IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ARC SC teleconferences minutes 22 February 2021 | | | | |
| Date: 2021-02-22 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Joseph LEVY | InterDigital Communication, Inc. | 111 W 33rd Street New York, NY 10120 | +1.631.622.4139 | [jslevy@ieee.org](mailto:jslevy@ieee.org) |
|  |  |  |  |  |
|  |  |  |  |  |

Abstract

This document contains the minutes of the IEEE 802.11 ARC SC teleconference held on 22 February 2021 at 19:00-21:00 h ET.

Note: Highlighted text are action items. A- precedes comments from the document’s author, C- precedes comments, R- precedes responses to comments.

**Contents:**

[Monday 22 February 2021, 19:00-21:00 h ET 3](#_Toc64901418)

[Administration: 3](#_Toc64901419)

[Contributions: 3](#_Toc64901420)

[Next Steps: 7](#_Toc64901421)

[Adjourned: 20:21 h EDT 7](#_Toc64901422)

# Monday 22 February 2021, 19:00-21:00 h ET

## Administration:

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

**Vice Chair: Joseph Levy, InterDigital**

**Secretary: Joseph Levy, InterDigital**

**Meeting called to order by the Chair 19:02 ET**

Agenda slide deck: [11-21/0263r0](https://mentor.ieee.org/802.11/dcn/21/11-21-0263-00-0arc-arc-sc-agenda-feb-22-2021.pptx)

**Call for Patents:**

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

**IEEE SA Copyright Policy:**

The chair reviewed the Copyright policy.

**Participation:**

The chair reviewed the participation policy.

**Approval of the Agenda:**

* **Attendance, noises/recording, meeting protocol reminders**
* **Policies, duty to inform, participation rules**
* **Contribution/discussion topics:**
  + **802.11 TGbe’s evolving multi-link architecture contributions:**
    - [11-20/1639r13](https://mentor.ieee.org/802.11/dcn/20/11-20-1639-13-00be-11be-ap-mld-architecture-discussion.pptx)
    - Consolidate security discussion to be liaised to TGbe??
* **Next Steps**

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

The proposed agenda was accepted without comment.

Chair reviewed agenda deck slide 16 – The ARC other topics slide and discussed ongoing ARC activities. Attention was call to Annex G – will be on the agenda for the March meeting.

Mike – will be on the Annex G agenda for TGme – also the HeSS LS will be covered.

R- we have one teleconference on the HeSS LS – hopefully will be completed next week – 13:00 h ET.

## Contributions:

[**11-20/1639r13**](https://mentor.ieee.org/802.11/dcn/20/11-20-1639-13-00be-11be-ap-mld-architecture-discussion.pptx)“802.11be AP MLD Architecture Discussion” – Mark Hamilton

Starting @ slide 24 – A very quick review of the status was given, as all the participants have been participating in past meetings.

Incoming frames would have address 1, RA field, would have the “side” address. Therefore, no address 1 filtering. Peer data base needs to be used to understand how to route/decode the frame. (Alt 2).

Fragmentation question:

Short Answer – the MSDU information is in the shared store.

**Discussion started focused on Alternative 3 (slides 31-37):**

C – We agreed we would have one MAC SAP to the DS.

R – Yes that is what I am arguing – I’m not sure TGbe had agreed what to do here. I don’t think this is sorted. As TGbe considers the legacy side it may modify/complete its views.

C – TGbe has motioned that there is one MAC SAP for MLD. It should be made clear that there is only one.

C – On the AP side there is no LLC – on the non-AP side there is an LLC.

C – are you saying for the mapping you will have multiple points.

R- The DS picks one of the SAPs – and send all MPDUs addressed to the non-AP MLD to that SAP.

C – which one?

R- It doesn’t matter which one as long as it is one. The association to DS uses the non-AP MLD address. The DS doesn’t know anything about AP addresses, it only knows which port to send the frames to. The choice of which of the lower MAC/PHYs is used to transmit the MPDU is up to the MLD. The non-AP MLD chooses one SAP to associate the non-AP peer with, once the association is made the DS will send all traffic for that non-AP MLD to the associated port.

C – When you say on the DL there is only one, but in UL it doesn’t matter – this is confusing.

C – For this dual SAP architecture – does it go out on both SAPs – how does the AP MLD choose which SAP to use for the UL – how does the MAC deal with it?

R – Whichever side finished the MPDU will send it out.

C – Both upper MACs? How does that work?

R – Whichever side finishes the MPDU will sent it, so it doesn’t matter. The SA is the non-AP STA address. So, it doesn’t matter which port it goes on.

C - But from a routing point of view how does this work. The AP provides a singular point of access to and from the AP. Here you are suggesting there are two different points.

