IEEE P802.11  
Wireless LANs

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| TGbn September 2024 Meeting Minutes | | | | |
| Date: 2024-09-13 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
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|  |  |  |  |  |

Abstract

This document contains the minutes for TGbn September 2024sessions.

Revision history:

* Rev0: Initial version of the document.

Abbreviations:

* C: Comment.
* A: Answer.

# September 9th, Monday (10:30-12:30 HST) - Joint

* The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order.
* Yusuke Asai (NTT) is serving as the Secretary.
* Registration information
  + The chair announced that registration is needed to attend this meeting.
* Meeting protocol
  + The chair announced that everyone is required to log in WebEx to vote.
  + Please ensure that the following information is listed correctly when joining the call:
    - "[voter status] First Name Last Name (Affiliation)"
* Attendance reminder.
  + Participation slide: <https://mentor.ieee.org/802-ec/dcn/16/ec-16-0180-05-00EC-ieee-802-participation-slide.pptx>
  + Please record your attendance during the conference call by using the IMAT system:
    - 1) login to [imat](https://imat.ieee.org/attendance), 2) select “802 Wireless Interim/Plenary Session” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “TGbn 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:
    - Joint: Yusuke Asai ([yusuke.asai@ntt.com](mailto:yusuke.asai@ntt.com)) & Alfred Asterjadhi ([aasterja@qti.qualcomm.com](mailto:aasterja@qti.qualcomm.com))
    - PHY: Sigurd Schelstraete ([sschelstraete@maxlinear.com](mailto:sschelstraete@maxlinear.com)), Tianyu Wu ([tianyu@apple.com](mailto:tianyu@apple.com)), and Dongguk Lim ([dongguk.lim@lge.com](mailto:dongguk.lim@lge.com))
    - MAC: Xiaofei Wang ([xiaofei.wang@interdigital.com](mailto:xiaofei.wang@interdigital.com)), and Srinivas Kandala ([srini.k1@samsung.com](mailto:srini.k1@samsung.com)), Jeongki Kim ([jeongki.kim.ieee@gmail.com](mailto:jeongki.kim.ieee@gmail.com))
* IEEE 802 and 802.11 IPR policy and procedure
  + Patent Policy: Ways to inform IEEE:
    - Cause an LOA to be submitted to the IEEE-SA ([patcom@ieee.org](mailto:patcom@ieee.org)); or
    - Provide the chair of this group with the identity of the holder(s) of any and all such claims as soon as possible; or
    - Speak up now and respond to this Call for Potentially Essential Patents

If anyone in this meeting is personally aware of the holder of any patent claims that are potentially essential to implementation of the proposed standard(s) under consideration by this group and that are not already the subject of an Accepted Letter of Assurance, please respond at this time by providing relevant information to the WG Chair.

Nobody spoke/wrote up.

* + **Patent, Participation, Copyright and policy related subclause:** Please refer to the agenda document ([11-24/1364r3](https://mentor.ieee.org/802.11/dcn/24/11-24-1364-03-00bn-tgbn-sept-2024-meeting-agenda.pptx).)
  + Copyright Policy: Participants are advised that
    - IEEE SA’s copyright policy is described in [Clause 7](https://standards.ieee.org/about/policies/bylaws/sect6-7.html#7) of the IEEE SA Standards Board Bylaws and [Clause 6.1](https://standards.ieee.org/about/policies/opman/sect6.html) of the IEEE SA Standards Board Operations Manual;
    - Any material submitted during standards development, whether verbal, recorded, or in written form, is a Contribution and shall comply with the IEEE SA Copyright Policy.

Copyright Policy was presented.

* Agenda
  + Chair reviewed proposed agenda found in [11-24/1364r3](https://mentor.ieee.org/802.11/dcn/24/11-24-1364-03-00bn-tgbn-sept-2024-meeting-agenda.pptx).
  + Discussion:

C: Can you explain the cutoff that you are using?

A: There are three cutoffs. The first cutoff right now is from prior to July F2F, then the second cutoff is after the F2F, and the third cutoff is last Sunday.

C: Is the submission list on the agenda based on the first cutoff?

A: MAC is based on first and second. PHY and Joint covers every submission because we have enough time.

* + The modified agenda was approved with unanimous consent.
* Announcements
  + Queues and agendas are organized following the usual routines:
    - Submissions ordered per-DCN, and distribution is on a per-topic basis
    - Sunday (start of each F2F) deadline used to determine the cut-offs
  + Queue Status and Plans for this F2F:
    - Still a lot of MAC submissions up to second cut-off to cover
      * Intent is to cover (at least part of) the 1st & 2nd cut-off during this F2F meeting
    - Good total number of PHY/Joint submissions
      * Intent is to cover as many as possible during this F2F meeting
    - Allocating 45’ at the start of each MAC/Joint/PHY session for SPs
      * These start from Wednesday’s sessions to allow for discussions and consensus building
  + Requests to members:
    - Please make sure that submissions are uploaded asap and no later than 24 hours before the allocated slot (those that were not in the server have the DCN in red font)
    - Please review submissions of other members in the same topic, if there are similarities check, if there is room for harmonization/consolidation (co-authoring, harmonized SPs, etc.)

C: If there is any document presented earlier, can the straw poll included it added?

A: If present, you should send an e-mail for the straw poll request to the chair. The straw poll is conducted dedicated sessions. I received only one request so far, but the same thing is going to apply also in that case.

* Summary from July 2024 meeting
  + Ten teleconferences were held between July and September 2024 ([11-24/0964r15](https://mentor.ieee.org/802.11/dcn/24/11-24-0964-15-00bn-may-july-tgbn-teleconference-agenda.docx)).
  + The group discussed 41 technical submissions on the calls.
  + Targets for the July plenary are as follows:
    - Presentation of technical submissions (~200 pending submissions)
    - Continue populating the TGbn SFD with approved concepts.
* Technical Submissions – Beamforming + Misc.
  + [11-24/0243r1](https://mentor.ieee.org/802.11/dcn/24/11-24-0243-01-00bn-protocol-design-for-ul-beamforming.pptx): Protocol Design for UL beamforming Eunsung Jeon (Samsung)

C: I support the general concept. In the slide 4, the trigger frame requests the sounding frame from stations. It looks very similar to 11bf. I am not sure but it might be useful if there is some harmonization.

