IEEE P802.11  
Wireless LANs

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| ARC SC teleconferences minutes 08 April 2021 | | | | |
| Date: 2021-04-08 | | | | |
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Abstract

This document contains the minutes of the IEEE 802.11 ARC SC teleconference held on 08 April 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.

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# Monday 08 April 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: [11-21/0590r0](https://mentor.ieee.org/802.11/dcn/21/11-21-0590-00-0arc-arc-sc-agenda-apr-8-2021.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**
    - [**11-21/0316r0**](https://mentor.ieee.org/802.11/dcn/21/11-21-0316-00-0arc-mlo-architecture-reference-model.pptx) **(reviewed during plenary)**
    - [**11-21/0396r0**](https://mentor.ieee.org/802.11/dcn/21/11-21-0396-00-00be-11be-ap-mld-architecture-discussion-2.pptx)
* **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.

## Contributions:

* [**11-21/0316r0**](https://mentor.ieee.org/802.11/dcn/21/11-21-0316-00-0arc-mlo-architecture-reference-model.pptx) **(reviewed during plenary)**

Quick review of the document – offering Abhi or Mike to provide a quick review.

Chair – this document addresses what an MLD does and the architecture of the MLD and does not address what an MLD does with legacy.

Duncan joined and will be providing a review - Chair we are just looking for an overview of the ideas of how an MLD is structured.

Chair – The PHY and MAC Sublayer B is shared.

C – Much of this is not shared at all. On the unicast communications – the MLO uses this configuration. It is like a virtual AP – the only thing that is shared when it joins a MLD is the STA and AP are part of a BSS.

A discussion was had on how many SMEs there are.

C – From the security point of view, there is no sharing.

C – There is only one ECA. What is the difference between one user and multiple users? What is different now that you have MLD? Why is it special?

R – The text does not say it is special. Moving to slide 7

Question – Are you asking if there is cross communication between the MAC/PHYs by the dots?

R – No, there is no communication – the dots mean there can be more than 2.

C – For NSTR you need some communication between MACs/PHYs – you need synchronization stuff.

C – We should be careful here – we must figure out how much of this is implementation and how much needs to be documented in the standard. Over the air – things work the same way. I’m not clear on what needs to be documented at this point.

C – These diagrams help me visualize and understand what is happening – to understand how packet numbers flow.

C – NSTR will require some management across the PHYs and lower MACs – will this be tested? To test we look at what is on the air. How much detail we will need to have to address these primitives?

R – I’m not defining any new interfaces – just trying to understand how things work – so things can be specified correctly, and legacy devices don’t get confused. This picture is not for the spec it is only to organize our thoughts.

C – Concern expressed that NSTR will require coordination to achieve the OTA performance. If coordination is needed, then this may get complex, and timing may be critical.

C – There don’t seem to be any showstoppers, yet – this is a useful picture to look at to understand interoperability. Implantation is up to the vendors.

C – There is no intent to define how it should be implemented – this figure is to add understanding so we can specify things correctly.

C – RFC it was discussed how things should be implemented – but in the end the implementations are proprietary implementations.

C – Even the controller CAP/WAP view of things there is a one to one relationship – of the MAC/PHY controller to the MAC/PHY seems to be one to one.

C – Well that is not strictly true, there are exceptions.

C – The exceptions are what raise strange behavior – which is what I’m trying to get at these to make sure we have the right rules. E.g. – how the PS queuing stuff work – will be necessary for compatibility. Maybe the answer is it just works.

C – The buffering of frames is at the MLD level; but the PS mode is on the link level.

Question – Where is legacy dealt with in the figure – an AP serves multiple users – there is no issue with PS user1 or user 2 – the AP just maintains the PS state. The STA have independent PS – how you buffer is independent. It should be independent. What is the relation you are looking for?

C – Group addressed frames do make it complicated.

C - There is a rule that all the STAs must be active at that DTIM – AP can serve multiple users – today – it is not documented in the specification. Why do you want document this? Are you saying that individual and group address – do you want to merge group address in this figure?

R – All of these things should be in this figure – so we understand what is happening.

C – I agree the base line – it is all about individual address. Group address doesn’t have BlockACK.

C – This figure is just summarizing what these things means and how things will interact.

C – About group address – is this a Group address with a legacy AP servicing both legacy and MLDs at the same time? The group address frames are affiliated to the affiliated APs – GTK that is provisioned is the same for MLO and legacy.

C – Group addressed data frames don’t flow to the MLD stack – just the legacy stacks.

C - An MDMS frame from the wired side – the group address frame – must be distributed – so there is a distribution issue. We don’t document this in dual band APs.