R – The DS is mapping the SA – the DS doesn’t care which port the MSDUs come in on – it just looks at the SA – the AP is invisible at the IP layer.

C – TGbe has had some discussion on the fragmentation. If the MPDU is fragmented at the link level, but if the MPDU is fragmented high up the MAC stack – it would need to be dealt with at he MLD level.

C – At the affiliated APs – if you have a MLD where each BSS has its own MAC address. The security is between the non-AP MLD and the AP MLD. While a legacy device is between the legacy devices.

C – There is only one authenticator – you can’t have two.

C – We are not restricted to one authenticator. A security the authenticator is tied to an MAC address. So, we’ve established this as a way to do this in resolving the comments.

C – Is there a physical limit on the source of the SA packets.

R – On the client side only the non-AP MLD address. Though different addresses are used over the link – once the packet hits the AP side – the packet is using the clients MLD address. The address between an affiliated non-AP STA.

You need a central box – something needs to convert the address to the non-AP MLD address – which is the only address you see on the LAN. Everything else is transparent.

C – There is only one MAC SAP at the AP.

C – the MLD what needs to support is – this diagram is dealing with legacy STAs too. So, the legacy is not MLD – So I think that it is complex with legacy. So that is the challenges I see here. I think we may end up with both – you may have MLD in the DS and legacy in the DS and the traffic will be labeled to differentiate the two cases.

R – well that thought brings us back to Alt 2.

C – Which AP the MLD is associated with matters – so MLD can be reached. I can’t agree it doesn’t matter – what’s in the middle matters. Do we need to mesh how the legacy and MLD work together?

R – what happens to PS stuff, what happens to signaling in beacons – as we are using the legacy. Mesh APs it matters where it goes. But all this stuff is collocated – so either way it will get to the same non-AP MLD.

C – Do you have two points to route to the MLD frames? I don’t see how this can work with legacy operation. You agree the legacy data coming in will not go to the other route. How the MAC SAP can be one address – if we have two SAPs.

R – well this may not be the way to go (Alt 3) – but let’s run it down and understand which alterative will work.

C – When legacy is mixed with MLO – I don’t think there is consensus on how things work. I have a presentation on this for TGbe – but it needs more work – supporting legacy and MLO. But once you mix it there are different views on how it works.

R – I’m looking to help TGbe with that discussion – what does mixing in the legacy impact in this structure.

C – A packet coming in from the DS – which SAP does it go to.

R – One of the SAPs tells the DS the association is with one MAC SAP – You can process the DL in either stack and send it out either BSS.

C – So you would only have one stack active?

R – In the receive direction the frames could pop out of either SAP. There is only one told to the DS for DL mapping. But the UL could pop up in either SAP.

C – do you care about order? As you have now it could violate order. TCIP keeps things in order, so we preserve order.

R – I have a shared block state – and frames won’t be released –

C – so why do we need two MAC SAPs?

R – for Alt 2 – we have three stacks. But I don’t think what is in there now has solved the legacy problem.

C – Don’t need to squeeze everything into one diagram. The legacy should just be as it was.

R – for Alt 2 – the AP needs to know where to send the packets to MLD or legacy. Well maybe we can know this at the low level (at the top of the lower MAC).

C – Let’s start with data – I think we can then go deeper and then see how.

1. Unicast Data receive – is OK? R- yes
2. Group Addressed –

R – I think any of these will work – it is logical stuff – we can squish it around and make it work. So, if we can agree how these alternatives work.

C – Is there a problem with alterative two? Can we start there – can we use this approach.

R – I guess we could start with Alt 2 – and then see what needs to be fixed. I was planning to walk through feature by feature and see if there are any problems for all alternatives. But we could start with just looking at Alt 2 and see if we have any issues.

C – The spec will have address this – The MAC header shouldn’t change – do you feel we need a new header for the MLD?

R – I don’t think we need a new header. But, if we have no address 1 filtering, we could filter based on address 1 and knowledge of the association of the address. My understanding is the security/frame split is in the upper MAC.

C – To decrypt you need to know which key to use.

R- I have a whole table of keys at the AP – I always need know which key to use.

C – don’t you have to know if it is legacy or not?

R – No I only care which Peer it came from.

C - There is a proposal is that the MLO will have different information.

C – How to decide, if there is no MLO stack – how will scheduling be controlled. So, it will be impossible to deliver from another data plane – this would make traffic scheduling difficult.

R – For Alt 3 either stack can send on either link, so I don’t see the issue.

C – Where is the scheduling decision made?

R- for Alt 3 it is made at the bottom of the Upper MAC stack.

C – If there is some data waiting on the left one can it move to the right one.

R – We haven’t discussed data queuing yet.

C – Does this mean the data can be sent out any link? If we have alterative 3, I don’t see how it could work.