A: Thank you for the suggestion.

C: In the slide 9, Is compressed BF report the same as current CSI feedback or something else?

A: The same format.

C: You are saying it is not just a SVD based CSI feedback. What is the content?

A: It contains angles for phi and psi to generate the right singular vector but every SNR is not contained in this format, which is the same as the DL CBF report.

C: Is the content the same as the conventional feedback?

A: Yes.

C: In the slide 4, do you think that there is so much difference between the basic trigger frame and BFP that we need to include it even if it will increase the overhead in the feedback? Could it be embedded in this compressed beamforming report?

A: The trigger frame is used to trigger the sounding NDP. The trigger frame is available to provide the channel sounding.

C: In this slide 4, you combine the basic trigger and the precoding matrix together to select the beamforming of the uplink PPDU. If you combine them, error recovery may be a problem. Because if the AP receives nothing during this trigger-based transmission, there will be several reasons. I suggest the beamformer may first send the precoding matrix to these stations, and after it ensures this procedure is successful, then the AP can further trigger the stations.

A: I prefer to start with just a right singular matrix can be separated.

C: Why do we need to have a SIFS between the receiving of the sounding and the basic trigger?

A: This is a typo.

----- (Comment from chat window) -----

C: Even the right singular matrix is being used for the precoder for TB PPDU.....still need to indicate the TX power normalization factor of the precoder for TB PPDU ....so still the average SNR and Delta SNR field may be needed in the ULBF CBF in my opinion...

C: If Avg. SNR and Delta-SNR is needed, then these can be delivered. However, my intention is UL BF to be very similar to DL SU-MIMO (using V-matrix), where delta-SNR is not fed back. The important thing is ULBF CBF format should have same (or very similar) format as DL BF CBF.

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* + [11-24/1491r](https://mentor.ieee.org/802.11/dcn/24/11-24-1491-00-00bn-ru-adaptation-signaling-in-ul-tb-transmission.pptx)0: RU adaptation signaling in UL TB transmission Yapu Li (OPPO)

C: How does the receiver side decide the adaptation bandwidth?

A: There are two methods. The first method is that the STA always decodes its own RU and find there is no energy for which 20 MHz subchannel and it can infer the adapted RU. The second method is that the STA may indicate something in its TB PPDU, so the AP knows the adaptability.

C: But in the MIMO case, your method may not work.

A: Maybe we can do some restriction for the adaptation in non-MIMO cases, for example.

C: I have two comments. If we try to do the sequence in the slide 3, only 16 microseconds is available to do that. The receiver will complex and fast to be able to handle this. In addition, we already have the BQRP to allow the receiver to find which sub-channel is busy in the baseline specification. I think the BQRP could be an alternative to handle this to keep the receiver side simple and also to give us more flexibilities.

A: For the first comment, I think we can do some padding in the frame and the STA have enough time to handle this.

C: Regarding the padding, I think it is still changing because the padding occurs before the SIFS.

C: I think this scheme could be used for MIMO but could not be used for uplink MU-MIMO. I think if we assume there will be some signaling in the trigger-based transmission, then there should be some restrictions.

C: In the slide 3, does the STA1 know that the STA2 is going to transmit or not?

A: The STA2 may not know the status to perform or not perform this adaptation procedure. They always perform the head from the adaptation within the allocated RU.

* + [11-24/1574](https://mentor.ieee.org/802.11/dcn/24/11-24-1574-01-00bn-harmonization-of-11bn-simulation-assumptions.pptx)r1: Harmonization of .11bn simulation assumption Klaus Doppler (Nokia)

C: I agree this direction. We see more complex MAC features and the interactions are quite unknown. From my personal experience, they end up not being enabled in deployments, because their interactions are not known. If we can simulate those over a slightly more complex or more descriptive simulation scenarios, then there is some confidence there.

Do you have any extra traffic models? Any thoughts on using the RTA report because they came up with newer traffic models compared to 11ax, a few years later.

A: We are open to use updated traffic models. Let’s synchronize offline on that.

C: You mentioned latency sensitive traffic and the file transfer traffic. I think in the middle we also have today high throughput and low latency traffic such as XR, which should be considered.

A: That is a good point. The suggestion here is to add a third traffic class.

C: It is very helpful to try and standardized these things. If you were thinking that the metric should measure fairness or something which you talked about throughput and latency distribution, should that be applied just one traffic type? What are you thinking about?

A: This is a really good point. Having per-station uplink and downlink throughput gives a CDF of throughput and that also is a measure of the fairness. So definitely that is an important measure.

----- (Discussion on chat window) -----

C: I remember RTA TIG report already summarized some kind of low latency traffic and was referred since UHG SG era. Do you consider to include the report to the harmonization?

A: Yes, we will look into that. Thanks for bringing it up.

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* + 11-24/[1566r1](https://mentor.ieee.org/802.11/dcn/24/11-24-1566-01-00bn-l4s-support-in-802-11bn.pptx): L4S Support in 802.11bn Prabodh Varshney （Nokia）

C: Are you trying to have two queues per access category?

A: One queue is for L4S traffic.

C: Do you expect to have only four queues at the EDCA level or more than that?

A: At the ECDA level, there are four queues.

C: L4S has been deployed in wired network. I am curious if we should make this architectural decision at the MAC SAP for supporting L4S.

A: We should definitely look into that aspect.

C: In the slide 4, I assume that when we are saving the latency by making sure that the packet is sending with the mark for the congestion. We pass the information as exactly as possible. Otherwise, we will wait a couple of TXOP right until that. I agree that would be very beneficial to help with the latency.

C: In the slide 3, because you mentioned about AC\_BK, AC\_BE, AC\_VI, and AC\_VO. It seems that it is a like mapping with the access class in the four different. But there are like additional queues on top of that.

