IEEE P802.11 Wireless LANs

|  |
| --- |
| Minutes for TGbe MAC Ad-Hoc teleconferences in July and September 2020 |
| Date: 2020-07-13 |
| Author(s): |
| Name | Affiliation | Address | Phone | Email |
| Jeongki Kim | LG Electronics |  |  |  |
| Liwen Chu | NXP |  |  |  |
|  |  |  |  |  |

Abstract

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

Revisions:

* Rev0: Added the minutes from the telephone conferences held on July 13, 2020.
* Rev1: Added the minutes from the telephone conferences held on July 15, 2020.
* Rev2: Added the minutes from the telephone conferences held on July 20, 2020.
* Rev3: Added the minutes from the telephone conferences held on July 22, 2020.
* Rev4: Added the minutes from the telephone conferences held on July 23, 2020.

**Monday 13 July 2020, 19:00 –21:00 ET (TGbe MAC ad hoc conference call)**

Chairman: Liwen Chu (NXP)

Secretary: Jeongki Kim (LG Electronics)

This meeting took place using a webex session.

**Introduction**

1. The Chair (Liwen, NXP) calls the meeting to order at 19:04am EDT. The Chair introduces himself and the Secretary, Jeongki Kim (LG)
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 Liwen Chu (liwen.chu@nxp.com) and Jeongki Kim (jeongki.kim@lge.com)

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

|  |  |
| --- | --- |
| Name | Affiliation |
| Abdelaal, Rana | Broadcom Corporation |
| AbidRabbu, Shaima' | Istanbul Medipol University; Vestel |
| Abouelseoud, Mohamed | Sony Corporation |
| Aboulmagd, Osama | Huawei Technologies Co.,  Ltd |
| Abushattal, Abdelrahman | Istanbul Medipol university ;Vestel |
| Adachi, Tomoko | TOSHIBA Corporation |
| Adhikari, Shubhodeep | Broadcom Corporation |
| Agarwal, Peyush | Broadcom Corporation |
| Agrawal, Sandeep | C-DOT/Centre for Development of Telematics |
| Ahn, Woojin | Korea Railroad Research Institute (KRRI) |
| Alayasra, Musab | Medipol University; Vestel |
| Alex, Sam | Facebook |
| Asai, Yusuke | Nippon Telegraph and Telephone Corporation (NTT) |
| Asterjadhi, Alfred | Qualcomm Incorporated |
| Au, Kwok Shum | Huawei Technologies Co.,  Ltd |
| Au, Oscar | Origin Wireless |
| Auluck, Vijay | Self |
| Baek, SunHee | LG ELECTRONICS |
| Bajko, Gabor | MediaTek Inc. |
| Banerjea, Raja | Qualcomm Incorporated |
| Bankov, Dmitry | IITP RAS |
| baron, stephane | Canon Research Centre France |
| Bhandaru, Nehru | Broadcom Corporation |
| Bims, Harry | Bims Laboratories, Inc. |
| Bober, Lennert | Fraunhofer Heinrich Hertz Institute |
| Calcev, George | Futurewei Technologies |
| Cariou, Laurent | Intel Corporation |
| Carney, William | Sony Corporation |
| Cavalcanti, Dave | Intel Corporation |
| Cha, Jaesun | Electronics and Telecommunications Research Institute (ETRI) |
| CHAN, YEE | Facebook |
| Chen, Cheng | Intel Corporation |
| Chen, Cheng-Ming | Qualcomm Incorporated |
| Chen, Na | MaxLinear Corp |
| Cheng, Paul | MediaTek Inc. |
| CHERIAN, GEORGE | Qualcomm Incorporated |
| Chitrakar, Rojan | Panasonic Asia Pacific Pte Ltd. |
| Chu, Liwen | NXP Semiconductors |
| Chung, Chulho | SAMSUNG |
| Cordeiro, Carlos | Intel Corporation |
| Das, Dibakar | Intel Corporation |
| Das, Subir | Perspecta Labs Inc. |
| Derham, Thomas | Broadcom Corporation |
| de Vegt, Rolf | Qualcomm Incorporated |
| Dong, Xiandong | Xiaomi Inc. |
| Fang, Yonggang | ZTE TX Inc |
| Fischer, Matthew | Broadcom Corporation |
| Gan, Ming | Huawei Technologies Co., Ltd |
| Garg, Lalit | Broadcom Corporation |
| Ghosh, Chittabrata | Intel Corporation |
| GUIGNARD, Romain | Canon Research Centre France |
| Guo, Yuchen | Huawei Technologies Co., Ltd |
| Hamilton, Mark | Ruckus/CommScope |
| Han, Jonghun | SAMSUNG |
| HAN, Xiao | Huawei Technologies Co., Ltd |
| Han, Zhiqiang | ZTE Corporation |
| Henry, Jerome | Cisco Systems, Inc. |
| Hervieu, Lili | Cable Television Laboratories Inc. (CableLabs) |
| Hirata, Ryuichi | Sony Corporation |
| Hiroki, Shigeru | Canon Research Centre France |
| Ho, Duncan | Qualcomm Incorporated |
| Hong, Hanseul | Yonsei University |
| Hsu, Chien-Fang | MediaTek Inc. |
| Hu, Chunyu | Facebook |
| Hu, Glenn | Tencent |
| Huang, Guogang  | Huawei |
| Huang, Po-Kai | Intel Corporation |
| Huang, Xiaolong | Qualcomm Incorporated |
| Hwang, Sung Hyun | Electronics and Telecommunications Research Institute (ETRI) |
| IDO, Tetsuo | Canon |
| Inohiza, Hirohiko | Canon Inc. |
| Inoue, Yasuhiko | Nippon Telegraph and Telephone Corporation (NTT) |
| Iwatani, Junichi | Nippon Telegraph and Telephone Corporation (NTT) |
| Jang, Insun | LG ELECTRONICS |
| Ji, Chenhe | Huawei Technologies Co. Ltd |
| Jiang, Jinjing | Apple Inc. |
| Jones, Allan | Activision |
| Jones, Vincent Knowles IV | Qualcomm Incorporated |
| Jung, hyojin | Hyundai Motor Company |
| JUNG, MYUNG CHEUL | Pantech Inc. |
| Kain, Carl | USDoT |
| Kakani, Naveen | Qualcomm Incorporated |
| Kandala, Srinivas | SAMSUNG |
| Kerry, Stuart | OK-Brit; Ruckus; CommScope |
| Khericha, samir | BRoadcom |
| Khorov, Evgeny | IITP RAS |
| Kim, Jeongki | LG ELECTRONICS |
| kim, namyeong | LG ELECTRONICS |
| Kim, Sang Gook | LG ELECTRONICS |
| Kim, Sanghyun | WILUS Inc |
| Kim, Yongho | Korea National University of Transportation |
| Kim, Youn-Kwan | The Catholic University of Korea |
| Kishida, Akira | Nippon Telegraph and Telephone Corporation (NTT) |
| Klein, Arik | Huawei Technologies Co. Ltd |
| Klimakov, Andrey | Huawei Technologies Co., Ltd |
| Kneckt, Jarkko | Apple Inc. |
| Ko, Geonjung | WILUS Inc. |
| Kondo, Yoshihisa | Advanced Telecommunications Research Institute International (ATR) |
| Kumar, Manish | Marvell Semiconductor, Inc. |
| Kwak, Jin-Sam | WILUS Inc. |
| Kwon, Young Hoon | NXP Semiconductors |
| Lan, Zhou | Broadcom Corporation |
| Lee, Hyeong Ho | Netvision Telecom Inc. |
| Lee, Jae Seung | Electronics and Telecommunications Research Institute (ETRI) |
| Lee, Nancy | Signify |
| Le Houerou, Brice | Canon Research Centre France |
| Li, Bo | Northwestern Polytechnical University |
| Li, Guoqing | Apple Inc. |
| Li, Nan | ZTE Corporation |
| Li, Yiqing | Huawei Technologies Co. Ltd |
| Li, Yunbo | Huawei Technologies Co., Ltd |
| Lin, Wei | Huawei Technologies Co. Ltd |
| Liu, Jeff | Broadcom Corporation |
| Liu, Yong | Apple Inc. |
| Loginov, Vyacheslav | IITP RAS |
| Lu, Liuming | ZTE Corporation |
| Luo, Chaoming | Beijing OPPO telecommunications corp., ltd. |
| Lv, kaiying | MediaTek Inc. |
| Lv, Lily | Huawei Technologies Co. Ltd |
| Ma, Mengyao | HUAWEI |
| Merlin, Simone | Qualcomm Incorporated |
| Mohanty, Bibhu | Qualcomm Incorporated |
| Monajemi, Pooya | Cisco Systems, Inc. |
| Morioka, Hitoshi | SRC Software |
| Motozuka, Hiroyuki | Panasonic Corporation |
| Murti, Wisnu | SeoulTech |
| Myles, Andrew | Cisco Systems, Inc. |
| Nagai, Yukimasa | Mitsubishi Electric Research Labs (MERL) |
| NAGATA, KENGO | Nippon Telegraph and Telephone Corporation (NTT) |
| Nakano, Hiroki | CAHI Corporation |
| NANDAGOPALAN, SAI SHANKAR | Cypress Semiconductor Corporation |
| Naribole, Sharan | SAMSUNG |
| Nezou, Patrice | Canon Research Centre France |
| Nguyen, An | DHS/CISA |
| Nurani Krishnan, Neelakantan | Qualcomm Incorporated |
| Ohsawa, Tomoki | NICT |
| Okada, Hiraku | Nagoya University |
| Omar, Hassan | Huawei Technologies Co.,  Ltd |
| Orlik, Philip | Mitsubishi Electric Research Labs (MERL) |
| Ouchi, Masatomo | Canon |
| Palm, Stephen | Broadcom Corporation |
| Pan, Chun | HUAWEI |
| Park, Minyoung | Intel Corporation |
| Patil, Abhishek | Qualcomm Incorporated |
| Patwardhan, Gaurav | Hewlett Packard Enterprise |
| Petranovich, James | ViaSat, Inc. |
| Petrick, Albert | InterDigital, Inc. |
| Petry, Brian | Broadcom Corporation |
| Purwita, Ardimas | University of Edinburgh |
| Pushkarna, Rajat | Panasonic Asia Pacific Pte Ltd. |
| Qi, Emily | Intel Corporation |
| Raissinia, Alireza | Qualcomm Incorporated |
| Rantala, Enrico-Henrik | Nokia |
| Rosdahl, Jon | Qualcomm Technologies, Inc. |
| Ryan, Mike | Ford Motor Company |
| Sadeghi, Bahareh | Intel Corporation |
| Sakamoto, Takenori | Panasonic Corporation |
| Sakoda, Kazuyuki | Sony Corporation |
| Salem, Mohamed | Huawei Technologies Co., Ltd |
| Salman, Hanadi | Istanbul Medipol University; VESTEL |
| Sambasivan, Sam | AT&T |
| Sandhu, Shivraj | Qualcomm Incorporated |
| Sedin, Jonas | Ericsson AB |
| Seok, Yongho | MediaTek Inc. |
| Sevin, Julien | Canon Research Centre France |
| Sherlock, Ian | Texas Instruments Incorporated |
| Siyari, Peyman | Qualcomm Incorporated |
| Solaija, Muhammad Sohaib | Istanbul Medipol University; Vestel |
| Son, Ju-Hyung | WILUS Inc. |
| Song, Taewon | LG ELECTRONICS |
| Startsev, Ivan | IITP RAS |
| Stott, Noel | Keysight Technologies |
| Su, Hang | Broadcom Corporation |
| Sumi, Takenori | Mitsubishi Electric Corporation |
| Sun, Li-Hsiang | InterDigital, Inc. |
| Sun, Yanjun | Qualcomm Incorporated |
| Takai, Mineo | Space-Time Engineering |
| Tanaka, Yusuke | Sony Corporation |
| Tomoyuki, Takada | Canon |
| Torab Jahromi, Payam | Facebook |
| Umehara, Makoto | Canon |
| Verma, Lochan | Qualcomm Incorporated |
| Verma, Sindhu | Broadcom Corporation |
| VIGER, Pascal | Canon Research Centre France |
| Wang, Chao Chun | MediaTek Inc. |
| Wang, Hao | Tencent |
| Wang, Huizhao | Quantenna Communications, Inc. |
| Wang, Lei | Huawei R&D USA |
| Wang, Qi | Apple Inc. |
| Wang, Xiaofei | InterDigital, Inc. |
| Wang, Yi-Hsiu | Zeku |
| Want, Roy | Google |
| Wilhelmsson, Leif | Ericsson AB |
| Wullert, John | Perspecta Labs |
| Xin, Liangxiao | Sony Corporation |
| Xue, Qi | Qualcomm Incorporated |
| Yan, Zhongjiang | Northwestern Polytechnical University |
| Yang, Bo | Huawei Technologies Co. Ltd |
| Yang, Jay | Nokia |
| Yang, Mao | Northwestern Polytechnical University |
| Yang, Yunsong | Futurewei Technologies |
| Yano, Kazuto | Advanced Telecommunications Research Institute International (ATR) |
| Yee, James | MediaTek Inc. |
| Yee, Peter | NSA-CSD |
| yi, yongjiang | Futurewei Technologies |
| Yin, Yue | HUAWEI |
| Yong, Su Khiong | Apple Inc. |
| Yoshikawa, Yuki | Canon |
| Yukawa, Mitsuyoshi | Canon, Inc. |
| Zhang, Meihong | Huawei Technologies Co., Ltd |
| Zhou, Yifan | Huawei Technologies Co., Ltd |
| Zou, Tristan | Qualcomm Incorporated |
| Zuo, Xin | Tencent |
| Baokun Ding | Huawei Technologies Co., Ltd |

