IEEE P802.11  
Wireless LANs

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| ARC SC teleconferences minutes 11 and 13 January 2021 - Interim | | | | |
| Date: 2021-01-13 | | | | |
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Abstract

This document contains the minutes of the IEEE 802.11 ARC SC teleconference held on 11 January 2020 at 13:30-15:30 h ET and 13 January 2021 at 11:15-13:15 h ET.

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

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# Monday 11 January 2021, 13:30-15:30 h ET

## Administration

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

**Vice Chair: Joseph Levy, InterDigital**

**Secretary: Joseph Levy, InterDigital**

**Meeting called to order by the Chair 13:30 ET**

Agenda slide deck: [11-20/1908r2](https://mentor.ieee.org/802.11/dcn/20/11-20-1908-02-0arc-arc-sc-agenda-jan-2021.pptx) proposed agenda copied here for reference (r3 out of the meeting):

**ARC Agenda – 11 Jan 2021, 13:30 ET**

* **Reminder: 2 meetings this week: 11 Jan 13:30 ET, 13 Jan 11:15 ET**
* **Attendance, noises/recording, meeting protocol reminders**
* **Policies, duty to inform, participation rules**
* **Prior meeting minutes**
* **Contribution/discussion topics:**
  1. **Updates to** [**11-20/0177r4**](https://mentor.ieee.org/802.11/dcn/20/11-20-0177-04-0arc-liaison-to-revmd-on-ess.docx) **(liaison to REVmd, now REVme)?**
  2. **802.11 TGbe’s evolving multi-link architecture contributions**

**ARC Agenda – 13 Jan 2021, 11:15 ET**

* **Attendance, noises/recording, meeting protocol reminders**
* **Policies, duty to inform, participation rules**
* **Contribution/discussion topics:**
  1. **802.11 TGbe’s evolving multi-link architecture contributions (< 1.25 hours)**
  2. **EPD/LPD presentation – Roger Marks (45 minutes)**
  3. **Any TGbd discussion?**
  4. **Other topic(s)?**
* **Next steps**

**Call for Patents:**

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

**Copyright Policy:**

The Chair reviewed the IEEE SA Copyright policy.

**Participation:**

The chair reviewed the participation policy.

**Approval of the Agenda:**

**ARC Agenda – 11 Jan 2021, 13:30 ET**

* **Reminder: 2 meetings this week: 11 Jan 13:30 ET, 13 Jan 11:15 ET**
* **Attendance, noises/recording, meeting protocol reminders**
* **Policies, duty to inform, participation rules**
* **Prior meeting minutes**
* **11-20/0177r4 -Review and Motion**
* **Contribution/discussion topics:**
  1. **Updates to** [**11-20/0177r4**](https://mentor.ieee.org/802.11/dcn/20/11-20-0177-04-0arc-liaison-to-revmd-on-ess.docx) **(liaison to REVmd, now REVme)?**
  2. **802.11 TGbe’s evolving multi-link architecture contributions**

**ARC Agenda – 13 Jan 2021, 11:15 ET**

* **Attendance, noises/recording, meeting protocol reminders**
* **Policies, duty to inform, participation rules**
* **Contribution/discussion topics:**
  1. **802.11 TGbe’s evolving multi-link architecture contributions (< 1.25 hours)**
  2. **EPD/LPD presentation – Roger Marks (45 minutes)**
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  4. **Other topic(s)?**
* **Next steps**

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

Note correction should be made on slide should be TGaz not TGbz.

The proposed agenda was accepted by unanimous consent.

## Prior meeting minutes:

**November plenary**

* [**https://mentor.ieee.org/802.11/dcn/20/11-20-1760-00-0arc-arc-sc-teleconferences-minutes-2-and-4-nov-2020-plenary.docx**](https://mentor.ieee.org/802.11/dcn/20/11-20-1760-00-0arc-arc-sc-teleconferences-minutes-2-and-4-nov-2020-plenary.docx)

Approved without comment or objection.

