pm on Wednesday.
	* The result is 31Y, 13N, 15A
3. Technical Submissions after the agenda discussion: **ML-Med Access**
	* [408r2](https://mentor.ieee.org/802.11/dcn/20/11-20-0408-02-00be-prioritized-edca-channel-access-over-latency-sensitive-links-in-mlo.pptx) Prioritized EDCA Channel Access Over Latency Sensitive Links in MLO (Chunyu Hu) [Cont.]
	* [~~1547r5~~](https://mentor.ieee.org/802.11/dcn/19/11-19-1547-05-00be-multi-link-operation-and-channel-access-discussion.pptx) ~~Multi-link-operation-and-channel-access-discussion (Kaiying Lu)~~
	* [469r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0469-00-00be-multi-link-channel-sensing.pptx) Multi-link channel sensing (Yonggang Fang)
4. Technical Submissions: **ML-General**
	* [1822r7](https://mentor.ieee.org/802.11/dcn/19/11-19-1822-07-00be-multi-link-security-consideration.pptx) Multi-link security consideration (Po-Kai Huang) [1 SP]
	* [069r2](https://mentor.ieee.org/802.11/dcn/20/11-20-0069-02-00be-multi-link-communication-mode-definition.pptx) Multi-link communication mode definition (Yonggang Fang) [2 SPs]
	* [~~105r4~~](https://mentor.ieee.org/802.11/dcn/20/11-20-0105-04-00be-link-latency-statistics-of-multi-band-operations-in-eht.pptx) ~~Link Latency Statistics of Multi-band Operations in EHT (Frank Hsu) [2 SPs]~~
	* [~~115r4~~](https://mentor.ieee.org/802.11/dcn/20/11-20-0115-04-00be-multi-link-feature-candidates-for-r1.pptx) ~~Multilink Feature Candidates For Release 1 (Huizhao Wang)~~
	* [~~292r0~~](https://mentor.ieee.org/802.11/dcn/20/11-20-0292-00-00be-mlo-typical-operating-scenarios-and-sub-feature-prioritization.pptx) ~~MLO Typical Operating Scenarios and Sub-feature prioritization (Zhou Lan)~~
	* [434r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0434-00-00be-multi-link-secured-retransmissions.pptx) Multi-link Secured Retransmissions (Rojan Chitrakar)
	* [472r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0472-00-00be-discussion-of-more-data-subfield-for-multi-link.pptx) Discussion of More Data subfield for multi-link (Yunbo Li)
	* 489r0 Applied Case Study of Multi-link Framework and Operation (Yoshihisa Kondo)
	* [562r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0562-00-00be-enhanced-multi-link-single-radio-operation.pptx) Enhanced multi-link single radio operation (Minyoung Park)
5. Technical Submissions: **MAC-General**
	* [363r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0363-00-00be-proposals-on-unused-bandwidth-utilizations.pptx) Proposals on unused bandwidth utilizations (Sindhu Verma)
	* [463r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0463-00-00be-priority-access-support-options-for-ns-ep-serveices.pptx) Priority Access Support Options for NS/EP Services (Subir Das)
	* [468r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0468-00-00be-channel-access-category.pptx) Access-category (Yonggang Fang)
	* [569r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0569-00-00be-11be-txop-protection-and-coexistence-with-11ax.pptx) 11be-txop-protection-coexistence-11ax (Chunyu Hu)
	* [591r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0591-00-00be-channel-width-selection-for-various-frame-types-with-preamble-puncture-and-puncture-location-indication.pptx) Channel width selection for various frame types with preamble puncture and puncture location indication (Lochan Verma)
	* 624r0 EHT-Operation-Element-for-320MHz (Jason Yuchen Guo)
	* [680r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0680-00-00be-operating-bandwidth-indication-for-eht-bss.pptx) Operating bandwidth indication for eht bss (Huang Guogang)

 **Submissions**

1. 408r3 Prioritized EDCA Channel Access Over Latency Sensitive Links in MLO (Chunyu Hu) [Cont.]

Discussion:

C: it seems time-slot is assigned.

A: it is not same as scheduling. It is not like HCCA. It more about STAs signíng slots.

C: question about straw poll 1, traffic is mapped to different link per TID. Is this ok for straw poll 1. how the service is mapped, to TID?

A: it depends on how to define that. One key part is priritized EDCA. Mapping TID to link is not the whole solution. This (TID to link mapping) may create collision.

C: what could we have on top of multi-link features already approved? How to deal with medium access within assigned slots and outside of the assigned slots? How about admission control?

A: admission control is not sufficient. With admission control, collision still may happen. Disributing the STAs to different slots can futher save power. About EDCA parameters, more detail needs to added, e.g. parameters within and outside of assigned slots.

C: time concern, some features should be in R2 since time doesn’t allow so many features in R1.

A: agree to consider the timing about R1, R2.

Talking about whether questions should focus on the presentation or on straw poll. The chair confirm the following comments are about SPs...

C: it seems SFD already allows it, e.g. TID to link mapping, EDCA per link.

A: Per link TID mapping in the SFD may not be sufficient.

The straw polls are deferred.

1. 469r1 Multi-link Channel Access Dsicussion (Yonggang Fang)

Summary:

 Medium access under multi-link to support high priority/low latency services.

 Joint backoff procedure among multiple links: when one link is detected idle, the backoff counter is decreased by 1.

Discussion:

C: question about joint backoff. Get one backoff value that applies to multiple links?

A: separate CCA sensing among links. Same backoff counter applies to multiple links.

C: one back off counter for each AC. If two links are idle, how to count down the backoff counter. Another concern is regulatory concern: this operation may not be allowed.

A: the backoff counter will be decreased by 2 in the example.

C: This may not be easy to be implemented because of the process delay.

A: it should be fine since they are internal processing.

C: this is not fair to legacy STAs.

A: if you look at it from another angle, it is fair since MLD has multiple devcies.

C: more concern about fairness. How to decrease the backoff counter when multiple links are idle?

A: more than one are decreased. This is for low latency service.

C: do you estimate the gain?

A: no simulation since so many models esist.

C: clarification question: for joint medium access, do you imagine dobled CW?

A: The CW is same as the single link CW. But the CW is shared among the links.

**SP1:**

* **Do you support to include the following in SFD ?**
	+ **STAs of MLD may use the joint backoff counters during EDCA process on multi-links for HP/LL transmissions.**

 The straw poll is deferred.

1. 11-19/1822r9 **Multi-link Security Consideration** (Po-kai) [1 SPs]

Discussion:

No discussion

SP3:

* **Between two MLDs, do you support to use the MLD MAC addresses to derive PMK under SAE method and PTK?**

The straw poll is approved with uanimous consent

1. 11-20/0069r5 **Multi-Link Communication Mode Discussion** (Yonggang Fang)
* **SP1:**
	+ **Do you support to define the following in SFD ?**
		- **STR:** simultaneous transmission and reception
		- **STR Operation:** is the operation of which a transmission on one link is independent to (i.e. non-interruptible on) the operation on another link.
		- **STR-constraint Operation:** is the operation on a link may depend on the operation of another link.
		- e.g. a transmission on a link may be constrained if it causes the reception interruption on another link, or a reception on a link may be constrained if a transmission is on anther link.
		- **STR-constraint links:** A pair or group of links are in the STR-constraint Operation.

Discussion:

C: question: do you think STR/STR-constraint operation should be restricted between a pair of links?

A: can add it.

C: question on wording. Should we define STR/NSTR MLD devcie? Why do we want to define operation?

A: it is really about the operation.

C: we have STR, NSTR in SFD. Do you mean that STR-constraint is same as NSTR? It is better to unify them.

A: yes.

