IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ARC SC Meeting Minutes 24 August 2020 | | | | |
| Date: 2020-08-06 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Joseph LEVY | InterDigital Communication, Inc. | 2 Huntington Quadrangle  4th floor, South Wing Melville, NY 11747 | +1.631.622.4139 | [joseph.levy@interdigital.com](mailto:joseph.levy@interdigital.com) |
|  |  |  |  |  |
|  |  |  |  |  |

Abstract

This document contains the minutes of the IEEE 802.11 ARC SC teleconference held on 24 August 2020 at 19:00 ET.

Note: Highlighted text are action items. C- proceeds comments, R- proceeds responses to comments

**Contents:**

[Monday 24 August 2020, 19:00-21:00 h EDT 3](#_Toc49185594)

# Monday 24 August 2020, 19:00-21:00 h EDT

**Administration:**

**Chair: Mark Hamilton, Ruckus/CommScope**

**Vice Chair: Joseph Levy, InterDigital**

**Secretary: Joseph Levy, InterDigital**

**Meeting called to order by the Chair 19:03 EDT,**

Agenda slide deck: [11-20/1282r0](https://mentor.ieee.org/802.11/dcn/20/11-20-1282-00-0arc-arc-sc-agenda-24-aug-2020.pptx) proposed agenda copied here for reference (will be r2 out of the meeting):

**Administration:**

The Chair reviewed the Administrative information in the agenda document, [11-20/1282r0](https://mentor.ieee.org/802.11/dcn/20/11-20-1282-00-0arc-arc-sc-agenda-24-aug-2020.pptx)

**Call for Patents:**

The Chair reviewed the Patent policy and called for potentially essential patents – there was no response to the call.

**Participation:**

The chair reviewed the participation policy

**Approval of the Agenda:**

**Administrative Items**

**802.11 TGbe’s evolving multi-link architecture**

* **How does the architecture (still evolving) within 802.11 TGbe fit into or affect the overall (baseline) 802.11 architecture?**
* **Contributions:**
  + <https://mentor.ieee.org/802.11/dcn/20/11-20-1171-00-00be-multi-link-ap-network-reference-model-discussion.pptx> - Yonggang Fang
  + <https://mentor.ieee.org/802.11/dcn/20/11-20-1122-00-00be-802-11be-architecture-association-discussion.pptx> - Joseph Levy

* + <https://mentor.ieee.org/802.11/dcn/20/11-20-1240-00-00be-how-many-macs-and-spacetime-in-reference-models.pptx> - Mark Hamilton
  + <https://mentor.ieee.org/802.11/dcn/20/11-20-1200-00-00be-11be-architecture-discussion.pptx> - Mark Hamilton
  + Past contributions:
    - <https://mentor.ieee.org/802.11/dcn/20/11-20-1148-00-00be-discussion-on-mld-architecture.pptx> - Po-Kai Huang
    - <https://mentor.ieee.org/802.11/dcn/20/11-20-1131-01-00be-multi-link-reference-model-discussion.pptx> - Yonggang Fang
* **Next Steps**

The Chair reviewed the agenda and called for comments or amendments to the agenda - there was no response to the call.

**Contributions:**

[**11-20/1171r1**](https://mentor.ieee.org/802.11/dcn/20/11-20-1171-01-00be-multi-link-ap-network-reference-model-discussion.pptx) **- multi-link ap network reference-model discussion - Yonggang Fang (ZTE TX)**

Youngang Fang presented.

Q - Why do you want to change to non-AP STA MLD –

A – we need to change this to non-AP STA MLD to AP MLD mapping.

Q – on slide 5 – why do you have two MAC SAPs –

A - The second MAC-SAP is for the legacy one. I don’t know if we want to show the legacy in the model

Q - Legacy would be more than more than one of the links, and it would be look different.

A – I don’t understand how to draw this.

Chair – lets come back to the legacy – unless it impacts the DS discussion.

C – When we have discussion on how many MAC SAPs we have, our thinking is wrong. The LLC is out of scope for 802.11, 802.11 provides a link, a single addressable entity, a link from one MAC SAP to its peer MAC SAP. (Secretary’s note: this commenter using the term link to describe an 802 level link, not a WM link.) You are showing multiple links on slide 5. This will generate lots of discussion, and confusion. It is not necessary to use multiple links – it is not a good thing to do at layer 1.5 and below. So, links should not be at this layer (MAC and PHY). If this done it will not sit well with upper-layer people who will view the definition of the term link from an upper layer perspective.

A – This is my thinking about the link –

C – there is a big difference between an single addressable entity and a device. Most 802.11 devices have more than one STA. But the entity is the STA. It is important to get the concept of a single link correct.