**November 16 telecon**

* [**https://mentor.ieee.org/802.11/dcn/20/11-20-1866-00-0arc-arc-sc-teleconferences-minutes-16-nov-2020.docx**](https://mentor.ieee.org/802.11/dcn/20/11-20-1866-00-0arc-arc-sc-teleconferences-minutes-16-nov-2020.docx)

Approved without comment or objection.

**December 7 telecon**

* [**https://mentor.ieee.org/802.11/dcn/20/11-20-1936-00-0arc-arc-sc-teleconferences-minutes-07-dec-2020.docx**](https://mentor.ieee.org/802.11/dcn/20/11-20-1936-00-0arc-arc-sc-teleconferences-minutes-07-dec-2020.docx)

Approved without comment or objection.

## Contribution/discussion topics:

* **Updates to** [**11-20/0177r4**](https://mentor.ieee.org/802.11/dcn/20/11-20-0177-04-0arc-liaison-to-revmd-on-ess.docx) **(liaison to REVmd, now REVme)?**

Review of Liaison to REVmd to correct definitions/concepts of ESS and HESS. Latest version:[**11-20/0177r4**](https://mentor.ieee.org/802.11/dcn/20/11-20-0177-04-0arc-liaison-to-revmd-on-ess.docx)

C – 4.3.5.2 – the definition of an IBSS and BSS seem to be in conflict.

R – agreed – that was the old text – the new text resolves the conflict.

C – Is the concept of an access domain well defined? These concepts are related to other 802 specifications.

R – The document uses the 802 terms as they define it in the 802 specification – the document is using these terms to align with 802 practice. The 802 hope was that 802.2 would be a universal standard, but that didn’t happen, hence the 802 spec was updated – and the LLC has been defined in the 802 Specification.

C – The terms transparency and mobility are used – can these terms be used without defining them?

R – The term transparent used in a location sense: the upper layers don’t need to know the logical or physical location of the device to send packets to the device. The upper layers only learn the devices physical location if the device is requested to and supplies its physical location. Transparency means that there may be a hiccup in service, but it will just go through – it is not possible to know if the hiccup is due to mobility or another source.

A - Rev me will not start till March – so there is no rush.

C – Regarding location, does it mean which BSS? Does transparency location actually mean which BSS is the non-AP STA associated with? This should be very specific and clearly stated, defining the term location transparency.

C - REVmd – the new ESS definition, is a set of BSSs interconnected by a DS. This seems to leave out .11ak. Did we leave out .11ak on purpose?

R – I think GLK (.11ak) has to be reviewed.

Note: review of the GLK text and how it uses ESS if there is an ESS without a DS?

C – HeSS and HESSID – has its own ESS definition.

R – We used the lower case – to try to flag that this is not a type of ESS. But wanted consistence with the HESSID concept. HESSID is used by an external organization so we wanted to keep it as HESSID and not use the lower case.

C – If one is not aware of the way the external organization uses HESSID one can make a mess of things. A reference should be added. This is an important set of requirements.

C – While it is important to implementation – is it something that need to be in the specification?

C – Suggested reference: Wi-Fi Certified deployment guidelines. <https://www.wi-fi.org/file/wi-fi-certified-passpoint-deployment-guidelines>.

C - Clause 11.22.2 – says it is a 6 octet that identified the HESSID.

C – This works with what is currently in REVmd – but we are trying to refine/clarify it.

C – 802.11 complicates these definitions, due to 802.11u

C – There is no need to add anything normative into the 802.11, but the reference to the Wi-Fi specification on how it is used should be provided.

C – This is fixing use in 802.11.

C – An informative reference will work.

Editorial changed “a HeSS” to be “an HeSS”.

R – The informative reference and be added to the subclauses on interworking and SSPN.

C – Interworking 4.5.9 may benefit from the HeSS concept, also ANQP. (The commentor suggested they may work on this and provide inputs to ARC.)

R- we may want to put this additional information somewhere other than clause 4. Agree that 4.5.9 may need to introduce the HeSS concept.

C – Regarding mobility – as there may be different regulatory domains in a HeSS – there may be issues. Removing homogenous.