The Chair went over the document 11-20-0997-03-00be related to spec text volunteers and status. The Chair reminds that the agenda can be found in 11-20/927r6. The agenda is modified slightly and approved.

**Submissions**

1. 357r4 **Container for advertising ML Information** Abhishek Patil [SP only]

SP 7

* **Do you agree to include a Control field in Multi-Link element to indicate the presence of certain fields?**

C: is it in common field?

A: I’m supporting more than one profile

Approved with unanimous consent

1. 396r5 MLO BSS Information Transmission and Multiple BSSID Support, Liwen Chu (NXP) **[SP only]**

SP3: **Do you agree that AP’s Beacon and probe response shall not include ML element for MLD with no affiliated APs operating on this link**?

Yes/No/Abstain/No Answer: 35/27/62/68

1. 20/503r2, BSS parameter update for Multi-link Operation, Ming Gan (Huawei) [SP only]

SP1: Do you agree to amend the SP#77 by adding the following bullet?

* The reported AP in the AP MLD is identified by a TBD field, which is used together with Change Sequence Number field
* TBD field could be either the existing field or additional field

C: can you also show SP 77?

C: which element can contain TBD field?

A: RNR element or ML element can contain it. I will provide the details of it later. Now is TBD.

 SP is deferred

1. 20/0770r1, MLO: AID allocation, Yoong Hoon Kwon [SP only]

**Do you support in TGbe SFD that**

The AID assigned to a non-AP MLD shall be unique and shall be set to a value greater than or equal to 2^n where n is the maximum value of the MaxBSSID Indicator amongst the multiple BSSID set(s) operating on any link of the AP MLD.

 Yes/No/Abstain/No Answer: 54/19/44/76

1. [772r1](https://mentor.ieee.org/802.11/dcn/20/11-20-0772-01-00be-multi-link-element-format.pptx) Multi-link element format (Rojan Chitrakar)

Summary: Proposing details of multi-link element. Defining the Type field for carrying the different contents as well as Presence bitmap

Disucssion:

C: Presence bitmap indicates which fields are included or not. How does the type field help?

A: Type field indicates the format for common or per-link. I want to give more flexibility. This is similar to Trigger frame. If it’s not, we will have universial format.

C: If we have universial format, we can have several different combinations by presence bitmap.

C: Need to make simple ML element format. It seems like complex format.

C: Presence bitmap is enough. Need more disucssion.

SP is deferred.

1. [883r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0883-00-00be-multi-link-spatial-multiplexing.pptx) Multi-link Spatial Multiplexing (Yongho Seok)

Summary: Multi-link Spatial Multiplexing method with receive chain switching and transmit chain switching operation

Discussion:

C: slide 5, the switching time is larger than 80us?

A: Yes, additionally STA can indicate the switching delay to AP. Based on the information, AP can use MU-RTS with padding instead of RTS

C: You’re assuming the 1 TXOP for OM Control.

A: You can use Operating mode indication frame.

C: slide 9, 10, can we use this for enhanced single link MLD feature as well?

A: Yes

The teleconference was adjourned at 09:00pm EDT

**Wendsday 15 July 2020, 10:00 –12:00 ET (TGbe MAC ad hoc conference call)**

Chairman: Liwen Chu (NXP)

Secretary: Jeongki Kim (LG Electronics)

This meeting took place using a webex session.

**Introduction**

1. The Chair (Liwen, NXP) calls the meeting to order at 10:03am EDT. The Chair introduces himself and the Secretary, Jeongki Kim (LG)
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 Liwen Chu (liwen.chu@nxp.com) and Jeongki Kim (jeongki.kim@lge.com)

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

Abdelaal, Rana Broadcom Corporation

AbidRabbu, Shaima' Vestal Company, Istanbul Medipol University;

Aboulmagd, Osama Huawei Technologies Co., Ltd

Abushattal, Abdelrahman Vestal Company, Istanbul Medipol University;

Adachi, Tomoko TOSHIBA Corporation

Adhikari, Shubhodeep Broadcom Corporation

Agarwal, Peyush Broadcom Corporation

Ahn, Woojin Korea Railroad Research Institute (KRRI)

Aio, Kosuke Sony Corporation

AKHTAR, NADEEM Arista Networks, Inc.