A: The ACs are still the four. We only take traffic flow. For example, if there are two access categories of, best effort and video, we take the L4S traffic flow and create these two queues.

C: OK. You have L4S is the one and classic.

A: Right. The classic is explaining that it is not an L4S traffic flow.

C: OK. An alternate queue in the MAC is available. Do we think that all these categories there are alternative queues available right? You have two sub-queues for AC\_VI. I don’t think it is widely implemented. And in the slide 3, you indicated the approaches 1 and 3. Is there any approach

A: The approach 2 is essentially closer to what the approach 1. In that case the CE marked packet is not sent by the MAC. When the MAC determines the CE packet, it sends back to the higher layer.

C: The congestion experience function has not been standardized yet. Are you proposing to include that as well?

C: I am in favor of the approach 3. We know there are some venders or some implementations that support to change the IP header, for example, they can set their CE field in the IP header while the frames are still buffered in their buffers. But there are some implementations that don’t support such function. And regarding the approach 1, I would like you to take some clarification.

A: Of course. We should talk to the authors of the reference [3].

C: Regarding the approach 3, there is way of remarking IP headers. Though, this a control sending the information so that the station has to do something is really overengineering a problem, which is quite hard to agree with. You have these dual queues for VI and BE, therefore the AC assignment of a given packet is pretty much orthogonal to the L4S packet. Are you continuing to assume that is possible? Do you think that you don’t need your dual queues for VO? It is just fine if non L4S and L4S VO traffic share the same queue. Or, are you trying to apply something that VO L4S traffic is not allowed?

A: That is the point. I am still trying to figure out whether the L4S traffic should be also applicable to VO or not. I was not sure that will assign on L4S traffic to VO.

C: My understanding is there is no restriction in the RFC.

A: You are right.

C: In the slide 3, how would this standardization work? Today, you would already have implementation for the dual queues but you wanted that to inside the MAC, what we have to send for suboptimal performance improvement. But what does standardization look like?

A: Basically, what the standard can help the markings. Basically, whenever you get this request, and you have these marking there, they can be easily seen over the air.

C: How do you even measure the status you have experienced the congestion at the same time? If you have experienced congestion, why not mark it in the future packets?

A: That is what you have to do to mark the packet which is experiencing the congestion.

C: You do the L4S more like end-to-end feedback to the sender. If you already have the congested experience flag it in the packet, do you assume we still do this the same thing? If there is some congestion on the previous notes and in the IP header, do you think we still need to set it again in this case?

A: No, if it is already experienced and if the higher layer already know that packet is experiencing a congestion.

C: Probably you are seeing that whenever you don’t have any congestion experience before and then it is come to the Wi-Fi layer problem.

A: Exactly.

C: There could be many cases where this congestion experience is already marked. So, I am wondering if you consider the AP provides the latency experience instead of just marking through a control. That is something some members are discussing.

C(Chair): In the CAC, there were some discussions that the WBA provided liaison regarding the L4S. So, I need get some more details from the working group leadership, but also some discussion with the ARC leadership. Once we get to some clarity, I will provide an update, but we might need to provide a response to the WBA. It just needs to be determined who, where, when that is going to occur.

C: FYI, there is already an agenda item for ARC for this afternoon to talk about a presentation responding to the WBA liaison. That is for those who are interested in this topic in the ARC PM1 session, today.

----- (Discussion on chat window) -----

C: Question for slide 3, what does standardization look like in terms of testing ? basically, how would anyone differentiate queuing done inside MAC versus above MAC ? for slide 4, on CE marking in DL its simpler if CE marking is done the way L4s is supposed to work in IETF: use the field in IP header.

C: Marking at IP layer would be simpler, but latency-wise it would also be less efficient.

C: In practice, Approach 1 does not necessarily imply the marking has to be applied only to subsequent packets, since implementations might actually be able to remark IP header (even if they are ostensibly L2 devices). I think this is sufficient. Approach 3 seems way over-engineered to me.

C: As I understand, it’s not supposed to be for making corrections in the same TXOP

C: If AP can't remark packets, then sure it applies to subsequent ones, with not much degradation.

C: Approach 2 is quite straightforward BTW - and likely quite close to Thomas' mention of inline remarking (but done with clear layering and interfaces)

C: "implementations might actually be able to remark IP header (even if they are ostensibly L2 devices). I think this is sufficient" ... this is approach 2 btw, which also addresses the "ostensibly" problem.

C: The sooner you inform the source about the congestion, the quicker it will react and make the rate adjustment. That is the principle of L4S. In this case the proposal is to pass the CE as soon as we can on L2, and not wait until the packet waiting at the upper layer is transmitted to pass the CE info.

C: if AP can set L3 in-line, there no advantage to doing the special L2 signaling. The L2 signaling implicates the STA (which, in some cases, might not be an L3+ endpoint either) in a feature which is really the AP's to address.

C: In the 11ak case, the 11 link might be a through link and congestion should be signaled further downstream.

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(Chair proposed to add submission of [11-24/1469r1](https://mentor.ieee.org/802.11/dcn/24/11-24-1469-00-00bn-phy-primitive-extension-for-npca.pptx) because there were remaining time (25 minutes). The modification of agenda was approved with unanimous consent.)

* + 11-24/[1469r1](https://mentor.ieee.org/802.11/dcn/24/11-24-1469-00-00bn-phy-primitive-extension-for-npca.pptx): PHY Primitive extension for NPCA Yan Li (ZTE)

C: The non-primary channel access potentially must protect off rather than a single PPDU. In terms of reception, I think doing it in the PHYCONVIG vector makes sense. This is very minor but it will be a boolean variable, and so I really don’t like to call a boolean as a flag. I think it is much better naming. If it is true or false, you immediately understand that’s meaning. I prefer option 2. We are in as a default operating channel and NPCA channel, I think it would be helpful.

(Chair asked the presenter to check the naming issue to run the straw poll in the subsequent session.)