R – yes there are many things going on “under the hood” – with regulatory domains, but from a logical concept the type of mobility provided is orthogonal to these concerns.

Action – document now needs additional updates.

C – The term HSS should not be used here, as HSS is a used/defined term meaning Home Subscriber Server.

C – Check grammar: “a HeSS” or “an HeSS”.

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

[11-20/1639r8](https://mentor.ieee.org/802.11/dcn/20/11-20-1639-08-00be-11be-ap-mld-architecture-discussion.pptx) “11be AP MLD Architecture Discussion” - Mark Hamilton (Ruckus/CommScope)

Mark Hamilton – presented a summary of 11-20/1639r8 - to bring people up to speed – then began his presentation discussing slide 24.

Slide 25 – for basic agreement – basically agreed, there were no objections or additional discussion.

The object of this discussion is to get this to work from an architectural view and leave the nuts and bolts of how it works to TGbe. The object of this document is to provide a framework to have discussions – this document does not provide answers, just structure for discussion.

Slide 27 -

Security SAs/Keys –

C – Is there an agreement if Alternative 1 or 2 is preferred?

Cleaned up the text for – Alterative 2 – PTK: Each stack (MLD for MLO peer, legacy for legacy peer) GTK, IGTK BIGTK: in legacy.

The participants’ understanding is that TGbe currently using Alternative 1.

C – It may be of helpful – to look at each radio independently, and how the queues then process the packets received from the radio.

A – TGbe seems to be looking at this bottom up, I think there is a benefit to looking at this from the top down.

C – How does this impact the 802.11 concept of BSS?

R – This has not been discussed – as we seem to be ahead of where TGbe is at regarding these concepts.

C – There has been no explicit discussion here on how this architecture impacts the BSS concept?

R – The goal of the ARC SC has been to get the model right, then discuss the impact of the model, and then discuss/decide where things need to change.

C – Alternative 1 – if security is taken at the MLD level – for a peer MLO association. If all management frames are encrypted, then all peer to peer management frames will be at the MLD level.

R – the lower MAC doesn’t know about frame exchanges; the state is in the upper MAC.

There was some additional discussion on group addressed management frames.

## Recess 15:29 h EDT

# Wednesday 13 Jan 2021, 11:15-13:15 h ET

## Administration

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

**Vice Chair: Joseph Levy, InterDigital**

**Secretary: Joseph Levy, InterDigital**

**Meeting called to order by the Chair 11:15 ET**

Agenda slide deck: [11-20/1908r4](https://mentor.ieee.org/802.11/dcn/20/11-20-1908-04-0arc-arc-sc-agenda-jan-2021.pptx) proposed agenda copied here for reference (will be r5 out of the meeting):

* **Attendance, noises/recording, meeting protocol reminders**
* **Policies, duty to inform, participation rules**
* **Contribution/discussion topics:**
  1. **802.11 TGbe’s evolving multi-link architecture contributions (< 1.25 hours)**
  2. **EPD/LPD presentation – Roger Marks (45 minutes)**
  3. **Any TGbd discussion?**
  4. **Other topic(s)? (See next slide)**
* **Next steps**

**Call for Patents:**

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

**Copyright Policy:**

The Chair reviewed the IEEE SA 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:**
  1. **802.11 TGbe’s evolving multi-link architecture contributions (< 1.25 hours)**
  2. **EPD/LPD presentation – Roger Marks (45 minutes)**
  3. **Any TGbd discussion?**
  4. **Other topic(s)? (See next slide)**
* **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 by unanimous consent.

Brief update on [11-20/0177r4](https://mentor.ieee.org/802.11/dcn/20/11-20-0177-04-0arc-liaison-to-revmd-on-ess.docx) (liaison to REVmd, now REVme).