A – it is a logical link – between the AP MLD and the DS. When we look at 802.11 base line it is a physical link – so I am confused. MLD is multiple links over the media.

C - the DS is not specified; in the last 4-5 years we’ve been adding details. If you think of a single DS for each of the links. How this is built is not standardized, as 802.11 stops at the MAC SAP, and the DS is above that in the ISO model. What comprises a link and multiple links? I think if you stick to the architecture. If we use the abstract model it will be less confusing.

C –We have the MLD which is a logical device. You have multiple STAs associated with the MLD. This is different than what we have had where there is one PHY.

A – I agree with previous comment – we should be careful with the terms we use in the SFD.

C – Maybe multiple link entity is a better choice. The word device will probably get us into trouble. The concept seems to be creating a MAC-U layer where they are sharing a lot of the MAC functions – there have been lots of discussion on how the split will work. Retries could go out on different channels (link). Even though it is using different physical media to get this done. Is this just link aggregation. On slide 3 – the DS being below the DSAF is intentional – we want to be clear there is not LLC layer on the AP for data, it moves data through the DSAF to the DS. So, we should be very careful to draw these things – as on slide 5, the DS is not above the MAC SAP.

C – Multi-link is describing operation with multiple links/PHYs/channels and it not describing a multiple 802/MAC SAP links.

C – we used MLD – based on the history in TGbe – it is just a name – we are addressing this as a logical entity.

[**11-20/1122r2**](https://mentor.ieee.org/802.11/dcn/20/11-20-1122-02-00be-802-11be-architecture-association-discussion.pptx) **- 802.11be Architecture/Association Discussion - Joseph Levy (InterDigital)**

Joseph Levy presented.

Posted a while ago, before some of the discussions we’ve just had.

Concepts of Association, SAP-to-SAP connection (“link”?). We should keep using these concepts.

Don’t lose track of GLK, and don’t break GLK capability.

Slide 5: simplified view of existing architecture. Slide 6, then Slide 7, extends this for 802.11be concepts.

Slide 8: FST is a different concept – MACs (SAPs) are relatively separate in FST; contrast with 802.11be.

Use a MAC address to define the MLD configuration.

C: General agreement to reuse association/reassociation/disassociation.

Q: How relate 11be to 11ak (GLK), and also relate to 11ah relay.

Q: What is point 3 on the Conclusions, related to the prior slides? A: An AP device can transmit on different PHYs at the same time. Each different instantiation of an MLD has a different address for its MAC SAP, providing service over that instantiation. A non-AP MLD STA associating to the AP MLD using only 2 links (instead of all three, on slide 7), is talking to a different AP MLD with a different configuration.

C: Slide 6 versus slide 7: The difference is how (or if) we specify the interface between the upper and lower MAC. A: Yes, preference is to not specify that interface, we don’t need it. It doesn’t add anything, and just causes debate about how it is defined.

C: The view in 11be (I think) is that we support legacy stations on each link, so there is a legacy Beacon on each link. There is an MLD MAC address, to support the MLD entity concepts. A: I think it will simplify the spec, if we only talk about one MLD “configuration” (PHY sets) with an MLD instance, and its associated MAC address. C: Multiple BSSID is really meant to support different logical networks on the same physical device (and PHY). MLD is different, it is allowing access to the same logical network.

Q: Are the colored PHY arrows implying always an exact match of PHYs between AP and non-AP MLDs? A: Yes. A different set of PHYs is a different MLD instantiation. C: But 11be has a concept of single radio non-AP STA. How does it map to the figure? A: That is beyond this diagram. This diagram is not trying to imply that all the PHYs are present all the time. C: In the single radio non-AP STA, “Lower MAC 2” and “Lower MAC 3” could use the same MAC address. A: In this view, all the PHYs are using the same MAC address. This might be counter to a straw poll agreed in 11be – that needs more architectural discussion. Note also, the 802.11 definition of a STA extends up to the MAC SAP, so the whole MLD is just one STA (doesn’t “include” STAs). Needs discussion about security implications of doing it either way.

C: These discussions are pointing out the implications of these decisions. For example, using a MAC address to identify PHY configuration seems like a huge problem. We have a fundamental concept of what a STA is, and that a STA is identified by a MAC Address. As we change those assumptions, we are opening a lot of potential concerns about breaking our structure and assumptions. A: Associations (legacy) are single PHY at a time. 11be is adding the idea of using multiple PHY resources at the same time. That can work easily, if it is still a ‘constant’ set, similar to a single PHY in the legacy case.