The straw poll is changed as follows per the discussion:

Do you support to define the following in SFD ?
STR: simultaneous transmission and reception
STR Operation: is the operation of which a transmission on one link is independent to (i.e. non-interruptible on) the operation on another link of MLD.
STR-constraint Operation: is the operation on a link may depend on the operation of another link of MLD.
i.e. a transmission on a link may be constrained if it causes the reception interruption on another link, or a reception on a link may be constrained if a transmission is on anther link of MLD.
STR-constraint links: A pair or group of links are in the STR-constraint Operation.

16Y, 25N, 29A

1. 434r1 **Multi-link Secured Retransmissions** (Rojan Chitrakar)

Summary:

 The presentation focuses on the issues related to retransmission of protected frames (CCMP/GCMP) and present a proposal to simplify the retransmission of protected frames.

 MLD address instead of link address is used for encrypting/decrypting the transmitted frame.

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Discussion:

C: straw poll 1 is ok since all people agree with it.

C: AAD Nonce only happen when AP link MAC addresses of AP MLD are same and STA link addresses of STA MLD are different or AP link MAC addresses of AP MLD are different and STA link addresses of STA MLD are same.

A: agree.

C: For the TID without BA agreement, it is open question about wheter we allow retransmisison of a frame in another link.

C: similarly it is open question about whether fragment can be retransmitted in different link from the the link for original transmission.

The straw polls are differed.

1. 472r0 **Discussion of More Data subfield for multi-link** (Yunbo Li)

Summary:

 The setting of More Data subfield is not accurate in MLD case, it is better to adjust it to fit MLD scenario. The following solutions are proposed:

* When AP MLD transmit a BU in one link to a non-AP MLD, if there is at least one more BU of any TID or management frames that mapping to this link present for the same non-AP MLD, the More Data subfield is set to 1, otherwise the More Data subfield is set to 0
* A QoS Null frame with More Data subfield sets to 0 is transmitted in one link to indicate no more BU of any TID or management frames that mapping to this link present

Discussion:

C: the first bullet is too restricted.

C: the setting should be based on the TID to link mapping.

The teleconference was adjourned at 10:00pm

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**Monday 18 May 2020, 10:00am – 01:00pm ET (TGbe MAC ad hoc conference call)**

Chairman: Jeongki Kim (LG Electronics)

Secretary: Liwen Chu (NXP)

This meeting took place using a webex session.

**Introduction**

1. The Chair (Jeongki, LG) calls the meeting to order at 10:04am EDT. The Chair introduces himself and the Secretary, Liwen Chu (NXP)
2. The Chair goes through the 802 and 802.11 IPR policy and procedures and asks if there is anyone that is aware of any potentially essential patents. Nobody speaks up.
3. The Chair recommends using IMAT for recording the attendance.
	* Please record your attendance during the conference call by using the IMAT system:
		1. 1) login to [imat](https://imat.ieee.org/attendance), 2) select “802.11 Telecons (<Month>)” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “TGbe <MAC/PHY/Joint> conference call that you are attending.
	* If you are unable to record the attendance via [IMAT](https://imat.ieee.org/attendance) then please send an e-mail to Jeongki Kim (jeongki.kim@lge.com) and Liwen Chu (liwen.chu@nxp.com)

**Recorded attendance through Imat and e-mail:**

|  |  |  |
| --- | --- | --- |
| 5/18 | Adhikari, Shubhodeep | Broadcom Corporation |
| 5/18 | Andersdotter, Amelia | None - Self-funded |
| 5/18 | Asai, Yusuke | Nippon Telegraph and Telephone Corporation (NTT) |
| 5/18 | Asterjadhi, Alfred | Qualcomm Incorporated |
| 5/18 | Au, Kwok Shum | Huawei Technologies Co., Ltd |
| 5/18 | baron, stephane | Canon Research Centre France |
| 5/18 | Bredewoud, Albert | Broadcom Corporation |
| 5/18 | Cariou, Laurent | Intel Corporation |
| 5/18 | Carney, William | Sony Corporation |
| 5/18 | Cheng, Paul | MediaTek Inc. |
| 5/18 | Chitrakar, Rojan | Panasonic Asia Pacific Pte Ltd. |
| 5/18 | Ciochina, Dana | Sony Corporation |
| 5/18 | Das, Dibakar | Intel Corporation |
| 5/18 | Das, Subir | Perspecta Labs Inc. |
| 5/18 | de Vegt, Rolf | Qualcomm Incorporated |
| 5/18 | Ding, Baokun | Huawei Technologies Co. Ltd |
| 5/18 | Dong, Xiandong | Xiaomi Inc. |
| 5/18 | Fang, Yonggang | ZTE TX Inc |
| 5/18 | Garg, Lalit | Broadcom Corporation |
| 5/18 | Ghosh, Chittabrata | Intel Corporation |
| 5/18 | Guo, Qiang | InfomTechnologies |
| 5/18 | Guo, Yuchen | Huawei Technologies Co., Ltd |
| 5/18 | Han, Jonghun | SAMSUNG |
| 5/18 | Han, Zhiqiang | ZTE Corporation |
| 5/18 | Handte, Thomas | Sony Corporation |
| 5/18 | Hsu, Chien-Fang | MediaTek Inc. |
| 5/18 | Hu, Chunyu | Facebook |
| 5/18 | Huang, Po-Kai | Intel Corporation |
| 5/18 | Hwang, Sung Hyun | Electronics and Telecommunications Research Institute (ETRI) |
| 5/18 | Inoue, Yasuhiko | Nippon Telegraph and Telephone Corporation (NTT) |
| 5/18 | Jiang, Jinjing | Apple, Inc. |
| 5/18 | Kain, Carl | USDoT |
| 5/18 | kim, namyeong | LG ELECTRONICS |
| 5/18 | Kim, Sang Gook | LG ELECTRONICS |
| 5/18 | Kim, Yongho | Korea National University of Transportation |
| 5/18 | Kishida, Akira | Nippon Telegraph and Telephone Corporation (NTT) |
| 5/18 | Ko, Geonjung | WILUS Inc. |
| 5/18 | Kondo, Yoshihisa | Advanced Telecommunications Research Institute International (ATR) |
| 5/18 | Kumar, Manish | Marvell Semiconductor, Inc. |
| 5/18 | Kwon, Young Hoon | NXP Semiconductors |
| 5/18 | Levitsky, Ilya | IITP RAS |
| 5/18 | Levy, Joseph | InterDigital, Inc. |
| 5/18 | Li, Yiqing | Huawei Technologies Co. Ltd |
| 5/18 | Li, Yunbo | Huawei Technologies Co., Ltd |
| 5/18 | Lv, kaiying | MediaTek Inc. |
| 5/18 | Max, Sebastian | Ericsson AB |
| 5/18 | Monajemi, Pooya | Cisco Systems, Inc. |
| 5/18 | NANDAGOPALAN, SAI SHANKAR | Cypress Semiconductor Corporation |
| 5/18 | Naribole, Sharan | SAMSUNG |
| 5/18 | Nezou, Patrice | Canon Research Centre France |
| 5/18 | Park, Minyoung | Intel Corporation |
| 5/18 | Park, Sung-jin | LG ELECTRONICS |
| 5/18 | Patil, Abhishek | Qualcomm Incorporated |
| 5/18 | Patwardhan, Gaurav | Hewlett Packard Enterprise |
| 5/18 | Petrick, Albert | InterDigital, Inc. |
| 5/18 | RISON, Mark | Samsung Cambridge Solution Centre |
| 5/18 | Rosdahl, Jon | Qualcomm Technologies, Inc. |
| 5/18 | Sedin, Jonas | Ericsson AB |
| 5/18 | Seok, Yongho | MediaTek Inc. |
| 5/18 | Solaija, Muhammad Sohaib | Istanbul Medipol University; Vestel |
| 5/18 | Song, Taewon | LG ELECTRONICS |
| 5/18 | Sun, Li-Hsiang | InterDigital, Inc. |
| 5/18 | Sun, Yanjun | Qualcomm Incorporated |
| 5/18 | Torab Jahromi, Payam | Facebook |
| 5/18 | Verma, Sindhu | Broadcom Corporation |
| 5/18 | VIGER, Pascal | Canon Research Centre France |
| 5/18 | Wang, Hao | Tencent |
| 5/18 | Wang, Huizhao | Quantenna Communications, Inc. |
| 5/18 | Wang, Lei | Huawei R&D USA |
| 5/18 | Wang, Xiaofei | InterDigital, Inc. |
| 5/18 | Wentink, Menzo | Qualcomm |
| 5/18 | Wu, Hao | XGIMI Technology Co.Ltd |
| 5/18 | Wullert, John | Perspecta Labs |
| 5/18 | Yang, Jay | Nokia |
| 5/18 | Yano, Kazuto | Advanced Telecommunications Research Institute International (ATR) |
| 5/18 | Yee, James | MediaTek Inc. |
| 5/18 | Yukawa, Mitsuyoshi | Canon, Inc. |

1. The Chair reminds that the agenda can be found in 11-20/735r6. The chair asked whether there is comment about the agenda. No response. The agenda is approved.