## Contribution/discussion topics:

* 1. **802.11 TGbe’s evolving multi-link architecture contributions (< 1.25 hours)**

[11-20/1639r9](https://mentor.ieee.org/802.11/dcn/20/11-20-1639-09-00be-11be-ap-mld-architecture-discussion.pptx) “11be AP MLD Architecture Discussion” - Mark Hamilton (Ruckus/CommScope)

Started with slide 3 for a brief review, most if not all participants have been following this activity. The review continued with slide 24, 25, 27/28

Slide 27 –

C – Different PTKs are being discussed. In .11i the consensus is that the AA MAC and SA MAC address – are bound to the PTK. So how does the concept of different PTKs work?

C – TGbe has passed a motion. The confusion is PTK per link in 802.11 (legacy). In an AP MLD it is important for each legacy AP have it own legacy operation. How the AP deals with legacy is not really MLO.

C – .11be has defined PTK and PMK as single P2P keys for the MLD MAC Address P2P link.

C – The PTKSA can be used for rekeying – the PTKSA is really there. Regarding the MLO stack and legacy – a single state machine is required – the status of GTK distribution and when the new GTK can be implemented need to be tracked/managed. The legacy information needs to be shared between the MLO and legacy.

R – the MAC address for each stack – the direction .11be is going is to have a separate authenticator. The GTKs are per link, so separate authenticators could be kept up to date.

C – An accurate count as to which STAs need to receive the new GTK must be maintained.

R – adding rows to the slide 27 – Authenticators and SAP(s) – also adding “MLD routing” and “DS routing”

C –.11be has defined association for MLO to be a peer to peer link at the MLD level. Therefore, the PTK, PMK, and PTKSA are all at the MLD level. This MLD level secure peer to peer link is used to provide other keys (e.g., GTKs) which may be for legacy (non MLO) APs, (the APs in the AP MLD). A non-AP MLD STA associated with the AP MLD will also receive group addressed frames from these legacy APs (beacons, management frames, etc.) and will need to have the GTK to decrypt these frames. The GTK used by each legacy AP of the AP MLD will be unique and these keys will need to be distributed using the secure MLD peer to peer link (PTK), as it is currently done in the legacy case.

C – The specification of MLO should only specify new functionality required for MLO it should not respecify legacy operation.

C –Management frames and how they are handled should be included– MPF is important.

A – All of these things are in the MLD stack – also Action frames – maybe robust management frames. (added to slide 28).

C – I’m concerned how all this discussion will be synchronized with/reported to TGbe. It is important – stuff. TGbe may be thinking in a different in a different manner. Is ARC being a security ad hoc to be?

R – I was hoping to do this faster – we should start liaising something now – as we may be missing our opportunity to impact TGbe and there are TGbe experts on this call who are bringing this information to TGbe. Could we send some of these thoughts to be.

C – It seems ARC is just confirming what TGbe has motioned in TGbe. The on the air transmissions should be captured as a figure and the TGbe decisions could be described. If there is a technical problem, it should be shared with TGbe.

R – It is not necessary to send back to TGbe what TGbe has done. But determining what has been agreed and the implications may be useful.

C – The authenticator is higher layer – we don’t need to specify it. What are we trying to specify?

R – Following up on the authenticator comment – it is specified in 802.11 – we don’t specify the higher layers and the behaviors between authenticators, but we do describe it some. .11be should also provide this information.

C – The way keys are derived is not changing – the specification may not be consistent with itself – regarding the MLE primitives the behavior is not consistent with what TGbe is currently doing. E.g., how many authenticators there are and how do these processes work. I don’t think TGbe will focus on making MLE work.

C – Shouldn’t we let TGbe do the TGbe work and then look at it. It seems we are getting very close to telling TGbe what they should do.

R – I think it is ARCs job to ask the questions that impact the architecture so that TGbe is informed.

C – That is a lesson for TGbe to learn.

R – TGbe has been responsive to our discussions and has been doing the work.

A – The stack can be split with address 1 to route frames – this seems to be the direction that TGbe is heading – so if it is fine there is no issue – but we should think about it.

C – There is a new proposal that provides an MLO modification. But this is being discussed now in TGbe.

C – Concern about MLO configuration modification beyond association/reassociation.

C – Concern about service sets – what is an ESS in MLO?