* AoB: None.
* Recessed at 12:29.

**September 9th, Monday (16:00-18:00 HST)**

* Split MAC and PHY sessions.
  + MAC: <https://mentor.ieee.org/802.11/dcn/24/11-24-1654-00-00bn-minutes-for-tgbn-mac-ad-hoc-sessions-in-september-2024.docx>
  + PHY: <https://mentor.ieee.org/802.11/dcn/24/11-24-1656-00-00bn-minutes-for-tgbn-phy-ad-hoc-teleconference-in-september-to-october-2024.docx>

**September 10th, Tuesday (10:30-12:30 HST)**

* Split MAC and PHY sessions.
  + MAC: <https://mentor.ieee.org/802.11/dcn/24/11-24-1654-00-00bn-minutes-for-tgbn-mac-ad-hoc-sessions-in-september-2024.docx>
  + PHY: <https://mentor.ieee.org/802.11/dcn/24/11-24-1656-00-00bn-minutes-for-tgbn-phy-ad-hoc-teleconference-in-september-to-october-2024.docx>

**September 10th, Tuesday (13:30-15:30 HST)**

* Split MAC and PHY sessions.
  + MAC: <https://mentor.ieee.org/802.11/dcn/24/11-24-1654-00-00bn-minutes-for-tgbn-mac-ad-hoc-sessions-in-september-2024.docx>
  + PHY: <https://mentor.ieee.org/802.11/dcn/24/11-24-1656-00-00bn-minutes-for-tgbn-phy-ad-hoc-teleconference-in-september-to-october-2024.docx>

**September 10th, Tuesday (16:00-18:00 HST)**

* Split MAC and PHY sessions.
  + MAC: <https://mentor.ieee.org/802.11/dcn/24/11-24-1654-00-00bn-minutes-for-tgbn-mac-ad-hoc-sessions-in-september-2024.docx>
  + PHY: <https://mentor.ieee.org/802.11/dcn/24/11-24-1656-00-00bn-minutes-for-tgbn-phy-ad-hoc-teleconference-in-september-to-october-2024.docx>

**September 11th, Wednesday (8:00-10:00 HST)**

* Split MAC and PHY sessions.
  + MAC: <https://mentor.ieee.org/802.11/dcn/24/11-24-1654-00-00bn-minutes-for-tgbn-mac-ad-hoc-sessions-in-september-2024.docx>
  + PHY: <https://mentor.ieee.org/802.11/dcn/24/11-24-1656-00-00bn-minutes-for-tgbn-phy-ad-hoc-teleconference-in-september-to-october-2024.docx>

**September 11th, Wednesday (10:30-12:30 HST)**

* Split MAC and PHY sessions.
  + MAC: <https://mentor.ieee.org/802.11/dcn/24/11-24-1654-00-00bn-minutes-for-tgbn-mac-ad-hoc-sessions-in-september-2024.docx>
  + PHY: <https://mentor.ieee.org/802.11/dcn/24/11-24-1656-00-00bn-minutes-for-tgbn-phy-ad-hoc-teleconference-in-september-to-october-2024.docx>

# September 11th, Wednesday (16:00-18:00 HST) - Joint

* The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order.
* Yusuke Asai (NTT) is serving as the Secretary.
* Registration information
  + The chair announced that registration is needed to attend this meeting.
* Meeting protocol
  + The chair announced that everyone is required to log in WebEx to vote.
  + Please ensure that the following information is listed correctly when joining the call:
    - "[voter status] First Name Last Name (Affiliation)"
* Attendance reminder.
  + Participation slide: <https://mentor.ieee.org/802-ec/dcn/16/ec-16-0180-05-00EC-ieee-802-participation-slide.pptx>
  + Please record your attendance during the conference call by using the IMAT system:
    - 1) login to [imat](https://imat.ieee.org/attendance), 2) select “802 Wireless Interim/Plenary Session” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “TGbn 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:
    - Joint: Yusuke Asai ([yusuke.asai@ntt.com](mailto:yusuke.asai@ntt.com)) & Alfred Asterjadhi ([aasterja@qti.qualcomm.com](mailto:aasterja@qti.qualcomm.com))
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    - MAC: Xiaofei Wang ([xiaofei.wang@interdigital.com](mailto:xiaofei.wang@interdigital.com)), and Srinivas Kandala ([srini.k1@samsung.com](mailto:srini.k1@samsung.com)), Jeongki Kim ([jeongki.kim.ieee@gmail.com](mailto:jeongki.kim.ieee@gmail.com))
* IEEE 802 and 802.11 IPR policy and procedure
  + Patent Policy: Ways to inform IEEE:
    - Cause an LOA to be submitted to the IEEE-SA ([patcom@ieee.org](mailto:patcom@ieee.org)); or
    - Provide the chair of this group with the identity of the holder(s) of any and all such claims as soon as possible; or
    - Speak up now and respond to this Call for Potentially Essential Patents

If anyone in this meeting is personally aware of the holder of any patent claims that are potentially essential to implementation of the proposed standard(s) under consideration by this group and that are not already the subject of an Accepted Letter of Assurance, please respond at this time by providing relevant information to the WG Chair.

Nobody spoke/wrote up.

* + Copyright Policy: Participants are advised that
    - IEEE SA’s copyright policy is described in [Clause 7](https://standards.ieee.org/about/policies/bylaws/sect6-7.html#7) of the IEEE SA Standards Board Bylaws and [Clause 6.1](https://standards.ieee.org/about/policies/opman/sect6.html) of the IEEE SA Standards Board Operations Manual;
    - Any material submitted during standards development, whether verbal, recorded, or in written form, is a Contribution and shall comply with the IEEE SA Copyright Policy.

Copyright Policy was presented.