**Submissions**

1. [408r4](https://mentor.ieee.org/802.11/dcn/20/11-20-0408-04-00be-prioritized-edca-channel-access-over-latency-sensitive-links-in-mlo.pptx) Prioritized EDCA Channel Access Over Latency Sensitive Links in MLO (Chunyu Hu) [SP only]

Chunyu went through the straw polls. No comments/qestions to the straw polls.

SP #1

* + Do you support that the TGbe SFD shall include that
		- An MLD AP may offer differentiated quality of service over different links

61Y, 8N,17A

SP #2

* + **Do you support that the TGbe SFD shall include:**
		- An optional mechanism of dividing medium time into slots of duration TBD during which prioritized EDCA access operates for specifically allowed STAs

15Y, 30N, 39A

1. 358r3 **Multi-BSSID Operation with MLO (Abhishek Patil)** [SP only]

Per the advice, the straw poll is updated as following

SP #4

* + Do you support that each AP of an AP MLD is independently configured to operate as transmitted or nontransmitted BSSID of a multiple BSSID set or as an AP of a co-hosted BSSID set or not part of either a multiple BSSID set or co-hosted BSSID set?

52Y, 2N, 33A

1. 105r4 **Link Latency Statistics of Multi-band Operations in EHT (**Frank Hsu**)** [SP only]

SP #1

* + **Do you support that EHT AP should provide BSS transmit delay statistics carried in an information element?**
		- Transmit delay statistics details are TBD?

C: per AC, DL only.

A: Yes it is DL only whether it is per AC is TBD.

C: the parameters are already in 11md.

A: only average is in 11md. Other parameters are missing.

C: about SP #2. It seems SP #1 covers SP #2.

A: for SP#2, each link may different statistics. SP #1 is the combination of all links. SP #2 is about per link statistics.

C: The BSS TX delay, detail is TBD. But they are important.

A: May be modify the language to show DL only. Detail can be discussed later.

C: it is useful to be included for latency, load for STA to select link. Question: long time, short time etc. should be defined. BSS is not clrear under MLD. It is better to change the text to average among links.

A:

After the discussion, the SP #1 is changed to

Do you support that EHT AP should provide DL transmit delay statistics over all links carried in an information element?
DL transmit delay statistics details are TBD

30Y, 25N, 27A

SP #2

* + **Do you support that EHT AP MLD should provide transmit delay statistics of each link carried in an information element?**
	+ Transmit delay statistics details are TBD

38Y, 24N, 22A

1. 434r2 **Multi-link Secured Retransmissions (Rojan Chitrakar)** [SP only]

Per the advice, the straw poll is updated as following

SP #4

Do you support that each AP of an AP MLD is independently configured to operate as transmitted or nontransmitted BSSID of a multiple BSSID set or as an AP of a co-hosted BSSID set or not part of either a multiple BSSID set or co-hosted BSSID set?

SP #1

* **Do you support to add the following to the 11be SFD:**
	1. When a BA agreement for a TID exists between two MLDs, if the transmission of a frame that belongs to the TID, and which is not a fragment, fails on a link, the frame may be retransmitted on a different link.

C: failure is not clear. The retry can be done in respective link of the original transmission.

A: it is per MLD level.

SP #1 is deferred.

1. 472r1 Discussion of More Data subfield for multi-link (Yunbo Li) [SP only]

SP #1

* Do you support to adjust the setting of More Data subfield to fit MLD scenario?

45Y, 8N, 25A

SP #2

Do you support below setting of More Data subfield?
When AP MLD transmit a BU in one link to a non-AP MLD, if there is at least one additional buffered BU of any TID or management frames that mapping to this link present for the same non-AP MLD, the More Data subfield is set to 1, otherwise the More Data subfield is set to 0.
A QoS Null frame with More Data subfield sets to 0 can be transmitted in one link to indicate no more additional buffered BU of any TID or management frames that mapping to this link present.

Based on the feedback, SP #2 is changed to

Do you support below setting of More Data subfield?
When AP MLD transmit a BU in one link to a non-AP MLD, if there is at least one additional buffered BU of any TID or management frames that is mapped to this link by TID-to-link mapping or default mapping for the same non-AP MLD, the More Data subfield is set to 1, otherwise the More Data subfield is set to 0.

43Y, 7N, 28A

SP #3

Do you support below setting of More Data subfield?

A QoS Null frame with More Data subfield sets to 0 may be transmitted in one link to indicate no more additional buffered BU of any TID or management frames that mapping to this link present?

29Y, 16N, 37A

1. 562r1 Enhanced multi-link single radio operation (Minyoung Park**)**

Summary: many non-AP MLDs are expected to operate with a single radio. This presentation proposes an enhanced multi-link single radio operation where the non-AP MLDs can listen to two (or more) pre-configured channels simultaneously.

C: Is dynamic SM power save for one TXOP only?

A: detail for more discussion. Currently assume the same baseline dynamic SM power save operation: dynamic SM power save is applied to one frame exchange sequences within the TXOP.

C: dynamic configuration of radio needs to be done within 16us. Do we assume madatory or optional?

A: it should be optional.

C: radio switch may require several ms. Your propposal proposes radio switch within several 10us.

A: our PHY expert assumes it can be done within several 10us.

The straw polls were deferred.

1. 398r4 EHT BSS with Wider BW (Liwen Chu**)** [SP only]

SP #1

* Do you support that in 6GHz band, an EHT AP may announce different BSS operating bandwidth to non-EHT STAs than the BSS operating bandwidth it announces to EHT STAs when EHT BW covers disallowed 20MHz channels and/or when the announced EHT BW is not supported by non-EHT amendments. The advertised BSS operating bandwidth to EHT STA shall include the advertised BSS operating bandwidth to non-EHT STA?

31Y, 1N, 33A

1. 363r1 Proposals on unused bandwidth utilizations (Sindhu Verma**)**

Summary: This contribution discusses changes required to enable a device to transmit on the DL or enable transmission on the UL, on any subset of channels that are a part of its operating bandwidth and are idle, even when the primary channel is busy.

C: it seems that the parallel CCA is needed.

C: When the primary channel is busy, you switch to another channel. Do you need to do link status synchronization (recover NAV information)?

C: when you transmit in secondary channel and the primary channel is busy, this requires STA nneds to do parallel PPDU detection.

A: it could be predetermined pattern.

C: it seems this imply full duplex radio.

The teleconference was adjourned at 01:00pm EDT

**Wendesday 20 May 2020, 10:00am – 01:00pm ET (TGbe MAC ad hoc conference call)**

Chairman: Jeongki Kim (LG Electronics)

Secretary: Liwen Chu (NXP)

This meeting took place using a webex session.