C – Concern about moving from an MLD association to a legacy association and back again for mobility – captured in the [11-20/1639r10](https://mentor.ieee.org/802.11/dcn/20/11-20-1639-10-00be-11be-ap-mld-architecture-discussion.pptx)

* 1. **EPD/LPD presentation – Roger Marks (45 minutes)**

11-21-0092r1 – Roger Marks – <https://mentor.ieee.org/802.11/dcn/21/11-21-0092-01-0arc-llc-theory-and-protocol-discrimination.pdf>

A – Receiving LLC needs to know how things are encoded. Currently each type of network is assumed to use one type of encoding – so translation is done at each change of protocol. (EPD/LPD – but this protocol language is not consistently used, Roger will use different terms)

A – Looking for an architecture that is more neutral and not need translation.

A – EPD – 3PD and LPD – 2PD, a network shouldn’t care if the frame is an 3PD or 2PD frame – need to support at least 3 types.

*Due to a connectivity issue Roger dropped off the call mid-presentation. The Chair completed the remaining agenda items while waiting for Roger to return, for consistency sake these minutes keep the continuation of this discussion here. Roger returned and restarted at slide 9.*

Slide 9 – discussing the L, E, O – and a Protocol Shim a PIF

A – With this information the receiver can decode the frame independent of the encoding. Looking at putting this in place so that we can mix frames. So, the frame can be received by either type of receiver, so the sender could send the frame independent of the format.

A – VLAN tagging is different for 3PD and simple, 2PD VLAN tagging is more complex (slides 18, 19, 20, 21)

A – Simplified 2PD on 22. – this should allow for the creation of a universal protocol discrimination.

A – Slide 27 if the frame is tagged you don’t have a problem. Pointing to 0xAAAA, 0x4242, 0xFEFE as ether types.

A – Slide 27 are a list of possibilities – there are no conflict with these values – these either types should be assigned and could be used to support this proposal.

A – Slide 29 is the proposal. IEEE Std 802 is due for an update – and these changes can be added there.

A – Slide 30 – Requesting ARC consider a unified LLC, with no layer violations, and unified approach to handling multiple MAC interfaces. (minimally .11 and .3).

Discussion –

C – Regarding your possible way forward on slide 30 – there are a lot of could do things – is there enough interest to solve this.

R – The first place to discuss this in .11 – as .11 is the only MAC that is working with 2PD and 3PD – It is not only keeping them straight – there are translation issues and the burden this point is on bridges. EPD is limited to certain scenarios – this is very restricted. So, some of the functionality would show up early in .11 – in other areas we need to see if there is something useful, beyond protocol.

C – Given that this is a protocol change – this will require people to buy in to do this work. Will people use this in new devices?

R – It would be used in some cases and the value would be shown - then it could spread from there.

Chair questioned when we should discuss this again: in a teleconference or the March meeting? The Author chose March – no teleconference requested.

*Due to a connectivity issue Roger dropped off the call mid-presentation of the contribution above. The Chair completed the remaining agenda items below while waiting for Roger to return, for consistency sake these minutes keep these agenda items here.*

* 1. **Any TGbd discussion?**

None

* 1. **Other topic(s)?**

None

## Next Steps:

**Contributions requested/expected:**

* Looking for 802.11be discussion inputs.
* Looking to finish up the LS to me on HeSS
* TBD

**Next Teleconference(s):**

* Schedule a couple of calls for the LS in the AM
* Schedule a couple of calls for PM Monday 7 PM to discuss 802.11be issues– if TGbe doesn’t change their meeting schedule. (in 20/1917r6 is the current TGbe meeting plan)

## Adjourned – 13:17 h EDT.

Note: final agenda slide deck is: [11-20/1908r6](https://mentor.ieee.org/802.11/dcn/20/11-20-1908-06-0arc-arc-sc-agenda-jan-2021.pptx), ARC SC closing report: [11-21-0106r0](https://mentor.ieee.org/802.11/dcn/21/11-21-0106-00-0arc-arc-closing-report-january-2021.pptx)