* + **Patent, Participation, Copyright and policy related subclause:** Please refer to the agenda document ([11-24/1364r11](https://mentor.ieee.org/802.11/dcn/24/11-24-1364-11-00bn-tgbn-sept-2024-meeting-agenda.pptx).)
* Agenda
  + Chair reviewed proposed agenda found in [11-24/1364r11](https://mentor.ieee.org/802.11/dcn/24/11-24-1364-11-00bn-tgbn-sept-2024-meeting-agenda.pptx).
  + Discussion:
    - There was a request to run the SP 3 and before the SPs 1 and 2 (on the original agenda) because they are much more general, which was approved.
  + The modified agenda was approved with unanimous consent.
* Approve TG minutes
  + **Motion:**

Move to approve TGbn minutes listed below:

* + - July plenary: <https://mentor.ieee.org/802.11/dcn/24/11-24-1391-02-00bn-tgbn-july-2024-meeting-minutes.docx>
    - Teleconferences July-Sept: <https://mentor.ieee.org/802.11/dcn/24/11-24-1392-04-00bn-tgbn-july-august-2024-teleconference-minutes.docx>

Move: Yusuke Asai Second: Stephen McCann

Approved with unanimous consent.

* Straw Polls
  + [11-23/1871r5](https://mentor.ieee.org/802.11/dcn/23/11-23-1871-05-00bn-m-ap-coordinated-transmission-framework.pptx): M-AP Coordinated Transmission framework Arik Klein (Huawei)

**SP1:**

Do you support defining a common framework of a M-AP Coordination for various coordination schemes?

* + - NOTE: Coordination schemes such as (but not limited to): Co-SR (TXOP-based with power control), Co-BF, TBD Co-TDMA, TBD C-RTWT, etc.

*Supporting doc: [??]*

(Requested by Arik Klein.)

* + - Discussion

C: It is better to merge the SPs 1 and 2 together. The reason is that the SP1 itself may leads to some impression, for example, CBF and C-RTWT will use the same coordinated transmission procedure. I think that may be a little bit too broadly at this stage to see the other thing.

A: As shown in the diagram, we are not talking about these two stages that are detailed in couple two. I prefer the different SPs.

**Result: 170Y, 30N, 42A**

* + **SP2:**

Do you support defining a common framework of a M-AP Coordination that includes the following procedures:

* + - M-AP Coordination Discovery procedure
    - M-AP Coordination agreement negotiation procedure

Note: Details of the procedures and whether the above procedures are mandatory / optional – TBD

*Supporting doc: [*[*11-22/1530r1*](https://mentor.ieee.org/802.11/dcn/23/11-23-1530-01-0uhr-evaluation-of-supported-low-latency-services.pptx)*,* [*11-23/293r0*](https://mentor.ieee.org/802.11/dcn/23/11-23-0293-00-0uhr-follow-up-on-twt-based-multi-ap-coordination.pptx)*,* [*11-23/1871r5*](https://mentor.ieee.org/802.11/dcn/23/11-23-1871-05-00bn-m-ap-coordinated-transmission-framework.pptx)*,* [*11-23/1932r3*](https://mentor.ieee.org/802.11/dcn/23/11-23-1932-03-00bn-further-considerations-on-coordinated-twt.pptx)*,* [*11-23/2022r1*](https://mentor.ieee.org/802.11/dcn/23/11-23-2022-01-00bn-r-twt-for-multi-ap-follow-up.pptx)*,* [*11-24/0072r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-0072-00-00bn-map-channel-access-procedure.pptx)*,* [*11-24/453r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-0453-00-00bn-multi-ap-coordination-and-roaming.pptx)*,* [*11-24/511r1*](https://mentor.ieee.org/802.11/dcn/24/11-24-0511-01-00bn-requirements-and-functionalities-for-multi-ap-framework.pptx)*,* [*11-24/512r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-0512-00-00bn-considerations-for-coordinated-tdma.pptx)*,* [*11-24/719r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-0719-00-00bn-map-set-operation.pptx)*,* [*11-24/842r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-0842-00-00bn-multi-ap-set-configuration-for-c-tdma.pptx)*,* [*11-24/1217r2*](https://mentor.ieee.org/802.11/dcn/24/11-24-1217-02-00bn-multi-ap-coordination-setup-scheme.pptx)*,* [*11-24/1220r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-1220-00-00bn-a-framework-for-coordinated-access-points.pptx)*]*

* + - Discussion

C: There have been presentations indicating that multi-APs can discover each other in other ways. They may be parts of some enterprise networks. In this case, the common framework discovery is trivial. The APs register with a wireless controller, and the controller knows everybody. I don’t think you’re trying to constrain or eliminate that possibility, but I just wanted to hear you confirm that.

A: It can be implemented. What we want to have it’s the ability to do it the wireless LANs. It’s not a requirement but a possibility.

C: This SP says that through we have defined the procedure of discovery and the procedure of the agreement negotiation. Whether each of them mandatory or optional is TBD.

(There were several discussions on revising the SP2 test. The above SP text is the revised version.)

**Result: 199Y, 8N, 46A**

* + **SP3:**

Do you support defining a multi-AP operation that includes the following procedure?

* + - One AP may provide a preferred multi-AP scheme to another AP in MAP procedure if both APs support more than one multi-AP scheme.

Note 1: the naming of term MAP scheme is TBD, e.g., MAP transmission schemes/modes, MAP coordination schemes/modes, etc., and may include but not limited to CSR, CBF, TBD C-TDMA, etc.

Note 2: the term MAP procedure may include but not limited to MAP setup, MAP information exchange, MAP selection, MAP Coordination agreement negotiation, etc.

*Supporting doc: [*[*24/0084*](https://mentor.ieee.org/802.11/dcn/24/11-24-0084-03-00bn-considerations-on-multi-ap-operation-follow-up.pptx)*]*.

* + - Discussion

C: Is it static preference or dynamic signaling?

A: It can be dynamic signaling between multiple BSSs and multiple TXOPs.

C: What do you mean by exactly preferred scheme? Is that a special step in the negotiation or something different like that is not a part of the negotiation process, or how is that done?

A: It can be a part of a negotiation step. For example, it is the shared AP sends such preferred scheme to the sharing AP, then the shared AP will decide the final multi-AP coordination scheme to be used. But based on this preference scheme, it works with when both APs support more than one multiple schemes, so then the shared AP can have a preference.