**Introduction**

1. The Chair (Jeongki, LG) calls the meeting to order at 10:04am EDT. The Chair introduces himself and the Secretary, Liwen Chu (NXP)
2. The Chair goes through the 802 and 802.11 IPR policy and procedures and asks if there is anyone that is aware of any potentially essential patents. Nobody speaks up.
3. The Chair recommends using IMAT for recording the attendance.
	* Please record your attendance during the conference call by using the IMAT system:
		1. 1) login to [imat](https://imat.ieee.org/attendance), 2) select “802.11 Telecons (<Month>)” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “TGbe <MAC/PHY/Joint> conference call that you are attending.
	* If you are unable to record the attendance via [IMAT](https://imat.ieee.org/attendance) then please send an e-mail to Jeongki Kim (jeongki.kim@lge.com) and Liwen Chu (liwen.chu@nxp.com)

**Recorded attendance through Imat and e-mail:**

|  |  |  |
| --- | --- | --- |
| TGbe (MAC)  | 5/20 Gaurav Patwardhan | Hewlett Packard Enterprise |
| TGbe (MAC) | 5/20 | Aboulmagd, Osama | Huawei Technologies Co.,  Ltd |
| TGbe (MAC) | 5/20 | Adhikari, Shubhodeep | Broadcom Corporation |
| TGbe (MAC) | 5/20 | Akhmetov, Dmitry | Intel Corporation |
| TGbe (MAC) | 5/20 | Asterjadhi, Alfred | Qualcomm Incorporated |
| TGbe (MAC) | 5/20 | Au, Kwok Shum | Huawei Technologies Co., Ltd |
| TGbe (MAC) | 5/20 | baron, stephane | Canon Research Centre France |
| TGbe (MAC) | 5/20 | Bredewoud, Albert | Broadcom Corporation |
| TGbe (MAC) | 5/20 | Carney, William | Sony Corporation |
| TGbe (MAC) | 5/20 | Cheng, Paul | MediaTek Inc. |
| TGbe (MAC) | 5/20 | CHERIAN, GEORGE | Qualcomm Incorporated |
| TGbe (MAC) | 5/20 | Chitrakar, Rojan | Panasonic Asia Pacific Pte Ltd. |
| TGbe (MAC) | 5/20 | Choi, Jinsoo | LG ELECTRONICS |
| TGbe (MAC) | 5/20 | Ciochina, Dana | Sony Corporation |
| TGbe (MAC) | 5/20 | Das, Dibakar | Intel Corporation |
| TGbe (MAC) | 5/20 | Das, Subir | Perspecta Labs Inc. |
| TGbe (MAC) | 5/20 | Derham, Thomas | Broadcom Corporation |
| TGbe (MAC) | 5/20 | Ding, Baokun | Huawei Technologies Co. Ltd |
| TGbe (MAC) | 5/20 | Dong, Xiandong | Xiaomi Inc. |
| TGbe (MAC) | 5/20 | Doostnejad, Roya | Intel Corporation |
| TGbe (MAC) | 5/20 | Fang, Yonggang | ZTE TX Inc |
| TGbe (MAC) | 5/20 | Garg, Lalit | Broadcom Corporation |
| TGbe (MAC) | 5/20 | Ghosh, Chittabrata | Intel Corporation |
| TGbe (MAC) | 5/20 | Guo, Yuchen | Huawei Technologies Co., Ltd |
| TGbe (MAC) | 5/20 | Han, Jonghun | SAMSUNG |
| TGbe (MAC) | 5/20 | Han, Zhiqiang | ZTE Corporation |
| TGbe (MAC) | 5/20 | Handte, Thomas | Sony Corporation |
| TGbe (MAC) | 5/20 | Hervieu, Lili | Cable Television Laboratories Inc. (CableLabs) |
| TGbe (MAC) | 5/20 | Ho, Duncan | Qualcomm Incorporated |
| TGbe (MAC) | 5/20 | Hong, Hanseul | Yonsei University |
| TGbe (MAC) | 5/20 | Huang, Guogang  | Huawei |
| TGbe (MAC) | 5/20 | Inoue, Yasuhiko | Nippon Telegraph and Telephone Corporation (NTT) |
| TGbe (MAC) | 5/20 | Jang, Insun | LG ELECTRONICS |
| TGbe (MAC) | 5/20 | Jiang, Jinjing | Apple, Inc. |
| TGbe (MAC) | 5/20 | Kain, Carl | USDoT |
| TGbe (MAC) | 5/20 | Kedem, Oren | Huawei Technologies Co. Ltd |
| TGbe (MAC) | 5/20 | Kim, Jeongki | LG ELECTRONICS |
| TGbe (MAC) | 5/20 | kim, namyeong | LG ELECTRONICS |
| TGbe (MAC) | 5/20 | Kim, Sang Gook | LG ELECTRONICS |
| TGbe (MAC) | 5/20 | Kim, Sanghyun | WILUS Inc |
| TGbe (MAC) | 5/20 | Kim, Yongho | Korea National University of Transportation |
| TGbe (MAC) | 5/20 | Kim, Youhan | Qualcomm Incorporated |
| TGbe (MAC) | 5/20 | Kishida, Akira | Nippon Telegraph and Telephone Corporation (NTT) |
| TGbe (MAC) | 5/20 | Ko, Geonjung | WILUS Inc. |
| TGbe (MAC) | 5/20 | Kondo, Yoshihisa | Advanced Telecommunications Research Institute International (ATR) |
| TGbe (MAC) | 5/20 | Kumar, Manish | Marvell Semiconductor, Inc. |
| TGbe (MAC) | 5/20 | Kwon, Young Hoon | NXP Semiconductors |
| TGbe (MAC) | 5/20 | Lalam, Massinissa | SAGEMCOM BROADBAND SAS |
| TGbe (MAC) | 5/20 | Li, Qinghua | Intel Corporation |
| TGbe (MAC) | 5/20 | Li, Yiqing | Huawei Technologies Co. Ltd |
| TGbe (MAC) | 5/20 | Li, Yunbo | Huawei Technologies Co., Ltd |
| TGbe (MAC) | 5/20 | LIU, CHENCHEN | Huawei Technologies Co., Ltd |
| TGbe (MAC) | 5/20 | Lou, Hanqing | InterDigital, Inc. |
| TGbe (MAC) | 5/20 | Lu, Liuming | ZTE Corporation |
| TGbe (MAC) | 5/20 | Lv, kaiying | MediaTek Inc. |
| TGbe (MAC) | 5/20 | Lv, Lily | Huawei Technologies Co. Ltd |
| TGbe (MAC) | 5/20 | Max, Sebastian | Ericsson AB |
| TGbe (MAC) | 5/20 | Monajemi, Pooya | Cisco Systems, Inc. |
| TGbe (MAC) | 5/20 | Nezou, Patrice | Canon Research Centre France |
| TGbe (MAC) | 5/20 | Nguyen, An | DHS/CISA |
| TGbe (MAC) | 5/20 | Park, Minyoung | Intel Corporation |
| TGbe (MAC) | 5/20 | Park, Sung-jin | LG ELECTRONICS |
| TGbe (MAC) | 5/20 | Patil, Abhishek | Qualcomm Incorporated |
| TGbe (MAC) | 5/20 | Rosdahl, Jon | Qualcomm Technologies, Inc. |
| TGbe (MAC) | 5/20 | Salman, Hanadi | Istanbul Medipol University |
| TGbe (MAC) | 5/20 | Sedin, Jonas | Ericsson AB |
| TGbe (MAC) | 5/20 | Solaija, Muhammad Sohaib | Istanbul Medipol University; Vestel |
| TGbe (MAC) | 5/20 | Song, Taewon | LG ELECTRONICS |
| TGbe (MAC) | 5/20 | Strauch, Paul | Qualcomm Incorporated |
| TGbe (MAC) | 5/20 | Sun, Li-Hsiang | InterDigital, Inc. |
| TGbe (MAC) | 5/20 | Sun, Yanjun | Qualcomm Incorporated |
| TGbe (MAC) | 5/20 | Torab Jahromi, Payam | Facebook |
| TGbe (MAC) | 5/20 | Verma, Sindhu | Broadcom Corporation |
| TGbe (MAC) | 5/20 | VIGER, Pascal | Canon Research Centre France |
| TGbe (MAC) | 5/20 | Wang, Lei | Huawei R&D USA |
| TGbe (MAC) | 5/20 | Wang, Qi | Apple, Inc. |
| TGbe (MAC) | 5/20 | Wang, Xiaofei | InterDigital, Inc. |
| TGbe (MAC) | 5/20 | Wentink, Menzo | Qualcomm |
| TGbe (MAC) | 5/20 | Wullert, John | Perspecta Labs |
| TGbe (MAC) | 5/20 | YANG, RUI | InterDigital, Inc. |
| TGbe (MAC) | 5/20 | Yano, Kazuto | Advanced Telecommunications Research Institute International (ATR) |
| TGbe (MAC) | 5/20 | Yee, James | MediaTek Inc. |
| TGbe (MAC) | 5/20 | yi, yongjiang | Futurewei Technologies |
| TGbe (MAC) | 5/20 | Yu, Jian | Huawei Technologies Co., Ltd |