Alayasra, Musab Medipol University; Vestel

Alex, Sam Facebook

Asterjadhi, Alfred Qualcomm Incorporated

Avrillon, Matthieu Luceor

B, Hari Ram NXP Semiconductors

Baek, SunHee LG ELECTRONICS

Baik, Eugene Qualcomm Incorporated

Banerjea, Raja Qualcomm Incorporated

Bankov, Dmitry IITP RAS

baron, stephane Canon Research Centre France

BECHADERGUE, Bastien OLEDCOMM

Bei, Jianwei NXP Semiconductors

Ben Arie, Yaron toga networks(a huawei company)

Bhandaru, Nehru Broadcom Corporation

Bims, Harry Bims Laboratories, Inc.

Bluschke, Andreas Signify

Bober, Lennert Fraunhofer Heinrich Hertz Institute

Boldy, David Broadcom Corporation

Bredewoud, Albert Broadcom Corporation

Calcev, George Futurewei Technologies

Cao, Rui NXP Semiconductors

Cariou, Laurent Intel Corporation

Carney, William Sony Corporation

Cavalcanti, Dave Intel Corporation

Cha, Jaesun Electronics and Telecommunications Research Institute (ETRI)

CHAN, YEE Facebook

Chen, Cheng Intel Corporation

Chen, Cheng-Ming Qualcomm Incorporated

Chen, Evelyn Ericsson AB

Chen, Na MaxLinear Corp

Cheng, Paul MediaTek Inc.

CHERIAN, GEORGE Qualcomm Incorporated

Chitrakar, Rojan Panasonic Asia Pacific Pte Ltd.

Choo, Seungho Senscomm Semiconductor Co., Ltd.

Chu, Liwen NXP Semiconductors

CHUN, JINYOUNG LG ELECTRONICS

Chung, Bruce Realtek Semiconductor Corp.

Chung, Chulho SAMSUNG

Ciochina, Dana Sony Corporation

Das, Dibakar Intel Corporation

Das, Subir Perspecta Labs Inc.

Davies, Robert Signify

DeLaOlivaDelgado, Antonio InterDigital, Inc.

Derham, Thomas Broadcom Corporation

de Vegt, Rolf Qualcomm Incorporated

Ding, Baokun Huawei Technologies Co., Ltd

Dogukan, Ali Vestel

Dong, Xiandong Xiaomi Inc.

Duan, Ruchen SAMSUNG

Edgar, Richard Imagination Technologies Ltd.

ElSherif, Ahmed Qualcomm Incorporated

Erceg, Vinko Broadcom Corporation

Fang, Yonggang ZTE TX Inc

Feng, Xiang Keysight Technologies

Fischer, Matthew Broadcom Corporation

Gan, Ming Huawei Technologies Co., Ltd

Gardner, James Qualcomm Incorporated

Garg, Lalit Broadcom Corporation

Ghosh, Chittabrata Intel Corporation

Godbole, sachin Broadcom Corporation

Goto, Fumihide Self

Grandhe, Niranjan NXP Semiconductors

GUIGNARD, Romain Canon Research Centre France

Guntupalli, Lakshmikanth Ericsson AB

Guo, Yuchen Huawei Technologies Co., Ltd

Haider, Muhammad Kumail Facebook

Hamilton, Mark Ruckus/CommScope

HAN, CHONG pureLiFi

Han, Jonghun SAMSUNG

Han, Zhiqiang ZTE Corporation

Handte, Thomas Sony Corporation

Harrison, Edward Anritsu Company

Hervieu, Lili Cable Television Laboratories Inc. (CableLabs)

Hiertz, Guido Ericsson GmbH

Hirata, Ryuichi Sony Corporation

Hiroki, Shigeru Canon

Ho, Duncan Qualcomm Incorporated

Hong, Hanseul Yonsei University

Hsieh, Hung-Tao MediaTek Inc.

Hsu, Chien-Fang MediaTek Inc.

Hu, Chunyu Facebook

Hu, Glenn Tencent

Hu, Mengshi HUAWEI

Huang, Guogang Huawei

Huang, Lei Panasonic Asia Pacific Pte Ltd.

Huang, Po-Kai Intel Corporation

Huang, Xiaolong Qualcomm Incorporated

Hwang, Sung Hyun Electronics and Telecommunications Research Institute (ETRI)

Ibrahim, Mostafa SAMSUNG ELECTRONICS

IDO, Tetsuo Canon

Inohiza, Hirohiko Canon

Inoue, Yasuhiko Nippon Telegraph and Telephone Corporation (NTT)

Jang, Insun LG ELECTRONICS

Ji, Chenhe Huawei Technologies Co. Ltd

Jia, Jia Huawei Technologies Co., Ltd

Jiang, Jinjing Apple Inc.

Jones, Allan Activision

JOO, SEONG-SOON Electronics and Telecommunications Research Institute (ETRI)

JUNG, MYUNG CHEUL Pantech Inc.

Jungnickel, Volker Fraunhofer Heinrich Hertz Institute

Kandala, Srinivas SAMSUNG

Kedem, Oren Huawei Technologies Co. Ltd

Khericha, samir BRoadcom

Khorov, Evgeny IITP RAS

Khude, Nilesh NXP Semiconductors

Kim, Eunhee Electronics and Telecommunications Research Institute (ETRI)

Kim, Jeongki LG ELECTRONICS

Kim, Myeong-Jin SAMSUNG

kim, namyeong LG ELECTRONICS

Kim, Sanghyun WILUS Inc

Kim, Yongho Korea National University of Transportation

Kim, Youhan Qualcomm Incorporated

Kim, Youn-Kwan The Catholic University of Korea

Kishida, Akira Nippon Telegraph and Telephone Corporation (NTT)

Klein, Arik Huawei Technologies Co. Ltd

Klimakov, Andrey Huawei Technologies Co., Ltd

Kneckt, Jarkko Apple Inc.

Ko, Geonjung WILUS Inc.

Kondo, Yoshihisa Advanced Telecommunications Research Institute International (ATR)

Kumar, Manish Marvell Semiconductor, Inc.

Kwak, Jin-Sam WILUS Inc.

Kwon, Young Hoon NXP Semiconductors

Lalam, Massinissa SAGEMCOM BROADBAND SAS

Lan, Zhou Broadcom Corporation

Lanante, Leonardo Kyushu Institute of Technology

Lee, Il-Gu Sungshin University

Lee, Jae Seung Electronics and Telecommunications Research Institute (ETRI)

Lee, Kyeseon ETRI

Lee, Wookbong SAMSUNG

Le Houerou, Brice Canon Research Centre France

Lepp, James BlackBerry

Levitsky, Ilya IITP RAS

Levy, Joseph InterDigital, Inc.

Li, Guoqing Apple Inc.

Li, Nan ZTE Corporation

Li, Yiqing Huawei Technologies Co. Ltd

Li, Yunbo Huawei Technologies Co., Ltd

Liang, dandan Huawei Technologies Co., Ltd

Lin, Wei Huawei Technologies Co. Ltd

LIU, CHENCHEN Huawei Technologies Co., Ltd

Liu, Der-Zheng Realtek Semiconductor Corp.

Liu, Jeff Broadcom Corporation

Liu, Yong Apple Inc.

Loginov, Vyacheslav IITP RAS

Lorgeoux, Mikael Canon Research Centre France

Lou, Hanqing InterDigital, Inc.

Lou, Hui-Ling NXP Semiconductors

Lu, Liuming ZTE Corporation

Luo, Chaoming Beijing OPPO telecommunications corp., ltd.

Lv, kaiying MediaTek Inc.

Ma, Mengyao HUAWEI

Madpuwar, Girish Broadcom Corporation

Mai, Huiheng Blu Wireless Technology Ltd

Malinen, Jouni Qualcomm Incorporated

Martinez Vazquez, Marcos MaxLinear Corp

Max, Sebastian Ericsson AB

McCann, Stephen Self

Mcconnell, Ray blu wireless technology

MELZER, Ezer Toga Networks, a Huawei company

Memisoglu, Ebubekir Vestal Company, Istanbul Medipol University;

Mirfakhraei, Khashayar Cisco Systems, Inc.

Mohanty, Bibhu Qualcomm Incorporated

Monajemi, Pooya Cisco Systems, Inc.

Montemurro, Michael Self

Montreuil, Leo Broadcom Corporation

Murphy, Rick vLogic, Inc.