C: Like calling the whole MLD a STA and avoiding the “affiliated STAs”. We need to think about the MA-UNITDATA interface details, and any implications. Lots of 11be diagrams, like slide 7 here, show the same number of PHYs on both “sides” (both ends of the link(s)). Would be good to show a figure that has different numbers or has a changing number to show dynamic changing of the relation.

C: We did agree in 11be to different MAC addresses within an MLD. Otherwise, it causes discovery problems for non-AP STAs. But we agree on a single MAC address for the MAC SAP. A: Understand that is the current plan in 11be, but it may need to be reconsidered, as the architecture get sorted out.

Chair - There is no time to discuss the remaining documents – Please review 11-20/1240 is a mapping current ARC concepts to MLD and 11-20/1200 is some new ideas for MLD:

[**11-20/1240r0**](https://mentor.ieee.org/802.11/dcn/20/11-20-1240-00-00be-how-many-macs-and-spacetime-in-reference-models.pptx) **- How many MACs, and Spacetime in Reference Models - Mark Hamilton**

[**11-20/1200r0**](https://mentor.ieee.org/802.11/dcn/20/11-20-1200-00-00be-11be-architecture-discussion.pptx) **- 11be architecture discussion -Mark Hamilton**

The next ARC SC meeting will be during the 802.11 Interim:  
Wednesday 16 September 2020 @ 11:15-13:15 ET.

The 802.11 WG and ARC SC agendas will be posted by Monday 31 August.

Continuation of the TGbe MLD Architecture discussion and possible other topics may be on the agenda.

Additional contributions are welcome.

**Adjourned – 21:01 h EDT.**

Note: final agenda slide deck is: [11-20/1282r1](https://mentor.ieee.org/802.11/dcn/20/11-20-1282-01-0arc-arc-sc-agenda-24-aug-2020.pptx)

**Attendance:**

| **Name** | **Affiliation** |
| --- | --- |
| Ansley, Carol | CommScope |
| Asterjadhi, Alfred | Qualcomm Incorporated |
| AU, Edward\* | Huawei |
| Bajko, Gabor | MediaTek Inc. |
| Bankov, Dmitry | IITP RAS |
| Berkema, Alan | HP Inc. |
| Bims, Harry | Bims Laboratories, Inc. |
| Bredewoud, Albert | Broadcom Corporation |
| Chitrakar, Rojan | Panasonic Asia Pacific Pte Ltd. |
| Das, Subir | Perspecta Labs Inc |
| Dong, Xiandong | Xiaomi Inc. |
| Duan, Ruchen | SAMSUNG |
| Ecclesine, Peter | Cisco Systems, Inc. |
| Fang, Yonggang | ZTE TX Inc |
| Hamilton, Mark | Ruckus/CommScope |
| Ho, Duncan | Qualcomm Incorporated |
| Hu, Chunyu | Facebook |
| Huang, Lei | Panasonic Asia Pacific Pte Ltd. |
| Huang, Po-Kai | Intel Corporation |
| Ji, Chenhe | Huawei Technologies Co., Ltd |
| Khorov, Evgeny | IITP RAS |
| Kim, Sang Gook | LG ELECTRONICS |
| Kim, Sanghyun | WILUS Inc. |
| Klimakov, Andrey | Huawei Technologies Co., Ltd |
| Levitsky, Ilya | IITP RAS |
| Levy, Joseph | InterDigital, Inc. |
| Li, Yiqing | Huawei Technologies Co. Ltd |
| Lindskog, Erik | SAMSUNG |
| Lu, Liuming | ZTE Corporation |
| Marks, Roger | EthAirNet Associates |
| Max, Sebastian | Ericsson AB |
| Naribole, Sharan | SAMSUNG |
| Patil, Abhishek | Qualcomm Incorporated |
| Patwardhan, Gaurav | Hewlett Packard Enterprise |
| Pushkarna, Rajat | Panasonic Asia Pacific Pte Ltd. |
| Riegel, Maximilian | Nokia |
| Smith, Graham | SR Technologies |
| Stanley, Dorothy | Hewlett Packard Enterprise |
| Startsev, Ivan | IITP |
| Sun, Bo | ZTE Corporation |
| Torab Jahromi, Payam | Facebook |
| Wang, Lei | Huawei R&D USA |
| Yang, Jay | Nokia |
| Yee, James | MediaTek Inc. |
| YI, Yongjiang | Futurewei Technologies |
| Zuo, Xin | Tencent |

\*Added Edward AU – he was in ax and then joined (wanted to maintain his ax attendance, imat limitations would not allow attendance in both meetings).