1. The Chair reminds that the agenda can be found in 11-20/735r8. The chair asked whether there is comment about the agenda. No response. The agenda is approved.

**Submissions**

1. 363r1 Proposals on unused bandwidth utilizations (Sindhu Verma) [SP only]

Sindu would like to defer her straw polls and bring back later after the offline discussion.

1. 429r4 **Link Latency Statistics of Multi-band Operations in EHT (**Kaiying Lu**)**

Summary

This presentation proposes to use partial bandwidth transmission opportunities to increase spectrum utilization in a wide band system and improve quality of services for low latency applications.

C: slide 9 question. Second bullet requirement is critical: parallel preamble detection.

A: second subbullet doesn’t mean that an AP may need to do parallel preamble detection.

C: Does the SC rule mean randomly select one 20MHz channel to do backoff?

A: here the proposal is that if the primary 20MHz channel is busy, other 20MHz channel is selected.

C: AP needs multiple PPDU decoders.

A: this depends on AP’s capability. If AP can’t decode multiple parallel PPDUs, it just selects one another channel to do backoff.

C: AP and STA may have different receiving strength. How the threshold in slide 9 works? This may create more hidden node problem.

A: This happens in the current BSS.

C: do you have the result about the improvement?

A: will do further investment.

1. 463r1 Priority Access Support Options for NS/EP Services (Subir Das**)**

Summary

This presentation proposes an approach for supporting priority access to NS/EP Priority Service non-AP STA(s) using OFDMA-based Triggered Uplink Access.  Specific TID is allocated to such service.

C: STA’s announcement of TID is just an advice to AP. It may not be trustable.

A: we assume the support of this is optional to AP, and mandatory to STA.

C: this can be generalized for other service. Instead of specific TID value, the more general method could be considered, e.g. through management etc.

A: would like to do further offline discussion.

C: separate BSS can be used since the service requires specific authentication.

A: we want to avoid that since what I proposed is used by other network.

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1. 468r0 Access category (Yonggang Fang**)**

Summary

This contribution discusses the channel access in Multi-Link communication to support low latency applications and high priority services. The new TID/ACs are used

C: slide about new AC/TID. Adding AC can provide higher priority. But if there are many traffic for such AC, the performance may be influenced. The backoff parameters of AC VO are already aggresive.

A: the separate queues will be used for the new AC.

C: question for slide 8. How to deal with TID 8 to 11 (e.g. no mapping of TID to AC) is not clear to me.

A: this is from 802.11 baseline.

C: the separate queue for specific traffic is already supported in baseline.

A: but the ACs are same in baseline.

C: agree the idea. The priority for low latency traffic should be higher than control message,

A: agreed.

C: how to handle the cases of multiple low latency traffics. More flexible/genernal solution should be considered.

A: need further study.

1. 569r1 11be txop protection coexistence 11ax (Payam Torab, Chunyu Hu**)**

Summary

This contribution proposes TXOP protection for >160MHz TXOP through new frame formats.

C: 11ax will approve in enxt 6 months. We shouldn’t change 11ax.

A: Let me give a similar method in 11ay. In 11ay, new channel mode is proposed. 11ay defines a capability to announce whether 11ad device supports the new channel access mode.

C: agree with the proposal.

C: In general, CTS time out may create fariness issue to legacy STAs. Using the frame format is preferable.

SP #1

* **Do you support defining new MAC-level mechanism for TXOP protection in 11be as HE capability?**
	+ Yes:
	+ No:
	+ Abstain:

*Notes*

* + *Examples of MAC-level mechanisms include modified or new RTS, MU-RTS and CTS frames, and NAV set/reset procedures to the extent that they are independent of EHT PHY header*
	+ *A feature can be defined as an HE capability through using bits/fields in HE Capabilities element (9.4.2.247), Extended Capabilities element (9.4.2.26), or similar fields/elements accessible to HE STAs*

C: why do you need this capability. An HE device can do it if it wants.

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17Y, 40N, 37A

SP #2

* **Do you support requiring formats for new RTS, MU-RTS and CTS frames (if defined) to be forward compatible?**
	+ Yes:
	+ No:
	+ Abstain:

*Notes*

* + *One examples of forward compatibility is using a version field; see 802.11-19-1519/r5 for ”forward compatibility” discussion*
	+ *Combination of Straw Polls #1 and #2 means “forward compatibility” to start from 11ax, but for 11ax as optional (capability)*

24Y, 20N, 40A

SP #3

* **Do you support defining new control frames in 11be using the existing “Control Frame Extension” subtype (6) and using bits 8-11 in Frame Control field?**
	+ **Yes:**
	+ **No:**
	+ **Abstain:**

***Notes***

* + ***This means different definitions for control frames under “Control Frame Extension” subtype (6) in 2.4/5/6 GHz and in 60 GHz)***

10Y, 26N, 49A

1. 591r0 Channel width selection for various frame types with preamble puncture and puncture location indication (Lochan Verma**)**

Summary

This contribution proposes channel width selection for Control frame, individually addressed Data frame and Management frame with Preamble Puncture.  A-Control and management element are used to carry the puncture information.

C: A-Control notifies the preferred puncture. Is this optional. Puncture is not new, e.g. 11ax has BQR.

A: too eary to say mandatory. The difference is how fast you can indicate your channel puncture pattern.

C: when AP will appy the STA’s puncture notification?

A: ideally it should be applied immediately after the PPDU carrying the nootification.

C: seems two parts are in the sldies. Long term signling, e.g. static signaling. This useful way. Different power envelope can provide flexble way, lower power channel to totally punctured channel.

A: we didn’t consider this.Please also consider our proposal in slide 6.

The teleconference was adjourned at 01:00pm EDT

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**Thursday 21 May 2020, 07:00pm – 10:00pm ET (TGbe MAC ad hoc conference call)**

Chairman: Jeongki Kim (LG Electronics)

Secretary: Liwen Chu (NXP)

This meeting took place using a webex session.