Murti, Wisnu SeoulTech

Nam, Junyoung Qualcomm Incorporated

Namboodiri, Vamadevan SAMSUNG ELECTRONICS

NANDAGOPALAN, SAI SHANKAR Cypress Semiconductor Corporation

Naribole, Sharan SAMSUNG

Nezou, Patrice Canon Research Centre France

Nguyen, An DHS/CISA

Nurani Krishnan, Neelakantan Qualcomm Incorporated

Ohsawa, Tomoki NICT

Omar, Hassan Huawei Technologies Co., Ltd

Ouchi, Masatomo Canon

Ozbakis, Basak VESTEL

Palm, Stephen Broadcom Corporation

Pan, Chun HUAWEI

Park, Eunsung LG ELECTRONICS

Park, Taejoon Electronics and Telecommunications Research Institute (ETRI)

Patil, Abhishek Qualcomm Incorporated

Patwardhan, Gaurav Hewlett Packard Enterprise

Perahia, Eldad Hewlett Packard Enterprise

Petranovich, James ViaSat, Inc.

Petrick, Albert InterDigital, Inc.

Petry, Brian Broadcom Corporation

Pettersson, Charlie Ericsson AB

porat, ron Broadcom Corporation

Prabhakaran, Dinakar Broadcom Corporation

Puducheri, Srinath Broadcom Corporation

QIU, WEI Huawei Technologies Co., Ltd

Rai, Kapil Qualcomm Incorporated

Raissinia, Alireza Qualcomm Incorporated

Redlich, Oded HUAWEI

Regev, Dror Toga Networks (a Huawei Company)

REICH, MOR Togan Networks, a Huawei Company

Rezk, Meriam Qualcomm Incorporated

Riegel, Maximilian Nokia

Rosdahl, Jon Qualcomm Technologies, Inc.

Roy, Sayak NXP Semiconductors

Sakoda, Kazuyuki Sony Corporation

Salem, Mohamed Huawei Technologies Co., Ltd

Salman, Hanadi Vestal Company, Istanbul Medipol University;

Sandhu, Shivraj Qualcomm Incorporated

Schiessl, Sebastian u-blox

Scott, Andy NCTA - The Internet & Television Association

Sedin, Jonas Ericsson AB

Seok, Yongho MediaTek Inc.

Sethi, Ankit NXP Semiconductors

Sevin, Julien Canon Research Centre France

Shilo, Shimi HUAWEI

Sinn, Ulrich Siemens AG

Siyari, Peyman Qualcomm Incorporated

Smith, Graham SR Technologies

Solaija, Muhammad Sohaib Vestal Company, Istanbul Medipol University;

Son, Ju-Hyung WILUS Inc.

Song, Taewon LG ELECTRONICS

Srinivasa, Sudhir NXP Semiconductors

Stacey, Robert Intel Corporation

Stahl Diskin, Nir Broadcom Corporation

Startsev, Ivan IITP RAS

Stott, Noel Keysight Technologies

Su, Hang Broadcom Corporation

SUH, JUNG HOON Huawei Technologies Co. Ltd

Sun, Li-Hsiang InterDigital, Inc.

Sun, Sheng Huawei Technologies Co., Ltd

Sun, Yanjun Qualcomm Incorporated

Tanaka, Yusuke Sony Corporation

Tomoyuki, Takada Canon

Torab Jahromi, Payam Facebook

Tsodik, Genadiy Huawei Technologies Co. Ltd

Uln, Kiran Cypress Semiconductor Corporation

Umehara, Makoto Canon

Urabe, Yoshio Panasonic Corporation

van Wageningen, Andries Signify

Van Zelst, Allert Qualcomm Incorporated

Verenzuela, Daniel Sony Corporation

Verma, Lochan Qualcomm Incorporated

Verma, Sindhu Broadcom Corporation

VIGER, Pascal Canon Research Centre France

Wang, Chao Chun MediaTek Inc.

Wang, Hao Tencent

Wang, Huizhao Quantenna Communications, Inc.

Wang, Lei Huawei R&D USA

Wang, Qi Apple Inc.

Wentink, Menzo Qualcomm

Wu, Kanke Qualcomm Incorporated

Wu, Tianyu Apple Inc.

Wullert, John Perspecta Labs

Xia, Qing Sony Corporation

Xin, Liangxiao Sony Corporation

Xin, Yan Huawei Technologies Co., Ltd

Xue, Ruifeng Cisco Systems, Inc.

Yan, Aiguo Oppo

Yan, Zhongjiang Northwestern Polytechnical University

Yang, Bo Huawei Technologies Co. Ltd

Yang, Jay Nokia

Yang, Lin Qualcomm Incorporated

Yang, Mao Northwestern Polytechnical University

Yang, Steve TS MediaTek Inc.

Yang, Yunsong Futurewei Technologies

Yano, Kazuto Advanced Telecommunications Research Institute International (ATR)

Yee, James MediaTek Inc.

yi, yongjiang Futurewei Technologies

Yona, Yair Qualcomm Incorporated

Yong, Su Khiong Apple Inc.

Yoshikawa, Yuki Canon

Young, Christopher Broadcom Corporation

Yu, Heejung Korea University

Yu, Jian Huawei Technologies Co., Ltd

Yu, Mao NXP Semiconductors

Yukawa, Mitsuyoshi Canon, Inc.

Zhang, John GuangDong OPPO Mobile Telecommunications Corp., Ltd.

Zhang, Yan NXP Semiconductors

Zhou, Yifan Huawei Technologies Co., Ltd

Zou, Tristan Qualcomm Incorporated

Zuo, Xin Tencent

The Chair reminds that the agenda can be found in 11-20/927r8. The agenda is modified slightly and approved.

**Submissions**

* 1. [883r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0883-00-00be-multi-link-spatial-multiplexing.pptx) Multi-link Spatial Multiplexing (Yongho Seok) [Q&A and SP]

Discussion:

C: I support this. I have the similar contribution. Could you defer the SP?

A: Yes

C: In example 2, different maximum streams number per different link is not normal case. Any reason why you consider?

A: I received comments. Wants to generalize the use case.

C: I see. But not clear still.

* SP 1 of 883r1: **Do you support the multi-link operation for a non-AP MLD that is defined as follows for R1?**
	+ An MLD that can: 1) transmit or receive data/management frames to another MLD on one link at a time, and 2) listening on one or more links.
		- The “listening” operation includes CCA as well as receiving initial control messages (e.g., RTS/MU-RTS)
		- The initial control message may have one or more additional limitations: spatial stream, MCS (data rate), PPDU type, frame type
		- Link switch delay may be indicated by the non-AP MLD
	+ The MLD may support concurrent transmission/reception or not support.

C: SP text is unclear.

A: Any suggestion?

C: The second part can be removed.

C: The last bullet is confict with the first listening part.

A: Fine. Fine to remove second part?

C: Had better defer this SP.

SP is defered

* 1. [900r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0900-00-00be-nstr-mld-operation.pptx) NSTR MLD operation (Young Hoon Kwon)

Discussion:

C: Your protocols seems a symetric protocol. Dynamically change. More flexiblity.

A: This example is downlink. TXOP owner is AP MLD.

C: static is default mode? Operating mode indication is very straightforward.

A: But in static eSR mode, although both links are clear, they cannot use both links.

C: on the dynamic operation, this is happening on the TXOP. The gain will be .... Once that’s busy and is then clear, after that, you’ll be and get in the gain. Just considering the length of the TXOP, have you ... how much gain will be obtain.

A: Now, i don’t have number of the gain.

* 1. [908r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0908-00-00be-multilink-ts-operation.pptx) Multilink TS Operation (Harry Wang)

Discussion:

A: Non-AP STA side has more information and non-AP MLD may not have full information just have data information

C: SP2 in slide 15, why do you use only TID 8~15 for this purpose in TSPEC?

A: other contribution mentioned more than 8 TID is used for other purpose. 8~15 can be included for other mechansim.

C: TSPEC is STA level as Duncun mentioned. Not MLD level.

C: I have similar presentation. I think they are aligned. We need to think about the signaling level. I agree with the high level concept.

C: Instead 8~15, suggestion is to use > 7.

The teleconference was adjourned at 12:00 EDT

**Monday, 20 July 2020, 10:00 –13:00 ET (TGbe MAC ad hoc conference call)**

Chairman: Liwen Chu (NXP)

Secretary: Jeongki Kim (LG Electronics)

This meeting took place using a webex session.

**Introduction**

1. The Chair (Liwen, NXP) calls the meeting to order at 10:03am EDT. The Chair introduces himself and the Secretary, Jeongki Kim (LG)
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 Liwen Chu (liwen.chu@nxp.com) and Jeongki Kim (jeongki.kim@lge.com)

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

AbidRabbu, Shaima' Istanbul Medipol University; Vestel

Aboulmagd, Osama Huawei Technologies Co., Ltd

Adhikari, Shubhodeep Broadcom Corporation

AKHTAR, NADEEM Arista Networks, Inc.

Baek, SunHee LG ELECTRONICS

Boldy, David Broadcom Corporation

Carney, William Sony Corporation

CHAN, YEE Facebook

chen, jindou Huawei Technologies Co. Ltd

Cheng, Paul MediaTek Inc.