C – Looking at PS in some details: in 35.3.10 there is a lot of the details. Each STA maintains its own PS state, there are some MLD level PS – the listen interval WMN and listen interval are at the MLD level, but the PS state is at the link level. At the AP side – the traffic is per MLD not per link – so the traffic information is for all TIDs map to all links – the TIM bit will be set to 1 – but the STA can choose which link to wake up on to get the buffered frames. Depending on the TID mapping it can be serviced on whatever links. The AID space is shared with legacy – there can be STAs in MLDs in the same space.

C - The legacy stacks can use a common AID between them – is this currently in the draft spec?

C – Confirming it is the same pool of AID space. TGbe has an agreed motion for the multiple to prevent overlapping of the AID space.

C – Is there a defined queuing for group address – I don’t see that in the specification. Does the baseline say anything about what the AP needs to do if all the STAs are in PS?

C – The baseline says if any STA is in PS – then group address frames are deferred. That is the kind of things that jump out at me. How does the duplicated stuff act? How does the shared stuff interact? I think we should think about this to make sure we are really done.

On slide 6 – DS structure.

C – Routing of all downlink packets for legacy and MLD seems to be clear. This is captured in the association. I think this reflects that we don’t change the DSAF picture yet – we did this register with associations.

Question – What about group address frames?

R – Regarding, group address frames – the MLD will not distributed them down – the MLD will only distribution group address up.

C – That part of the spec may need additional work.

C – What areas do we need to work on?

R – More text needs to be written to clarify it.

C – Each AP will have its group address we would need to duplicate across, if it is multi-cast. Where we write it, we don’t have DSAF – there is no duplication. We don’t connect it to DSAF.

R – We don’t need to address this in terms of the DSAF behavior.

C – the text is in <https://mentor.ieee.org/802.11/dcn/21/11-21-0349-03-00be-pdt-group-address-frame-reception-for-non-ap-mld.docx> document – I don’t remember seeing the DSAF- in this document – this is reception.

C – May have to worry about group membership stuff.

C – There are a few sentences that need to be added to the MAC clause -

<https://mentor.ieee.org/802.11/dcn/21/11-21-0081-05-00be-mlo-group-addressed-frame.docx>

C – The MLD doesn’t need to do anything if the legacy AP is being used for group address - the general case needs to be defined.

C – the second document is more appropriate for this discussion.

Chair – going to slide 8 – pointing out that the SME does not have a line closing the top – because it’s not clear where it ends.

On to slide 9 –

C – The SME is just where we put the stuff that doesn’t belong in the MAC.

C – Maybe we should change the multiband in REVme.

Question – Does anyone have suggestion on how to solve the 3d nature of the drawing?

C – An updated drawing will be available soon, and it should be clearer.

Moving to slide 11 –

Question – Asking about group addressed frame on the Non-AP MLD.

C – This not in the spec text.

C – There is information – in the legacy – we are adding buffering to link address – so before it switches will check that it doesn’t have any group addressed frames.

C – Is there any point in time where there are no frames?

C – The non-AP STA needs to wait till the AP to be switched to doesn’t have group addressed frames.

C – But this is in the DTIM – the DTIM indicates when there are no group addressed frames. But it may be possible that the AP will never have an empty group address. So, this could be messier.

C – The cross link buffer is there (in the above document) but non-AP MLD behavior is not clearly stated.

Question – What about NSTR?

C – There don’t seem to be any issues – as it is clearly in the right hand diagram.

Question – Is there an issue?

C – That is what we are talking about, to decide if there is an issue or not.

C – Maybe it is all just implementation for NSTR. We don’t need to draw anything for architecture. Only the timing alignment needs to be drawn.

C – We don’t need an architectural drawing at this point.

Slides 12, 13, 14, … are a list of potential issues that may need to be captured in the text – I think this list is a useful thing.

C – Interesting slides, they should help to make sure we haven’t missed anything.

C – We can review these details on the next call.

## Next Steps:

**Upcoming Teleconferences:**

* Annex G
  + April 26: 13:00 ET, 2 hours
* TGbe concepts
  + April 8: 19:00 ET, 2 hours
  + April 29: 19:00 ET, 2 hours
* Contributions requested/expected:

## Adjourned: 21:00 h EDT

**Attendance:**

| **Name** | **Affiliation** |
| --- | --- |
| Au, Kwok Shum | Huawei Technologies Co., Ltd |
| Gu, Xiangxin | UNISOC |
| Hamilton, Mark | Ruckus/CommScope |
| Huang, Po-Kai | Intel Corporation |
| Ibrahim, Ahmed | Samsung Research America |
| Levy, Joseph | InterDigital, Inc. |
| Montemurro, Michael | Huawei Technologies Co., Ltd |
| Naik, Gaurang | Qualcomm Incorporated |
| Nayak, Peshal | Samsung Research America |
| Patil, Abhishek | Qualcomm Incorporated |
| Petrick, Albert | Jones-Petrick and Associates, LLC. |
| Shafin, Rubayet | Samsung Research America |
| Wang, Lei | Futurewei Technologies |

\* Added based on Webex participants list.