**Introduction**

1. The Chair (Jeongki, LG) calls the meeting to order at 10:04am EDT. The Chair introduces himself and the Secretary, Liwen Chu (NXP)
2. The Chair goes through the 802 and 802.11 IPR policy and procedures and asks if there is anyone that is aware of any potentially essential patents. Nobody speaks up.
3. The Chair recommends using IMAT for recording the attendance.
	* Please record your attendance during the conference call by using the IMAT system:
		1. 1) login to [imat](https://imat.ieee.org/attendance), 2) select “802.11 Telecons (<Month>)” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “TGbe <MAC/PHY/Joint> conference call that you are attending.
	* If you are unable to record the attendance via [IMAT](https://imat.ieee.org/attendance) then please send an e-mail to Jeongki Kim (jeongki.kim@lge.com) and Liwen Chu (liwen.chu@nxp.com)

**Recorded attendance through Imat and e-mail:**

|  |  |  |
| --- | --- | --- |
| 5/21 | Adachi, Tomoko | TOSHIBA Corporation |
| 5/21 | Akhmetov, Dmitry | Intel Corporation |
| 5/21 | Au, Kwok Shum | Huawei Technologies Co., Ltd |
| 5/21 | Cariou, Laurent | Intel Corporation |
| 5/21 | Carney, William | Sony Corporation |
| 5/21 | CHAN, YEE | Facebook |
| 5/21 | Cheng, Paul | MediaTek Inc. |
| 5/21 | Coffey, John | Realtek Semiconductor Corp. |
| 5/21 | Das, Subir | Perspecta Labs Inc. |
| 5/21 | Derham, Thomas | Broadcom Corporation |
| 5/21 | Ding, Baokun | Huawei Technologies Co. Ltd |
| 5/21 | Dong, Xiandong | Xiaomi Inc. |
| 5/21 | Fischer, Matthew | Broadcom Corporation |
| 5/21 | Guo, Qiang | InfomTechnologies |
| 5/21 | Guo, Yuchen | Huawei Technologies Co., Ltd |
| 5/21 | Han, Jonghun | SAMSUNG |
| 5/21 | Han, Zhiqiang | ZTE Corporation |
| 5/21 | Hong, Hanseul | Yonsei University |
| 5/21 | Huang, Po-Kai | Intel Corporation |
| 5/21 | Jang, Insun | LG ELECTRONICS |
| 5/21 | Jiang, Jinjing | Apple, Inc. |
| 5/21 | Jung, hyojin | Hyundai Motor Company |
| 5/21 | Kain, Carl | USDoT |
| 5/21 | Kakani, Naveen | Qualcomm Incorporated |
| 5/21 | Kandala, Srinivas | SAMSUNG |
| 5/21 | kim, namyeong | LG ELECTRONICS |
| 5/21 | Kim, Sang Gook | LG ELECTRONICS |
| 5/21 | Kim, Sanghyun | WILUS Inc |
| 5/21 | Kim, Yongho | Korea National University of Transportation |
| 5/21 | Kishida, Akira | Nippon Telegraph and Telephone Corporation (NTT) |
| 5/21 | Kneckt, Jarkko | Apple, Inc. |
| 5/21 | Kondo, Yoshihisa | Advanced Telecommunications Research Institute International (ATR) |
| 5/21 | Kwon, Young Hoon | NXP Semiconductors |
| 5/21 | Levy, Joseph | InterDigital, Inc. |
| 5/21 | Li, Yunbo | Huawei Technologies Co., Ltd |
| 5/21 | Lu, Liuming | ZTE Corporation |
| 5/21 | Monajemi, Pooya | Cisco Systems, Inc. |
| 5/21 | NANDAGOPALAN, SAI SHANKAR | Cypress Semiconductor Corporation |
| 5/21 | Naribole, Sharan | SAMSUNG |
| 5/21 | Ouchi, Masatomo | Canon |
| 5/21 | Park, Minyoung | Intel Corporation |
| 5/21 | Patil, Abhishek | Qualcomm Incorporated |
| 5/21 | Patwardhan, Gaurav | Hewlett Packard Enterprise |
| 5/21 | Raissinia, Alireza | Qualcomm Incorporated |
| 5/21 | Rosdahl, Jon | Qualcomm Technologies, Inc. |
| 5/21 | Salman, Hanadi | Istanbul Medipol University |
| 5/21 | Seok, Yongho | MediaTek Inc. |
| 5/21 | Song, Taewon | LG ELECTRONICS |
| 5/21 | Sun, Li-Hsiang | InterDigital, Inc. |
| 5/21 | Sun, Yanjun | Qualcomm Incorporated |
| 5/21 | Tanaka, Yusuke | Sony Corporation |
| 5/21 | Torab Jahromi, Payam | Facebook |
| 5/21 | VIGER, Pascal | Canon Research Centre France |
| 5/21 | Wang, Hao | Tencent |
| 5/21 | Wang, Huizhao | Quantenna Communications, Inc. |
| 5/21 | Wu, Hao | XGIMI Technology Co.Ltd |
| 5/21 | Yang, Jay | Nokia |
| 5/21 | Yano, Kazuto | Advanced Telecommunications Research Institute International (ATR) |
| 5/21 | Yee, James | MediaTek Inc. |
| 5/21 | Yukawa, Mitsuyoshi | Canon, Inc. |

1. The Chair reminds that the agenda can be found in 11-20/735r11. The chair asked whether there is comment about the agenda. Abhi asked to defer his submission 11-19/1955. Lochan asked some time for his unfinished presented slides in 11-20/591r0. The agenda is updated per the request.

**Submissions**

1. 591r0 Channel Width Selection for various Frame Types with Preamble Puncture and Puncture Location Indication (Lochan Verma) [SP only]

After some discussion, the straw poll is deferred.

1. [624r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0624-00-00be-eht-operation-element-for-320mhz.pptx) EHT Operation Element for 320MHz (Jason Yuchen Guo)

Summary

This presentation proposes that one BSS can operate in more than one band and the EHT operation element format.

C: whether 160+80 is identified by BW should be discussed with PHY.

C: 6GHz has many regulatory rules that are different from 5GHz band operation. It is difficult to operate both bands in one BSS.

A: Indoor should be fine.

C: the power limit is different.

A: AP should follow the strict one.

C: 160+80 should be identified through channel puncture. The mixed bands for a BSS may be difficult.

A: this is for future extension. The channel access rules for 5GHz and 6GHz band are same.

C: the question is secondary channel rule.

A: we think IFS is enough.

C: the activity of two bands may be difficult. PIFS may create fairness issue.

1. 680r0 Operating bandwidth indication for eht bss (Huang Guogang)

Summary

This presentation proposes the BW, CCFSs for EHT BSS. Independent BW, CCFSs from EHT/HE operation element for EHT STAs are proposed.

C: we are ok with the solution to put everything in EHT operation element. For the multiple options, do you have any preference?

A: prefer option 1.

C: similar to my option 2 in reference 1.

C: what is the reason for option 1?

A: two CCFS fields are used in option 1.

C: the reason for the channel puncturing may be lower power subchannel. static channel puncturing should not be bitmap.

C: for straw poll 1, do you want to restrict to 6GHz?

A: Agreed.

After the discussion the straw poll is changed to

SP #1

* **Do you support to define EHT operation element to indicate the channel configuration for EHT STA, which does not need to combine with the indication of CCFS0 and CCFS1 in HE operation elements at 6 GHz?**

Approved with unanimous consent

1. [1988r1](https://mentor.ieee.org/802.11/dcn/19/11-19-1988-01-00be-power-save-for-multi-link.pptx) Power Save for Multi-link (Ming Gan)

Summary

This presentation proposes the primary link for monitoring Beacon etc., buffer status notification through one specific link, TWT set up through one specific link etc.

C: multiple TWT with same SP, interval in multiple links can be established. This is good. What do you think about other TWT establishment scheme?

A: we prefer the proposed one.

C: one association for multiple links. Why not to use same AID for multiple links of a STA MLD?

C: slide 3, anchor channel is similar to your primary link. STA can pick link as primary link that AP MLD is beaconing.

A: I should update my slides since AP MLD broadcasts Beacons in each link.

SP #1

* **Do you agree that not every STA operating in PS mode in a non-AP MLD is required to receive the beacon frames periodically?**
	+ This is an exemption besides the existing ones, such as individual TWT agreement, WNM sleep mode and NonTIM mode

C: this is already allowed by baseline. Probably we don’t need to run this.

C: similar question. Implementation specific.

C: what is the implication of the spec? looks more implementation thing.

A: the intention is that monitoring one link’s beacon is enough.

C: then you should reword the straw poll as that.

A: that is another straw poll.