C: The indication of the preference seems to be not really needed. It is to the proposal for it. It's any way you would decide the capability, and there's a negotiation.

C: I also think this is a part of the negotiation and don’t need to specifically preference.

C: It is better not to mention it for now.

A: Regarding these comments, we propose the point here is that when the multi-AP transmission is short term, then we did not like even the multiple PSRP or estimated two consequent PSRP or within one TXPO. If the channel changes, then the APs may have opportunity to update the multiple schemes.

C: Maybe simply remove it because we already have multi-AP coordination. I am doing the same thing that already had in the previous one.

C: When you say preference, do you mean that you still negotiate multiple cooperation, just saying which way you prefer, but just decide the information for the other AP to consider?

A: For example, you need channel information for CBF case. When the network solution changes, I may have different requirements.

**Result: 33Y, 140N, 76A**

* + **SP4:**

Do you support defining a multi-AP operation that includes the following procedure?

* + - One AP and another AP may coordinate availability/unavailability periods used for performing a multi-AP transmission.

Note 1: the availability/unavailability periods is within a TXOP obtained by one of the APs, e.g., a sharing AP. The naming of term availability/unavailability periods is TBD, e.g., transmission window, unavailability window, etc.

Note 2: the term MAP transmission may include MAP coordination using MAP scheme (e.g. see SP1). Details of the operation and whether the above operation are mandatory / optional - TBD

Supporting doc: [[24/0084](https://mentor.ieee.org/802.11/dcn/24/11-24-0084-03-00bn-considerations-on-multi-ap-operation-follow-up.pptx)]

* + - Discussion

C: What unavailability/availability is representing here?

A: The sharing AP shares the transmission window to the shared AP to know whether the shared AP is willing to participate within that period. It could be a standard sharing AP asks to share notifying the AP window. The shared AP may send to the shared AP period of other AP windows, so that the shared AP can know it is OK to participate. This helps the shared AP can schedule the multi-AP transmission more efficient.

C: I am struggling to figure out what you are trying to ask for. Because on one hand it sounds like C-TDMA, give that we have sharing and shared APs, but on the other hand, it sounds like C-RTWT. But in C-RTWT we don’t have a sharing and shared AP because they do not allocate TXOPs dynamically.

**Result: Y: 26, N: 161, A:62**

* Submissions (L4S, DRU, NPCA)
  + [11-24/1350r](https://mentor.ieee.org/802.11/dcn/24/11-24-1350-02-00bn-l4s-support-implementation-options.pptx)2: L4S support implementation options Lili Hervieu (CableLabs)

C: It certainly means interesting technology. When you have some L4S traffic and some normal traffic, how would you categorize them? What I see is that you are essentially lowering throughput at the cost of improving the latency.

A: We have been doing and the test results we have shown. This was how to say that the maybe the solution with we had a preliminary implementation. The simulation result is better than the test result.

C: I have two concerns. One is the difference between wired and wireless networks. Congestion could be transient problem of interferences in the regulatory power limits, etc. How is that going to be different than the wireless network? Another thing is on for the low latency application such as industry automation application. What would slowing the input rate impact on that kind of application?

A: I agree the Wi-Fi is quite different from the wired network. If you are in wired networks, you would expect constant rate compared with the Wi-Fi. When you move the station, the MCS changes but the data rate is not changed. But it can adapt quite working fast in this test.

And the solution was able to adapt quite well to changing the PHY rate. We expect when there would be lots of clients, the L4S capable AQM with the shallow queue will be able to adjust because we will be able to adjust.

C: In your measurement on latency, were you able to identify the gain that is happening on the Wi-Fi layer or is it because you are enabling the L4S on all the path to the server?

A: Basically, each time the packet is sent to Wi-Fi, there was a port mirroring. So, the packet was mirrored to the latest packet capture tool, and we timestamped the packet on the other side.

Each time a packet was sent through from the AP. We were also mirroring the packet and timestamp it. For each packet, we looked at the difference in the two timestamps. We did the experiment with 20 MHz channel to make sure that there is no buffering delays in the switchboard with 1 Gbps. The Access point supports a much higher rate.

C: Maybe in the interest of time, basically, it would be helpful to identify the latency and due to those changes on the AP, where it is between the AP and the STA or of all over the route because we are proposing something for the Wi-Fi layer.

* + [11-24/1124r](https://mentor.ieee.org/802.11/dcn/24/11-24-1124-03-00bn-headroom-reason-reporting.pptx)3: Headroom Reason Reporting Brian Hart (Cisco Systems)

C: How does this information be used for the AP link adaptation? Because the link adaptation in AP is a feedback driven system. When it receives a certain RSSI, the MCS will adapt to it.

A: I agree with you. The issue is one level above link adaptation. The AP could be asking the client to transmit at a lower power than it’s capable. So, given that SINR is lower and the MCS after rate adaptation will be lower than it could have been and especially if there is not much traffic, you don’t need to optimize for spatial reuse and system level optimization.

* + [11-24/1405r](https://mentor.ieee.org/802.11/dcn/24/11-24-1405-01-00bn-discussion-on-aspects-in-dru-operation-follow-up.pptx)1: Discussion on aspects in DRU operation – follow up Arik Klein (Huawei)

C: In the slide 3, The AP already knows this is LPI channel because it is operating in the LPI channel. Even if they started with the RRU, and then even if we send that information, then may not be decodable because power is too short. I think it is better way that the AP just tries a DRU because they already know power difference between the RRU size and the DRU size.

A: I mean the AP just has to know if there I limitation from the non-AP.

C: That is my point, how the message itself is successfully delivered to the AP.

A: We do not suggest arriving to this situation. We just show that in any case that the non-AP station is bounded by the PSD, not only if the uplink power headroom is already zero. It can be before the uplink power headroom is zero. It could just let the AP know that the bounding factor is by the DRU’s PSD value. The non-AP station knows it from the beginning because it knows what the regulation is. The non-AP station needs to calculate the transmit power as replaced by the AP as well as to know what the limitations are.