CHERIAN, GEORGE Qualcomm Incorporated

Chitrakar, Rojan Panasonic Asia Pacific Pte Ltd.

Das, Subir Perspecta Labs Inc.

Derham, Thomas Broadcom Corporation

de Vegt, Rolf Qualcomm Incorporated

Ding, Baokun Huawei Technologies Co., Ltd

Dong, Xiandong Xiaomi Inc.

Erceg, Vinko Broadcom Corporation

Fang, Yonggang ZTE TX Inc

Fischer, Matthew Broadcom Corporation

Garg, Lalit Broadcom Corporation

GUIGNARD, Romain Canon Research Centre France

Guo, Yuchen Huawei Technologies Co., Ltd

Han, Zhiqiang ZTE Corporation

Hirata, Ryuichi Sony Corporation

Ho, Duncan Qualcomm Incorporated

Hu, Chunyu Facebook

Huang, Guogang Huawei

Huang, Po-Kai Intel Corporation

Inohiza, Hirohiko Canon

Ji, Chenhe Huawei Technologies Co. Ltd

Jia, Jia Huawei Technologies Co., Ltd

Jiang, Jinjing Apple, Inc.

Kakani, Naveen Qualcomm Incorporated

Kedem, Oren Huawei Technologies Co. Ltd

Khorov, Evgeny IITP RAS

Kim, Jeongki LG ELECTRONICS

kim, namyeong LG ELECTRONICS

Kim, Sang Gook LG ELECTRONICS

Kim, Sanghyun WILUS Inc

Kim, Youn-Kwan The Catholic University of Korea

Kishida, Akira Nippon Telegraph and Telephone Corporation (NTT)

Klein, Arik Huawei Technologies Co. Ltd

Kneckt, Jarkko Apple, Inc.

Kondo, Yoshihisa Advanced Telecommunications Research Institute International (ATR)

Kumar, Manish Marvell Semiconductor, Inc.

Kwon, Young Hoon NXP Semiconductors

Lalam, Massinissa SAGEMCOM BROADBAND SAS

Li, Yiqing Huawei Technologies Co. Ltd

Li, Yunbo Huawei Technologies Co., Ltd

Lin, Wei Huawei Technologies Co. Ltd

Liu, Jeff Broadcom Corporation

Lu, Liuming ZTE Corporation

Luo, Chaoming Beijing OPPO telecommunications corp., ltd.

Lv, kaiying MediaTek Inc.

Ma, Mengyao HUAWEI

Monajemi, Pooya Cisco Systems, Inc.

Palm, Stephen Broadcom Corporation

Park, Minyoung Intel Corporation

Patil, Abhishek Qualcomm Incorporated

Patwardhan, Gaurav Hewlett Packard Enterprise

Petrick, Albert InterDigital, Inc.

Salman, Hanadi Istanbul Medipol University; VESTEL

Sedin, Jonas Ericsson AB

Seok, Yongho MediaTek Inc.

Solaija, Muhammad Sohaib Istanbul Medipol University; Vestel

Song, Taewon LG ELECTRONICS

Sun, Li-Hsiang InterDigital, Inc.

Sun, Yanjun Qualcomm Incorporated

Verma, Sindhu Broadcom Corporation

VIGER, Pascal Canon Research Centre France

Wang, Chao Chun MediaTek Inc.

Wang, Hao Tencent

Wang, Lei Huawei R&D USA

Wang, Qi Apple, Inc.

Wang, Xiaofei InterDigital, Inc.

Wentink, Menzo Qualcomm

Wullert, John Perspecta Labs

Yang, Jay Nokia

Yano, Kazuto Advanced Telecommunications Research Institute International (ATR)

yi, yongjiang Futurewei Technologies

Young, Christopher Broadcom Corporation

Zuo, Xin Tencent

The Chair reminds that the agenda can be found in 11-20/927r10.

**Submissions**

1. [1943r9](https://mentor.ieee.org/802.11/dcn/19/11-19-1943-09-00be-multi-link-management.pptx) Multi-link Management, Taewon Song (LG Electronics) [SP only]
* SP#4: **Do you agree to revise the SP text as follows?**
	+ [SP#118]
		- Single-link/radio (TBD) non-AP MLD: A non-AP MLD that supports operation on more than one link but can only receive, or transmit frames on one link at a time.

**Cf. The reason why I revised it is that the meaning of “listen” is already incorporated in “receive”, and therefore this “listen” might be redundant**

Discussion:

C: Minyoung’s SP can cover this SP. Can you merge them?

A: Both are different. My SP contains the meaning of ”listen”. We had better run each SP separately.

SP results: Yes:46, No:6, Abstain:23

1. [562r7](https://mentor.ieee.org/802.11/dcn/20/11-20-0562-07-00be-enhanced-multi-link-single-radio-operation.pptx) Enhanced multi-link single radio operation , Minyoung Park (Intel Corp.) [SP2]

**SP2: Do you support the multi-link operation for a non-AP MLD that is defined as follows to be included in R1?**

* A non-AP MLD that can: 1) transmit or receive data/management frames to another MLD on one link at a time, and 2) listening on one or more links
	+ The “listening” operation includes CCA as well as receiving initial control messages (e.g., RTS/MU-RTS)
	+ The initial control message may have one or more additional limitations: spatial stream, MCS (data rate), PPDU type, frame type
	+ Link switch delay may be indicated by the non-AP MLD

Discussion:

C: Is this enhanced single radio or normal single radio?

A: This is about enhanced single radio MLD. A normal single radio concept is already passed by Taewon’s SP.

SP results: Yes:52, No:2, Abstain:26

1. [389r3](https://mentor.ieee.org/802.11/dcn/20/11-20-0389-03-00be-multi-link-discovery-part-1.pptx) Multi-link discovery part 1 , laurent cariou (Intel) [SP 1 Ext]

SP1 extension:

* + Do you agree that all APs that are part of the same MLD as a non-transmitted BSSID and that are collocated with the non-transmitted BSSID shall be reported in the RNR element that is included in the beacons and the broadcast probe responses transmitted by the transmitted BSSID that is in the same Multiple BSSID set as the non-transmitted BSSID
	+ Do you agree that if a reporting AP is part of an AP MLD and is in the same collocated set as APs affiliated with another AP MLD for which there are no affiliated APs operating on the same channel as the reporting AP, each AP of the other AP MLD shall be reported in the RNR element that is included in the beacons and the broadcast probe responses transmitted by the reporting AP if at least one AP of the other AP MLD is in the same multiple BSSID set as an AP affiliated with the AP MLD of the reporting AP, unless the APs of the other AP MLDs are already reported in beacons and the broadcast probe responses transmitted by an AP in the same collocated set as the reporting AP on the same channel as the reporting AP.

SP is approved by unanimous consent

1. [668r](https://mentor.ieee.org/802.11/dcn/20/11-20-0668-01-00be-320-mhz-bss-configuration-follow-up.pptx)2 320-mhz-bss-configuration-follow-up (Po-Kai Huang)

Summary: channel width indication in EHT operation element for supporting 320MHz/160+160Mhz.

Discussion:

C: bandwidth for 320, the same setting or different setting with HT/VHT/HE, For SP1.

C: What does Note mean? There is an exception.

C: Agree with what you have. Can you do this in joint?

A: These bandwidths already is in SFD. I don’t touch any PHY.

C: Channel bandwidth can support 240MHz

A: Regarding the 240, we can support by using puncturing. We can discuss about that more in join.

C: I agree with this approach which is simple extension. I have similar to contribution. Can you run your SP after my presentation.

A: Sure.

1. [684r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0684-00-00be-bss-channel-width-configuration.pptx) BSS channel width configuration (Young Hoon Kwon)

Summary:

Discussion:

C: As you mentioned, option 1 is simple extension. Option 2 is STA need to calculate it.

A: Yes. My SP is for option 1.C:

C: Rui has a contribution on non-contiguous bandwidths. We don’t need two options depending PHY decision. How can we decide option 1 and option 2?

A: If we have only contiguous bandwdith, both options can be selected. But I can wait a PHY decision.

A: Each option has each advantages. Option 1 is simple but some overhead than option 2. When I talk to others, option 1 is more supportive.

C: slide 11, PHY also consider overlapping channels.

C: Option 1 is very simple compared to option 2. Could you go to nested structure? What is impact of option 2?

A: Option 2 is up to only 160.

C: 80+80 and 160+160 we can simple run the text. If we need to modify the text according to the PHY decision, we can modify the text.

C: My preference just waits for the PHY decision.

C: you need further discussion. Let’s go to next.

1. [712r](https://mentor.ieee.org/802.11/dcn/20/11-20-0712-00-00be-bqr-for-320mhz.pptx)1 BQR for 320MHz (Yunbo Li)

Summary: BQR A control field for supporting 320MHz. Two BQR Control subfields can be included. Two reserved bits can be used for saving more overhead

Discussion:

C: Control ID is same in both? There is no other option which carries bitmap indicating 320MHz.