26Y, 5N, 40A

SP #2

* **Do you agree that an AP in an AP MLD shall provide DL traffic notification for another AP in the same AP MLD**
	+ The detail for DL traffic notification is TBD

C: I have similar contribution. Please defer this one.

A: the straw poll is about collect the opinion.

The straw poll is deferred.

The other straw polls are deferred

1. 037r1 Power Saving Considering non-AP without STR Cap. (Namyeong Kim)

Summary

This presentation proposes the power saving mechanism considering the constraints of MLD that doesn’t support simultaneous TX/RX (STR) capability on a pair of links.

C: proposal 1 about slide 5. We don’t need to define specific power save rules. Normal NSTR rule should be enough.

A: basically, agree with the comment. However the proposal is like intra-PPDU power that is already in baseline.

C: Proposal 2. We don’t want to let one link to sleep because of throughput concern.

A: if the STA MLD want to increase the throughput, STA MLD will not go to power save mode.

C: Question to slide 8. Does STA2 notifies the mode in link 2?

A: No signaling is needed.

C: if no signaling, isn’t it just implementation issue?

C: this may decrease the throughput.

A: the link1 can indicate whether there are buffered frames in link2.

C: similar questions as previous comments.

SP # 1

* **Do you support 11be defines a power saving mechanism considering unused duration which is generated to avoid interference among links of non-STR non-AP MLD?**
	+ The details of unused duration are TBD (e.g., TXOP or PPDU)

C: the SP is not clear, e.g. unused duration.

A: ok, we can defer the SP for offline discussion.

1. 066r3 Multi-link TIM (Young Hoon Kwon)

Summary

This presentation proposes propose possible ways of expanding conventional TIM mechanism to be used for indication of multiple link status.

C: generally, agree with the SPs. Slide 12 bullet 2, the conclusion may not be right. It is better to have TID indication.

A: we have 8 TIDs. TID based indication has higher overhead.

C: Slide 12 bullet 2, I don’t think different AIDs for STA MLD have some issue.

A: TIMs in different links may have different meaning.

C: when TID maps multiple links, it is not clear which link to wake up.

A: STA MLD needs to wake up in those links.

. The teleconference was adjourned at 10:00pm EDT

**Wednesday 27 May 2020, 10:00am – 01:00pm ET (TGbe MAC ad hoc conference call)**

Chairman: Jeongki Kim (LG Electronics)

Secretary: Liwen Chu (NXP)

This meeting took place using a webex session.

**Introduction**

1. The Chair (Jeongki, LG) calls the meeting to order at 10:04am EDT. The Chair introduces himself and the Secretary, Liwen Chu (NXP)
2. The Chair goes through the 802 and 802.11 IPR policy and procedures and asks if there is anyone that is aware of any potentially essential patents. Nobody speaks up.
3. The Chair recommends using IMAT for recording the attendance.
	* Please record your attendance during the conference call by using the IMAT system:
		1. 1) login to [imat](https://imat.ieee.org/attendance), 2) select “802.11 Telecons (<Month>)” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “TGbe <MAC/PHY/Joint> conference call that you are attending.
	* If you are unable to record the attendance via [IMAT](https://imat.ieee.org/attendance) then please send an e-mail to Jeongki Kim (jeongki.kim@lge.com) and Liwen Chu (liwen.chu@nxp.com)

**Recorded attendance through Imat and e-mail:**

|  |  |  |
| --- | --- | --- |
| 5/27 | Adhikari, Shubhodeep | Broadcom Corporation |
| 5/27 | Akhmetov, Dmitry | Intel Corporation |
| 5/27 | baron, stephane | Canon Research Centre France |
| 5/27 | Bredewoud, Albert | Broadcom Corporation |
| 5/27 | Carney, William | Sony Corporation |
| 5/27 | Cheng, Paul | MediaTek Inc. |
| 5/27 | CHERIAN, GEORGE | Qualcomm Incorporated |
| 5/27 | Chitrakar, Rojan | Panasonic Asia Pacific Pte Ltd. |
| 5/27 | Choi, Jinsoo | LG ELECTRONICS |
| 5/27 | Coffey, John | Realtek Semiconductor Corp. |
| 5/27 | Das, Dibakar | Intel Corporation |
| 5/27 | Das, Subir | Perspecta Labs Inc. |
| 5/27 | Derham, Thomas | Broadcom Corporation |
| 5/27 | de Vegt, Rolf | Qualcomm Incorporated |
| 5/27 | Ding, Baokun | Huawei Technologies Co. Ltd |
| 5/27 | Dong, Xiandong | Xiaomi Inc. |
| 5/27 | Fang, Yonggang | ZTE TX Inc |
| 5/27 | Fischer, Matthew | Broadcom Corporation |
| 5/27 | Gan, Ming | Huawei Technologies Co., Ltd |
| 5/27 | Ghosh, Chittabrata | Intel Corporation |
| 5/27 | Guo, Yuchen | Huawei Technologies Co., Ltd |
| 5/27 | Han, Jonghun | SAMSUNG |
| 5/27 | Han, Zhiqiang | ZTE Corporation |
| 5/27 | Handte, Thomas | Sony Corporation |
| 5/27 | Ho, Duncan | Qualcomm Incorporated |
| 5/27 | Hong, Hanseul | Yonsei University |
| 5/27 | Hsu, Chien-Fang | MediaTek Inc. |
| 5/27 | Hu, Chunyu | Facebook |
| 5/27 | Hu, Mengshi | HUAWEI |
| 5/27 | Huang, Guogang  | Huawei |
| 5/27 | Huang, Po-Kai | Intel Corporation |
| 5/27 | Ji, Chenhe | Huawei Technologies Co. Ltd |
| 5/27 | Jiang, Jinjing | Apple, Inc. |
| 5/27 | Kakani, Naveen | Qualcomm Incorporated |
| 5/27 | Kandala, Srinivas | SAMSUNG |
| 5/27 | Kim, Jeongki | LG ELECTRONICS |
| 5/27 | kim, namyeong | LG ELECTRONICS |
| 5/27 | Kim, Sanghyun | WILUS Inc |
| 5/27 | Kim, Yongho | Korea National University of Transportation |
| 5/27 | Kim, Youhan | Qualcomm Incorporated |
| 5/27 | Kishida, Akira | Nippon Telegraph and Telephone Corporation (NTT) |
| 5/27 | Kondo, Yoshihisa | Advanced Telecommunications Research Institute International (ATR) |
| 5/27 | Kwon, Young Hoon | NXP Semiconductors |
| 5/27 | Lalam, Massinissa | SAGEMCOM BROADBAND SAS |
| 5/27 | Li, Yiqing | Huawei Technologies Co. Ltd |
| 5/27 | Li, Yunbo | Huawei Technologies Co., Ltd |
| 5/27 | Liang, dandan | Huawei Technologies Co., Ltd |
| 5/27 | LIU, CHENCHEN | Huawei Technologies Co., Ltd |
| 5/27 | Lou, Hanqing | InterDigital, Inc. |
| 5/27 | Lu, Liuming | ZTE Corporation |
| 5/27 | Lv, kaiying | MediaTek Inc. |
| 5/27 | Max, Sebastian | Ericsson AB |
| 5/27 | Monajemi, Pooya | Cisco Systems, Inc. |
| 5/27 | NANDAGOPALAN, SAI SHANKAR | Cypress Semiconductor Corporation |
| 5/27 | Park, Minyoung | Intel Corporation |
| 5/27 | Park, Sung-jin | LG ELECTRONICS |
| 5/27 | Patil, Abhishek | Qualcomm Incorporated |
| 5/27 | Petrick, Albert | InterDigital, Inc. |
| 5/27 | Raissinia, Alireza | Qualcomm Incorporated |
| 5/27 | Rosdahl, Jon | Qualcomm Technologies, Inc. |
| 5/27 | Sedin, Jonas | Ericsson AB |
| 5/27 | Seok, Yongho | MediaTek Inc. |
| 5/27 | Solaija, Muhammad Sohaib | Istanbul Medipol University; Vestel |
| 5/27 | Song, Taewon | LG ELECTRONICS |
| 5/27 | Stacey, Robert | Intel Corporation |
| 5/27 | Sun, Li-Hsiang | InterDigital, Inc. |
| 5/27 | Sun, Yanjun | Qualcomm Incorporated |
| 5/27 | Verma, Sindhu | Broadcom Corporation |
| 5/27 | VIGER, Pascal | Canon Research Centre France |
| 5/27 | Wang, Hao | Tencent |
| 5/27 | Wang, Huizhao | Quantenna Communications, Inc. |
| 5/27 | Wang, Lei | Huawei R&D USA |
| 5/27 | Wang, Xiaofei | InterDigital, Inc. |
| 5/27 | Yee, James | MediaTek Inc. |
| 5/27 | yi, yongjiang | Futurewei Technologies |
| 5/27 | Yu, Jian | Huawei Technologies Co., Ltd |
| 5/27 | Yu, Mao | NXP Semiconductors |