R – We get into things like retires – if it fails on the link – where does it go to be queued. So, I think drawing these queues is critical.

C – I imagine it happens locally and is simply implementation.

C – I think we need this for each MLD level.

R – it looks like most people are leaning toward alternative 2 and we should do a deep drive into alternative 2 and try to find any issues if they exist. So, let’s assume alternative 2 first. Is there anyone who objects to working ALT 2 first.

There was not objection, just support.

R – So we will focus on Alt 2 – moving to slide 38.

There was support for views on slide 38 for ALT 2 for Security SAs/Keys is correct, also Association/authentication.

R – Adding text to the Association/authentication. “Stack split based on ML element indication (legacy or MLO).

C – For MLO there is one authenticator and for legacy there is another. So, there is an AA for each. Each legacy AP will have a unique MAC address (AA) and each MLD will have a unique MAC address (AA).

Address 1 filter/RX frame routing: MLD peer – MLD stack, legacy peer – legacy stack. (all frames, data, Auth/Assoc, Mgmt, etc.) – (Power Save affecting information: PM Bit, PS-Poll frames, PS trigger frames.

C – Each STA tracks it PS independently, even for MLO operation. So, what is awake needs to be considered for mapping. When the PS state change the frame can be sent.

C – What do you mean we need a discussion on PS – we did think about this and how to deliver things properly. To make the protocol work or is it where to put it in the stack.

R – I meant it should be discussed here to understand what has been decided in TGbe.

C – Something on top to needs to coordinate the PS across the links – no one is going to test that this works, individually we will test if each link does PS properly.

R – But if all of the links are in PS – then you need to buffer otherwise you would have at least on active link and would not need to buffer the data. If the queuing is at the MLD level – then flow is controlled by the PS status of all of the links determine how data is queued and if it needs to be buffered.

C – PS on MLD level – if the AP indicates the non-AP MLD should wake up on link one – but the non-AP STA sends the PS poll on link 2 does this work.

C – There is no way for the AP to tell a non-AP STA to wake up on any link. C

C – The beacons are not consistent in time.

C – Well it is being discussed in TGbe.

C – All the TID traffic – will be sent as long as one link is open. When all the STAs are sleeping – the TIM bit will be set to 1 and the TID will be sent on all links.

C – When all the STAs are dozing – then the bit is sent to 1 and the TID will be sent on all links and the non-AP STA will be awake on which ever link it desires and will look for the TID as configured by PS for that link.

C – I’m concerned with the format of the frame – if it is buffered as an MPDU or PPDU?

C – that is an implementation issues – but how it should work regarding buffering is important.

**Summary – Power Save affecting information: PM bit, PS-Poll frames, PS trigger frames: handled by lower MAC. MLD know when all links (or all relevant -TID links) are PS, and buffers. SAPs – AP: 1 MLD, 1 per legacy – guarantees frame order per TID.**

## Next Steps:

**Next Teleconference(s):**

* **Next teleconference on TGbe topic:**
  + **March plenary session (day/time TBC)**
* **Also, next teleconference on ESS/HeSS topic (preparing liaison to REVme)** 
  + **Mar 1, 13:00 ET, 2 hours**
  + **Expect MOTION to liaise our document to REVme**

**Contributions requested/expected:**

* **TGbe architecture topics, especially trying to consolidate security discussion to be liaised to TGbe**

## Adjourned: 21:00 h EDT

**Attendance:**

| **Name** | **Affiliation** |
| --- | --- |
| Asterjadhi, Alfred\* | Qualcomm |
| Au, Kwok Shum | Huawei Technologies Co., Ltd |
| Dong, Xiandong | Xiaomi Inc. |
| Ecclesine, Peter | Cisco Systems, Inc. |
| Fang, Yonggang | Self |
| Hamilton, Mark | Ruckus/CommScope |
| Ho, Duncan | Qualcomm Incorporated |
| Huang, Po-Kai | Intel Corporation |
| Levy, Joseph | InterDigital, Inc. |
| Montemurro, Michael | Huawei Technologies Co. Ltd |
| Naik, Gaurang | Qualcomm Incorporated |
| Palayur, Saju\* | Maxlinear |
| Patil, Abhishek | Qualcomm Incorporated |
| Patwardhan, Gaurav | Hewlett Packard Enterprise |
| Petrick, Albert | Jones-Petrick and Associates, LLC. |
| Rosdahl, Jon | Qualcomm Technologies, Inc. |
| Roy, Dick | Self |
| Sun, Bo | ZTE Corporation |
| Wang, Lei | Futurewei Technologies |
| Wu, Chung\* | TP-link Corp. |
| Yang, Jay | Nokia |
| Yang, Rui\* | InterDigital |
| yi, yongjiang | Futurewei Technologies |

\* Added based on Webex participants list.