C: In the slide 5, will the non-AP STA send the A-control field to the AP? Or, will the AP send it to the STA?

A: The A-control of the applicable power headroom is sent by the non-AP station to the AP.

C: How this non-AP STA should associate with the AP in the first step?

A: If the AP has sent the trigger frame and the non-AP STA responds to this, the trigger frame is a trigger based PDU. That includes data or management frame. It includes an A-control field of the applicable power headroom, and this is sent without the request of the AP or the willing of the non-AP stations. This is the rule that is currently stated in the spec.

C: But even before the AP sends the trigger frame to the non-AP STA, there was communication between the non-AP STA and the AP, and the AP already knows that this non-AP st is limited in power.

A: No. because when they non-AP STA initiates the transmission it detects what is the transmission power. In case of trigger based PPDU or uplink trigger transmission, the AP sets the target RSSI in which the non-AP station needs to arrive, and the non-AP station has to follow all the parameters that are determined by the AP. Therefore, it has to follow the target RSSI requested by the AP and to calculate in what uplink transmit power it needs to transmit and then also needs to be followed by the regulation or any other limitation, as mentioned by the previous presentation.

* + - **SP1:**

Do you support adding the following to the TGbn SFD?

* + - * The 802.11bn amendment defines a mechanism for a UHR non-AP STA to assist a UHR AP with a DRU allocation.

Supporting submissions: [11-24/1405r1](https://mentor.ieee.org/802.11/dcn/24/11-24-1405-01-00bn-discussion-on-aspects-in-dru-operation-follow-up.pptx)

* + - * Discussion: None.

**Result: 85Y, 70N, 69A**

* + - **SP2:**

Do you support adding the following to the TGbn SFD?

* + - * The 802.11bn amendment defines a way for a non-AP STA to notify an AP when the STA’s 0 dB of UL power headroom is due to the STA’s Local max TX power level

Supporting submissions: [11-24/1124r2](https://mentor.ieee.org/802.11/dcn/24/11-24-1124-02-00bn-headroom-reason-reporting.pptx)

* + - * Discussion: None.

**Result: 69Y, 86N, 68A**

(The rest of the SPs were deferred.)

* Recessed at 17:53.

**September 11th, Thursday (8:00-10:00 HST)**

* Split MAC and PHY sessions.
  + MAC: <https://mentor.ieee.org/802.11/dcn/24/11-24-1654-00-00bn-minutes-for-tgbn-mac-ad-hoc-sessions-in-september-2024.docx>
  + PHY: <https://mentor.ieee.org/802.11/dcn/24/11-24-1656-00-00bn-minutes-for-tgbn-phy-ad-hoc-teleconference-in-september-to-october-2024.docx>

**September 11th, Thursday (10:30-12:00 HST)**

* Split MAC and PHY sessions.
  + MAC: <https://mentor.ieee.org/802.11/dcn/24/11-24-1654-00-00bn-minutes-for-tgbn-mac-ad-hoc-sessions-in-september-2024.docx>
  + PHY: <https://mentor.ieee.org/802.11/dcn/24/11-24-1656-00-00bn-minutes-for-tgbn-phy-ad-hoc-teleconference-in-september-to-october-2024.docx>

# September 12th, Thursday (13:30-15:30 HST) - Joint

* The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order.
* Yusuke Asai (NTT) is serving as the Secretary.
* Registration information
  + The chair announced that registration is needed to attend this meeting.
* Meeting protocol
  + The chair announced that everyone is required to log in WebEx to vote.
  + Please ensure that the following information is listed correctly when joining the call:
    - "[voter status] First Name Last Name (Affiliation)"
* Attendance reminder.
  + Participation slide: <https://mentor.ieee.org/802-ec/dcn/16/ec-16-0180-05-00EC-ieee-802-participation-slide.pptx>
  + Please record your attendance during the conference call by using the IMAT system:
    - 1) login to [imat](https://imat.ieee.org/attendance), 2) select “802 Wireless Interim/Plenary Session” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “TGbn 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:
    - Joint: Yusuke Asai ([yusuke.asai@ntt.com](mailto:yusuke.asai@ntt.com)) & Alfred Asterjadhi ([aasterja@qti.qualcomm.com](mailto:aasterja@qti.qualcomm.com))
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    - MAC: Xiaofei Wang ([xiaofei.wang@interdigital.com](mailto:xiaofei.wang@interdigital.com)), and Srinivas Kandala ([srini.k1@samsung.com](mailto:srini.k1@samsung.com)), Jeongki Kim ([jeongki.kim.ieee@gmail.com](mailto:jeongki.kim.ieee@gmail.com))
* IEEE 802 and 802.11 IPR policy and procedure
  + Patent Policy: Ways to inform IEEE:
    - Cause an LOA to be submitted to the IEEE-SA ([patcom@ieee.org](mailto:patcom@ieee.org)); or
    - Provide the chair of this group with the identity of the holder(s) of any and all such claims as soon as possible; or
    - Speak up now and respond to this Call for Potentially Essential Patents

If anyone in this meeting is personally aware of the holder of any patent claims that are potentially essential to implementation of the proposed standard(s) under consideration by this group and that are not already the subject of an Accepted Letter of Assurance, please respond at this time by providing relevant information to the WG Chair.

Nobody spoke/wrote up.

* + Copyright Policy: Participants are advised that
    - IEEE SA’s copyright policy is described in [Clause 7](https://standards.ieee.org/about/policies/bylaws/sect6-7.html#7) of the IEEE SA Standards Board Bylaws and [Clause 6.1](https://standards.ieee.org/about/policies/opman/sect6.html) of the IEEE SA Standards Board Operations Manual;
    - Any material submitted during standards development, whether verbal, recorded, or in written form, is a Contribution and shall comply with the IEEE SA Copyright Policy.

Copyright Policy was presented.