A: If we use long bitmap, we cannot save the bitmap overhead. And we can save the ID field.

C: In SP1, you want to reuse the same Control ID?..

A: At most there are two. It is for 320.

C: Today, how does AP know the same control ID with different contents?

* SP 1: **Do you support to indicate the channel availability of 320MHz channel by carrying two BQR Control subfields in A-control subfield?**

Discussion:

C: Generally I agree with new indication for 320MHz. How about making general SP for BQR for 320? This is too specific.

C: Similar. First of all, general concept. We can investigate pros and cons of options.

A: Got it.

* SP 1: **Do you support to indicate the channel availability up to 320MHz in A-control subfield?**
	+ Note: detailed solution is TBD

Approved with unanimous consent

1. [736r1](https://mentor.ieee.org/802.11/dcn/20/11-20-0736-01-00be-eht-sst-operation.pptx) EHT SST Operation (Yongho Seok)

Summary:

Discussion:

C: That is in R2. It mean optional

A: Optional/mandatory will be discussed later.

C: For packet detection channel. AP know this puncturing. STA just picks?

A: several rules. AP can provide it.

A: AP will not puncture your packet detection channel.

C: Dynamic?

A: Yes.

C: Do you want to run SP 2?

A: I have to defer SP 2, just willing to run SP1.

C: Just extend the bandwidth indication? Not changing the current rule.

A: Yes. I don’t know what is new thing.

C: This is simple extension of 11ax SST

A: Yes

**SP1: Do you support to extend SST mechanism so that an 80MHz/160 MHz (20MHz TBD) operating STA can operate in the secondary 160 MHz channel in R2?**

40/2/25/36

1. [866r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0866-00-00be-gcmp-for-11be.pptx) GCMP for 11be (Laurent Cariou)

**an EHT RSNA STA shall support GCMP-256**

Discussion:

C: This is optional or mandatory?

A: 11ax will support GCMP. EHT STA always support this.

C: What are you asking? Support or use?

A: Just supporting.

C: Generally fine with extension of this. we still need detailed discussion.

C: GCMP-256 is mandatory currently?

C: Not use GCMP-256 for every packet.

A: just support GCMP-256. Using it is implementation.

* **SP: Do you agree to add to the 11be SFD the following:**
	+ an EHT RSNA STA shall support GCMP-256?

34/2/32/34

1. [895r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0895-00-00be-preamble-puncturing-support-for-eht-transmission.pptx) Preamble Puncturing Support for EHT transmission (Kaiying Lu)

Discussion:

C: do you expect this mechanism is used for timely manner mechanism like TWT?

C: similar to Yongho’s SP2.

A: some difference, dynamic preamble puncturing.

C: UL operation, is based on Trigger based ?

A: In case of non-Primary, Trigger based can be used. Primary, same rule as legacy.

C: AP indicates the candidate PD channel.

C: slide 9, for CCARESET, is there any difference from primary channel?

C: AP indicate the candidate PD set, STA chooses one.

A: AP and STA negotiate the PD channel based on the channel condition.

C: PD channel candidates, how does AP select PD channel candidates? Is it related to preamle puncturing?

A: AFC or disallowed channel can be used for configuring pattern. Secondary, STA can choose one among pattern bits based on AID.

The teleconference was adjourned at 12:55 EDT

**Wendsday 22 July 2020, 10:00 –13:00 ET (TGbe MAC ad hoc conference call)**

Chairman: Liwen Chu (NXP)

Secretary: Jeongki Kim (LG Electronics)

This meeting took place using a webex session.

**Introduction**

1. The Chair (Liwen, NXP) calls the meeting to order at 10:03am EDT. The Chair introduces himself and the Secretary, Jeongki Kim (LG)
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 Liwen Chu (liwen.chu@nxp.com) and Jeongki Kim (jeongki.kim@lge.com)

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

AbidRabbu, Shaima' Istanbul Medipol University; Vestel

Aboulmagd, Osama Huawei Technologies Co., Ltd

Alayasra, Musab Medipol University; Vestel

Andersdotter, Amelia None - Self-funded

Asterjadhi, Alfred Qualcomm Incorporated

Baek, SunHee LG ELECTRONICS

Bankov, Dmitry IITP RAS

Bredewoud, Albert Broadcom Corporation

Carney, William Sony Corporation

chen, jindou Huawei Technologies Co. Ltd

Cheng, Paul MediaTek Inc.

Chitrakar, Rojan Panasonic Asia Pacific Pte Ltd.

Choi, Jinsoo LG ELECTRONICS

Chu, Liwen NXP Semiconductors

Das, Dibakar Intel Corporation

Das, Subir Perspecta Labs Inc.

Derham, Thomas Broadcom Corporation

de Vegt, Rolf Qualcomm Incorporated

Ding, Baokun Huawei Technologies Co., Ltd

Dong, Xiandong Xiaomi Inc.

Fang, Yonggang ZTE TX Inc

Fischer, Matthew Broadcom Corporation

Han, Jonghun SAMSUNG

Han, Zhiqiang ZTE Corporation

Handte, Thomas Sony Corporation

Hsu, Chien-Fang MediaTek Inc.

Hu, Chunyu Facebook

Hu, Glenn Tencent

Hu, Mengshi HUAWEI

Huang, Guogang Huawei

Huang, Lei Panasonic Asia Pacific Pte Ltd.

Huang, Po-Kai Intel Corporation

Hwang, Sung Hyun Electronics and Telecommunications Research Institute (ETRI)

Jang, Insun LG ELECTRONICS

Ji, Chenhe Huawei Technologies Co. Ltd

Jia, Jia Huawei Technologies Co., Ltd

Jiang, Jinjing Apple, Inc.

Kain, Carl USDoT

Kakani, Naveen Qualcomm Incorporated

Kamel, Mahmoud InterDigital, Inc.

Kandala, Srinivas SAMSUNG

Kedem, Oren Huawei Technologies Co. Ltd

kim, namyeong LG ELECTRONICS

Kim, Jeongki LG ELECTRONICS

Kim, Youhan Qualcomm Incorporated

Kim, Youn-Kwan The Catholic University of Korea

Kishida, Akira Nippon Telegraph and Telephone Corporation (NTT)

Klein, Arik Huawei Technologies Co. Ltd

Kneckt, Jarkko Apple, Inc.

Ko, Geonjung WILUS Inc.

Kondo, Yoshihisa Advanced Telecommunications Research Institute International (ATR)

Kwon, Young Hoon NXP Semiconductors

Lansford, James Qualcomm Incorporated

Levitsky, Ilya IITP RAS

Levy, Joseph InterDigital, Inc.

Li, Yiqing Huawei Technologies Co. Ltd

Li, Yunbo Huawei Technologies Co., Ltd

Liang, dandan Huawei Technologies Co., Ltd

Lin, Wei Huawei Technologies Co. Ltd

Liu, Jianfei HUAWEI

Lou, Hanqing InterDigital, Inc.

Lu, Liuming ZTE Corporation

Luo, Chaoming Beijing OPPO telecommunications corp., ltd.

Lv, kaiying MediaTek Inc.

Ma, Mengyao HUAWEI

Monajemi, Pooya Cisco Systems, Inc.

Ozbakis, Basak VESTEL

Park, Minyoung Intel Corporation

Patil, Abhishek Qualcomm Incorporated

Patwardhan, Gaurav Hewlett Packard Enterprise

Raissinia, Alireza Qualcomm Incorporated

Rosdahl, Jon Qualcomm Technologies, Inc.

Salman, Hanadi Istanbul Medipol University; VESTEL

Sedin, Jonas Ericsson AB

Solaija, Muhammad Sohaib Istanbul Medipol University; Vestel

Song, Taewon LG ELECTRONICS

Stacey, Robert Intel Corporation

Startsev, Ivan IITP RAS

SUH, JUNG HOON Huawei Technologies Co. Ltd

Sun, Bo ZTE Corporation

Verenzuela, Daniel Sony Corporation

VIGER, Pascal Canon Research Centre France

Wang, Chao Chun MediaTek Inc.

Wang, Lei Huawei R&D USA

Wang, Xiaofei InterDigital, Inc.

Wentink, Menzo Qualcomm

Wullert, John Perspecta Labs

yi, yongjiang Futurewei Technologies

Yu, Jian Huawei Technologies Co., Ltd

Yu, Mao NXP Semiconductors

Yukawa, Mitsuyoshi Canon, Inc.

Zhou, Yifan Huawei Technologies Co., Ltd

Zuo, Xin Tencent

The Chair reminds that the agenda can be found in 11-20/927r11.