1. The Chair reminds that the agenda can be found in 11-20/735r12. The chair asked whether there is comment about the agenda. Abhi asked to defer his submission 11-19/1955. Young Hoon asked for runing his deferred SP. The Chair ageed to add the deferred SPs at he end of the queue of power save topic. The agenda is updated per the request.

**Submissions**

1. 0070r1 Multi-link power saving operation (Yonggang Fang)

Summary

This presentation follows up the discussion of EHT multi-link communication to support low latency, high reliability and high throughput applications, and discusses the issue of power consumption in ML operation. It also proposes a possible approach for establishing an anchored link for ML power saving operation.

C: totch the different topics. In slide 7, how does the operating mode fit here?

A: this is single case. For multiple link case, disable/enable should exist.

C: why do we need the link awake state? Are link doze/active states enough?

A: link doze means no listen to anything.

C: lot of material. Question for SP, anchor link mentioned in several slides. some things need to be clear. What the anchor link is used? The Beacon in one link is not good for single radio STA MLD. For negotiation, it is not good for AP to decide.

A: do you have suggestion? AP needs to know which link the STA MLD will monitor the Beacon for AP to decide where to transmit buffer status indication.

C: agree with previous commenter. Anchor link is not clear. The role of the AP should be to serve the STA and send beacon in all its links. STA may internally to select one link.

A: For single link, it has to use the associated link for power save mode. For multiple link STA MLD, it should notify the AP MLD one link as anchor link so that AP can transmit the buffer status of the STA MLD through the negotiated link.

C: broadcast/multicast is decided by up layer. They are per link traffic. Anchor link is pretty much coverred by baseline. STA just goes to the link at TBTT time and check the bit for it. No negotiation is needed. Don’t think the proposal is needed.

A: for save power, one link should be used. Other link could be in deep sleep mode.

SP#1

* + **Do you support to include the following in SFD ?**
		- A non-AP MLD may negotiate with the associated AP MLD a link as the anchored link for the power saving operation.

13Y, 28N, 38A

1. [084r1](https://mentor.ieee.org/802.11/dcn/20/11-20-0084-01-00be-multi-link-tim-design.pptx) Multi-link TIM design (Minyoung Park)

Summary

This presentation proposes the power saving mechanism considering the constraints of MLD that doesn’t support simultaneous TX/RX (STR) capability on a pair of links.

C: Agree single AID for STA MLD. Assume two TIDs have buffered frames, TID1 Maps to link 1 and TID2 maps to two links. STA select link2. TID1 is stock in link1. The better way is to indicate the TID.

A: what you describe is similar to multi-link TIM.

C: is multi-link TIM per TID or per link?

A: it is based on TID to link mapping.

C: do you mean that all STA MLD has same mapping. If the mapping for STA MLDs are different, how do you transmit the information.

A: for 3 links, the maximum is 3.

C: for the two options of TIM and ML TIM, which one do you prefer?

A: they can work together.

C: what is the logic for TIM and ML TIM?

A: TIM indicates the buffer frames in AP MLD. ML TIM will indicate which link to wake up.

The SPs are deferred.

1. [085r1](https://mentor.ieee.org/802.11/dcn/20/11-20-0085-01-00be-multi-link-power-save-link-bitmap.pptx) Multi-link power save - link bitmap (Minyoung Park)

Summary

This presentation proposes a method to extend legacy power save operations to multi-link operation for 802.11be.

C: slide 4 generally makes sense. Does this apply to PS Poll.

A:I am not sure there is space to carry the indication. Maybe this is why I don’t include PS Poll here. PS Poll works in legacy way.

C: UAPSD case, if link bitmap is used, there may be a delay in AP MLD for APs’ communication.

A: agree with the delay.

C: PS Poll is typical case. How about only 1 has meaning, 0 has no meaning.

A: didn’t consider it.

C: for SP1, STA MLD can indicate awake state in the link of the indication transmission only. Why do we need to indicate other link’s awake state?

A: TWT can use such mechanism.

C: the simpler way is to indicate the state of a link in the link only.

A: different people have different opinion.

SP #1

**Do you agree with the following?**

* Between a non-AP MLD and an AP MLD, a STA may transmit a frame to an AP to indicate the transition to the awake state of the other STA(s) of the non-AP MLD
- Optional for both AP and non-AP

C: which sequence do you think the idea can be applied?

A: it will depend on STA MLD’s decision.

C: motion 84 is similar to this SP.

A: Then we don’t need to run this. Will check the motion.

 The SP is not run.

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1. 289r1 On multi-link power save and link management (Sindhu Verma)

Summary

This presentation proposes 1) fallback link(s) to help individual/broadcast TWT operation, 2) monitor channel segment narrower than 20MHz, 3) fast beacon channel switch etc.

C: question on slide 7. Are you talking about channel switch?

A: For three links in MLD, Link1 and 2 are used. If link 2 can’t work. Link1 and 3 can be used after such operation.

C: slide 5. Non-AP STA monitor channel less than 20MHz.

A: it depends on whether less than 20MHz monitoring is allowed by PHY design. This can save power if allowed by PHY.

C: it is difficult to co-exist with legacy devices.

A: the PPDU starts with 20MHz preamble.

The SPs are deferred.

1. 370r1 Multi-link Power Save Discussion (Sharan Naribole)

Summary

This presentation proposes the extreme power save mode of MLO operation, the anchor link for MLO operation etc.

C: trying to understand the extreme low power mode. Based on the current agreement, a STA MLD can monitor one link. You don’t need any new thing.

A: it is not defined clearly that an AP MLD will include all the information of their links in one link’s beacon. It is not clear whether the buffer status indication in one link applies to other links.

C: my understanding is that a STA MLD can monitor one link. But some rules should be defined to decrease Beacon overhead.

C: for links other than anchor link, they can be disabled. What is the difference between disabling and power save mode?

A: power save need to wake up to receive Beacon. Disabling link means the buffer frames are only in anchor link.

C: is it related to TID to link mapping?

A: we think about all possible case, special TID to link mapping, default mode.

C: do you prefer fixed anchor link or dynamic anchor link?

A: we support option 2 more than option 1.

C: The goals are good for extreme low power mode. For anchor link, do we need specific link?

C: several people already made similar comments. Power save mode of links can support extremely low power mode.

A: monitoring one link may need some consideration about Beacon overhead etc.

The straw polls are deferred

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1. [391r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0391-00-00be-multi-link-power-save-state-after-enablement.pptx) Power save state after enablement (Laurent Cariou)

Summary

This presentation clarifies the power save mode, power state of various links of STA MLS after the multi-link setup.

C: for multi-link, if there are no traffic in a link that the association is done, is it possible the link is not in active mode.

A: it is wired case. By your example, all the links are not in active mode after the association.

The straw polls are deferred since there is no time to run it.

The teleconference was adjourned at 01:00pm EDT