**Submissions**

1. [899r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0899-00-00be-tim-follow-up.pptx) TIM follow up (Young Hoon Kwon)

Summary: TIM operation considering U-APSD(U-APSD flag). MLD level approach is prefered. Listen interval and WNM sleep interval of the non-AP MLD is applied at MLD level

Discussion:

C: Option 1 in slide 6, how does this work for TID-to-link mapping considering different links and different TIDs?

A: We have TIM element.

C: TIM indication is common.

A: We have TIM indication. AP needs to tell where you go to.

C: Do you propose the same U-APSD flag for just U-APSD Flag? How about Max SP Length?

A: I just want to focus the first four bits for U-APSD flag

C: Generally, I’m aligned with what you have.

C: For TIM element, how the links are mapped? We need more discussion for some parts.

A: Yes.

C: Per-MLD indication for Listen interval and WNM sleep interval is a little complicated. Are you proposing the same value for MLD level in WNM sleep message exchange?

C: I have the similar comments with Yong for WNM sleep interval. Why do you want to make it MLD level? Need more discussion for that. Maybe side-effect.

C: I have the similar contribution and have the same opinion.

C: In slide 10, the second option, how is multiple Listen Interval for different links included in the association request?

* SP 1: **Do you agree to add the following to 11be SFD:**
	+ A non-AP MLD shall have the same U-APSD Flag value for each AC across all links that multi-link is setup.

C: Regarding the SP1, default mode is ok but for the TID-to-link mapping we need to think more.

A: I’ll defer SP1

* SP2: **Do you agree to add the following to 11be SFD:**
	+ Listen interval ~~and WNM sleep interval~~ of a non-AP MLD is applied at the MLD level and not at the STA level.

C: Regarding the SP text, what does the MLD level mean? Do you want to include one value in the frame?

A: There are several signaling mechanisms in slides. Just want to focus the concept of MLD level.

Deferred

1. [760r](https://mentor.ieee.org/802.11/dcn/20/11-20-0760-00-00be-multi-link-sm-power-save-mode.pptx)1 Multi-Link-SM-Power-Save-Mode (Jason Yuchen Guo)

Summary: ML SM Power save mode (e.g., multi-link multi-RF chain)

* AP can tell the non-AP STA which links to turn on

Disucssion:

C: seems like all the STA’s power saving mode + SM power save mode.

C: Can we combine this with existing power saving operation?

C: Is this operation applied to only STR MLD ? or non-STR MLD as well?

A: It doesn’t matter. Both can be possible

C: after RTS/CTS on one link, both links are on. But for the link2, AP can be busy. That is not used.

A: Yes right.

C: Per link SM power saving is more preferable. It should be per link power saving mode.

1. [615r](https://mentor.ieee.org/802.11/dcn/20/11-20-0615-00-00be-discovery-mechanism-for-mld.pptx)1 Discovery mechanism for MLD (Ming Gan)

Discussion:

C: Slide 7, 11ax already has the mandatory requirement, RNR can provide the information of nontransmitted BSSID. 11be will not be compatible with 11ax.

C: Mandatory for 6GHz AP. MLO is still operated in 6GHz, 5GHz , 2.4GHz.

C: SP2, 3, you have Multi-BSSID set index and MLD index. ...

C: what is the benefit of the Multi-BSSID set index?

C: Nontransmitted BSSID and Transmitted BSSID are included in the Beacon. It’s simple.

1. [669r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0669-00-00be-mld-transition.pptx) MLD transition (Po-Kai Huang)

Discussion:

C: slide 5, transition to single AP case. Are you also about the link address case? MAC SAP is MLD address. Right?

C: existing BSS transition, Are you suggesting the BSS transition concept? I’m not sure MLD transition

A: BSS definition we dont have MAC SAP.

C: MLD level MAC address and Link MAC address, MLD association uses the MLD level MAC address?

A: Yes, MLD association uses MLD address

C: If MLD transition goes to AP3, MLD association /MAC address is used

SP1: **Do you support the following definition:**

* **Define AP MLD in an ESS as follows:**
	+ An AP MLD is in one ESS if the SSID of the AP MLD is the same as the SSID of the ESS.
* **Define MLD transition as follows:**
	+ A non-AP MLD movement from having multi-link setup with one AP MLD in one ESS to having multi-link resetup with another AP MLD within the same ESS.
	+ A non-AP MLD movement from having multi-link setup with one AP MLD in one ESS to become a non-AP STA having reassociation with another AP within the same ESS.
	+ A non-AP STA movement from a non-AP STA having association with one AP in one ESS to become a non-AP MLD having multi-link resetup with another AP MLD with the same ESS.
* **Define fast MLD transition as follows:**
	+ A MLD transition that establishes the state necessary for data connectivity before the multi-link resetup or reassociation rather than after the multi-link resetup or reassociation.

NOTE - \*Name can be changed

C: I have conern on the wording and terminologies. First of all we need to decide them.

A: Basically, several terminologies are in the SFD.

C: Suggestion whether it’s in R1 or R2.

A: Do we need R1 or R2 for definition? But, I’m fine with it. It will be R1

C: I have the similar concen with Ming. Do we need the first part at this time? Duncun has the similar contribution.

A: I’m ok with removing it.

The SP is changed as follows:

**SP: Do you support the following definition in R1:**Define MLD transition\* as follows:A non-AP MLD movement from having multi-link setup with one AP MLD in one ESS to having multi-link resetup with another AP MLD within the same ESS. A non-AP MLD movement from having multi-link setup with one AP MLD in one ESS to become a non-AP STA having reassociation with another AP within the same ESS. A non-AP STA movement from a non-AP STA having association with one AP in one ESS to become a non-AP MLD having multi-link resetup with another AP MLD with the same ESS.Define fast MLD transition\* as follows:A MLD transition that establishes the state necessary for data connectivity before the multi-link resetup or reassociation rather than after the multi-link resetup or reassociation. NOTE - \*Name can be changed

Y/N/A: 31/19/33

1. [741r](https://mentor.ieee.org/802.11/dcn/20/11-20-0741-00-00be-indication-of-multi-link-information-follow-up.pptx)1 Indication of Multi-link Information: Follow-up (Insun Jang)

Discussion:

C: slide 4, terminologies, setup links, why do we need Setup links in addition to Enabled links?

A: enabled links are operating links, Some links can be setup but not operaing because of the number of links the non-AP has.

C: SP #1, who does not non-AP MLD

A: part or all that is my intention.

C: slide 9, why does the AP send the complete information of setup links which is not operating?

C: Can the AP reject some of setup links that STA can request?

A: At this time, Yes

C: slide 4, I’m confusing supported links and not capable. And setup but not operating means not TID-to-link mapping?

C: SP#1 and SP#2 texts are already allowed in SFD. What is difference?

A: Do we allow them? Those are new things.

C: Ok, Just clarification?

A: Yes

C: I don’t think we have one STA has two setup links. Basically, one STA is setup with one link. If you have three links, you have three STAs.

The teleconference was adjourned at 13:00 EDT

**Thursday 23 July 2020, 19:00 –22:00 ET (TGbe MAC ad hoc conference call)**

Chairman: Liwen Chu (NXP)

Secretary: Jeongki Kim (LG Electronics)

This meeting took place using a webex session.

**Introduction**

1. The Chair (Liwen, NXP) calls the meeting to order at 19:05am EDT. The Chair introduces himself and the Secretary, Jeongki Kim (LG)
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 Liwen Chu (liwen.chu@nxp.com) and Jeongki Kim (jeongki.kim@lge.com)

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

|  |  |
| --- | --- |
| AbidRabbu, Shaima' | Istanbul Medipol University; Vestel |
| Abushattal, Abdelrahman | Istanbul Medipol university ;Vestel |
| Alayasra, Musab | Medipol University; Vestel |
| Au, Kwok Shum | Huawei Technologies Co.,  Ltd |
| Baek, SunHee | LG ELECTRONICS |
| Bajko, Gabor | MediaTek Inc. |
| Cariou, Laurent | Intel Corporation |
| Carney, William | Sony Corporation |
| chen, jindou | Huawei Technologies Co. Ltd |
| Cheng, Paul | MediaTek Inc. |
| CHERIAN, GEORGE | Qualcomm Incorporated |
| Chitrakar, Rojan | Panasonic Asia Pacific Pte Ltd. |
| Das, Dibakar | Intel Corporation |
| Das, Subir | Perspecta Labs Inc. |
| Ding, Baokun | Huawei Technologies Co., Ltd |
| Dong, Xiandong | Xiaomi Inc. |
| ElSherif, Ahmed | Qualcomm Incorporated |
| Fang, Yonggang | ZTE TX Inc |
| Fischer, Matthew | Broadcom Corporation |
| Gan, Ming | Huawei Technologies Co., Ltd |
| Ghosh, Chittabrata | Intel Corporation |
| Guo, Yuchen | Huawei Technologies Co., Ltd |
| Han, Jonghun | SAMSUNG |
| Han, Zhiqiang | ZTE Corporation |
| Ho, Duncan | Qualcomm Incorporated |
| Hu, Chunyu | Facebook |
| Huang, Guogang  | Huawei |
| Hwang, Sung Hyun | Electronics and Telecommunications Research Institute (ETRI) |
| Jang, Insun | LG ELECTRONICS |
| Ji, Chenhe | Huawei Technologies Co. Ltd |
| Jiang, Jinjing | Apple, Inc. |
| Kain, Carl | USDoT |
| Kakani, Naveen | Qualcomm Incorporated |
| Kandala, Srinivas | SAMSUNG |
| Kim, Jeongki | LG ELECTRONICS |
| kim, namyeong | LG ELECTRONICS |
| Kim, Sang Gook | LG ELECTRONICS |
| Kishida, Akira | Nippon Telegraph and Telephone Corporation (NTT) |
| Kneckt, Jarkko | Apple, Inc. |
| Kwon, Young Hoon | NXP Semiconductors |
| Levy, Joseph | InterDigital, Inc. |
| Li, Yiqing | Huawei Technologies Co. Ltd |
| Li, Yunbo | Huawei Technologies Co., Ltd |
| Lin, Wei | Huawei Technologies Co. Ltd |
| Lindskog, Erik | SAMSUNG |
| Liu, Jianfei | HUAWEI |
| Lu, Liuming | ZTE Corporation |
| Luo, Chaoming | Beijing OPPO telecommunications corp., ltd. |
| Lv, kaiying | MediaTek Inc. |
| Ma, Mengyao | HUAWEI |
| Monajemi, Pooya | Cisco Systems, Inc. |
| Patil, Abhishek | Qualcomm Incorporated |
| Patwardhan, Gaurav | Hewlett Packard Enterprise |
| Petrick, Albert | InterDigital, Inc. |
| QIU, WEI | Huawei Technologies Co., Ltd |
| Raissinia, Alireza | Qualcomm Incorporated |
| Rosdahl, Jon | Qualcomm Technologies, Inc. |
| Solaija, Muhammad Sohaib | Istanbul Medipol University; Vestel |
| Song, Taewon | LG ELECTRONICS |
| Sun, Li-Hsiang | InterDigital, Inc. |
| Sun, Yanjun | Qualcomm Incorporated |
| Wang, Chao Chun | MediaTek Inc. |
| Wang, Hao | Tencent |
| Wang, Lei | Huawei R&D USA |
| Wang, Qi | Apple, Inc. |
| Wang, Xiaofei | InterDigital, Inc. |
| Wullert, John | Perspecta Labs |
| Yano, Kazuto | Advanced Telecommunications Research Institute International (ATR) |
| Yee, James | MediaTek Inc. |
| Yukawa, Mitsuyoshi | Canon, Inc. |
| Zeng, Yan | Huawei Technologies Co.,  Ltd |
| Zuo, Xin | Tencent |

The Chair reminds that the agenda can be found in 11-20/927r12.

**Submissions**

1. [741r](https://mentor.ieee.org/802.11/dcn/20/11-20-0741-00-00be-indication-of-multi-link-information-follow-up.pptx)1 Indication of Multi-link Information: Follow-up (Insun Jang) [SPs]

Discussion:

* **Do you support that a non-AP MLD may not be setup with all APs of AP MLD during ML setup?**

C: Instead of ”may not have”, ”does not need to setup ...” is better.

A: OK

C: It means subset of APs.

The SP text is modified as follows:

**Do you support that a non-AP MLD may request multi-link setup with an AP MLD to setup links with subset of APs?**

C: non-AP MLD does not need to connect all APs?

A: Yes

C: may request 🡪 may perform, po-kai?

A: how about initiate instead of request?

Text is changed.

C: setup links means one or more links? Or more than one link?

A: more than one link

C: then clarify it in the text

**SP1 of r1: Do you support to add to the 11be SFD in R1 that a non-AP MLD may initiate multi-link setup with an AP MLD to setup more than one link with subset of APs affiliated with the AP MLD?**

Yes/No/Abstain: 48/7/15

I’ll defer SP2

1. [751r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0751-00-00be-multi-link-setup-clarifications.pptx) Multi-link Setup clarifications (Rojan Chitrakar)

Discussion:

C: you assume that multi-link setup reqest/response are used instead of association request/response

A: Association request/response will be used

C: Two questions, first transmission links,

A: non-transmitted links can be setup during MLD setup.

C: only one transmitted link is available?

A: No restriction. One or more can be possible. This is just example.

C: Association request/response are used for this ?

A: Yes.

C: what is difference between setup and resetup? Just type or frames?

C:Link quality. What does non-AP provide AP with?

A: Non-AP only has knowlege of quality of links by non-AP. Non-AP can provide it with AP

A: AP MLD can choose certain links with the link quality.

C: For resetup, tear down and setup or incremental procedures?

A: My point is second. Don’t need to tear down. Just incremental.

C: Regarding Re-setup, there is security issue for GTK and so on.

A: Yes, that should be considered. Mine doesn’t cover it. I need to think about.

C: slide 6, Second bullet, all request reject and all reuqest accept?

A: Yes that’s my intention.

C: You don’t have SP for this?

A: Yes, I have only high level.

C: As another method, you simply accept all links and disallow some of links if AP wants.

A: Yes, it could be possible. I just use legacy method and AP can reject some request of non-AP

C: for link quality, before doing multi-link setup, non-AP needs to collect links quality of other links? Why are we doing that? Need more think about it.

C: For SP, implicitly and explicit, the element can be included in associate procedure. .. I think option 2 also makes sense.

A: For explicit signaling, just use Requst bitmap or Request bit, Option 1 based on the included link ID

C: Yes right I prefer option 1

C: SP 1, you prefer option 1. If non-AP does not include all information of all links, then how does AP know that information?

A: If non-AP includes all information which is not used, the overhead will increase. I prefer option 1 although option 2 has some benefit.

C: page 10, link id, what does it mean? Do you have something?

A: I’m proposing the specific thing. Just differentiate links. I don’t propose the specific format.

C: Ok, Link ID is included only in reposen?

A: Laurent mentioned, this can be included in request?

C: what is the benefit of link quality in non-AP sides?

A: If non-AP MLD provides the information, AP can choose its operation like which link is better to non-AP or whether the AP disallow some links or not.

C: what does the re-setup mean? For addition or deletion, we don’t need the resetup.

A: Your resetup means tear down rather than managing links?

C:AP can do link quality measurement, DL and UL are symentric. Non-AP doesn’t need to do this.

C: I have similar comment with Young Hoon for re-setup.

C: Infrastrucuture cannot trust clients always.

C: slide 8, motivation, try to reduce the overhead? Is that only motivation? Information is capability?

A: For signaling, i wasn’t think about that.

C: Resetup is re-association?

A: I think young hoon had SP.

A: Yes, re-association is used for re-setup

I’ll defer it.

1. [810r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0810-00-00be-dynamic-link-set.pptx) Dynamic Link Set (Pooya Monajemi)

SP1: **Do you agree to define mechanisms to add links to, and remove links from, an MLD setup without disruption in traffic, initiated by any one of AP or non-AP STA?**

**Note: This SP is not meant for spec text.**

Yes/No/Abstain:

C: Could you defer? Wording is not clear

A: Not for SFD.

C: what is diruption in traffic?

C: broadcast case. This already is mentioned in SFD?

C: Maybe good to have offline discussion.

A: This is not for SFD. Want to hear other peoples opinion.

Yes/No/Abstain: 32/18/22

1. [834r6](https://mentor.ieee.org/802.11/dcn/20/11-20-0834-06-00be-tentative-re-association-for-non-ap-mld.pptx) Tentative (Re)Association for Non-AP MLD (Guogang Huang)

Discussion:

C: current SFD we define multi-link reference model. AP MLD and non-AP MLD in MLD level. You need to make more consensus on framework level.

A: My contribution is not the AP MLD. AP MLD 1 and AP MLD 2 are separate. Not logical. This is not the new MLD.

C: slide 10, non-AP MLD has two links for two different MLDs.

A: I think that this is already allowed.

C:Do you really care this in MLO ?

A: A single radio MLD does not have benenfit.

C: Your intention is non-AP MLD to move to another MLD before breaking the current AP MLD?

A: Yes

C: Why is this context in multi-link? Seems like the power saving mechanism.

C: I think this is different from existing roaming scenario.

A: I’ll defer my SPs.

1. [843r0](https://mentor.ieee.org/802.11/dcn/20/11-20-0843-00-00be-mlo-bss-information-transmission-with-and-without-multiple-bssid.pptx) MLO BSS Info. TX with & without Multiple BSSID Support (Liwen Chu)

Discussion:

C: why do we need multiple BSSID Index?

A: BSSID index is different from MAC address,

C: In the bullets, you want to carry the transmitted BSSID and MaxBSSID Indicator

A: Yes, but, the signaling is TBD

The teleconference was adjourned at 22:00 EDT