* + **Patent, Participation, Copyright and policy related subclause:** Please refer to the agenda document ([11-24/1364r1](https://mentor.ieee.org/802.11/dcn/24/11-24-1364-13-00bn-tgbn-sept-2024-meeting-agenda.pptx)3.)
* Agenda
  + Chair reviewed proposed agenda found in [11-24/1364r13](https://mentor.ieee.org/802.11/dcn/24/11-24-1364-13-00bn-tgbn-sept-2024-meeting-agenda.pptx).
  + Discussion
    - The order of presentation was changed.
    - Two additional SPs were requested.
  + The modified agenda was approved.
* Straw Polls
  + **SP1:**

Do you agree to improve EDCA to reduce tail access delay of Low Latency traffic in multi-BSS dense scenarios in presence of best effort traffic?

* + - The solution to improve EDCA is distributed
    - The impact on legacy device has to be balanced
    - Low Latency traffic is treated as AC\_VO traffic. Other cases are TBD.

Supporting list: [[11-23/2126](https://mentor.ieee.org/802.11/dcn/23/11-23-2126-03-00bn-low-latency-channel-access-follow-up.pptx), [11-23/1065r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1065-00-0uhr-low-latency-channel-access.pptx), [11-24/467](https://mentor.ieee.org/802.11/dcn/24/11-24-0467-01-00bn-hip-edca-follow-up-legacy-impact.pptx), [11-24/31](https://mentor.ieee.org/802.11/dcn/24/11-24-0031-00-00bn-deterministic-backoff.pptx), [11-24/840](https://mentor.ieee.org/802.11/dcn/24/11-24-0840-00-00bn-hip-edca-proposal.pptx)]

* + - Discussion

C: I agree with the general direction that we should improve EDCA for low latency traffic. Regarding the first bullet, I have some concerns to keep the mechanisms as distributed. I understood a lot of these contributions are advocating for a mechanism where an 11bn device can transmit a signal that can basically prevent legacy devices from access the channel, or even contending for channel access for certain periods of time. Because EDCA has been for a long time in 802.11, going down this road is probably risky. Regarding the third bullet, low latency has been there even in prior standards, even in 11 be and we pretty much understand low latency as being traffic that has low latency. We don't want to parameterize it with an access category at this point. Because a number of low latency traffic that have even more stringent requirements than voice traffic, they go into other access categories as well. So, we don't really want to, it's not a good direction to parameterize it with an access category, at least at this this stage in the standards.

A: Regarding the first bullet, the solution is to improve EDCA lies within the word EDCA itself. It is a distributed mechanism. It does not rely on anything.

The stations compete for the medium using the parameters, and they are not dependent on each other. This is the distributed mechanism.

We are hoping that by being within the EDCA scope, we can improve the latency performance within a certain way.

So, I agree that there might be other solutions which may improve the channel access mechanisms. But we would like to limit ourselves to impose distributed channel access, and not to impose any restrictions which potentially can be put on from any management entity. And we have four access categories. We have rules in which the traffic falls into certain access category. If you look at the parameters, AC\_VO has the highest chance to access to the medium, which gives us a simple reason to fall the low latency traffic into there. The new traffic may not be categorized as AC\_VO or they will fall potentially same to AC\_VI, I agree with that. For that case, you might have potential issues with the classification without the other cases are TBDs. So, we are not preventing potentially other traffics to be using that mechanism. We suggest that we primarily should focus on the access category, which is naturally supposed to hold low latency traffic at the first place, because it requires the much quicker and faster channel access mechanism.

C: Because EDCA is a distributed mechanism, the improvement to EDCA, if it is an improved ECDA would also be distributed. If that is the case the first bullet tis trivial .The first bullet should be removed. As far as the third bullet is concerned, low latency traffic going into other queues is not necessarily a misclassification on the device side. Something that is the intention of the application, because these access categories, they come from EDCA values and those are used end-to-end, even on the backbone. So, just to gain some benefit on channel access on the last stop, you don’t want to change the EDCA value and suffer somewhere else on the backbone because of other issue that exist with changing EDCA values. So, we should try to improve the performance for low latency traffic without parameterizing it. And if the solution has to be an improvement of EDCA, the first bullet needs to be removed.

C: I have some concerns on the third bullet. I you want to improve the EDCA based solution, you can do that without any standardization. I don’t know why you want to restrict it to AC\_VO without any standardization. The second point is you will agree on the low latency traffic as AC\_VO. In our simulation results ([11-24/1473](https://mentor.ieee.org/802.11/dcn/24/11-24-1473-00-00bn-map-co-edca-to-improve-the-performance-of-edging-sta-follow-up.pptx)) in the overlapping area. The third station almost doesn’t have any chance to transmit its traffic. This will be negative or impacted to other STAs in the overlapping areas. So, this is a very bad direction. So, if you can remove the third bullet, that is OK.

A: We are going to work on the one of the goals for UHR to improve the delay for industry traffic. The contribution tries to focus on the low latency traffic in the first place. If you look at my previous contribution, we conducted multiple simulations, and through a deep analysis, that improving everything is not going to work. It is much better to focus on the just certain traffic types. Again, I am repeating the channel access mechanism in Wi-Fi is per access category, not per flow.

C: This is very interesting direction and maybe it can solve our low latency problem.

My concern is to include EDCA. With this word, I can’t understand which direction you want to go. Are you going to do something with backoff procedure compared with current one? What do you want to do with this including EDCA?

A: When the low latency client struggles to access the medium, you would like to dynamically create certain period where the low latency clients’ contention is going to be separated from the contention of other clients. This is main changes. It doesn’t touch any single other aspect of the backoff for EDCA procedure. Everything else remains.

C: There can be a management entity that can have control on the usage of this improved EDCA or high priority EDCA. I don’t see that reflected in the SP. I think it is decided by station instead of any management level entity, making the decision of which stations or which flows actually end up using this improved EDCA.

A: Even though you have the management entity which in some way tells in which direction the EDCA should work. We are not changing the foundation of EDCA can be there as well.

C: I support this. The low latency support is a very important requirement we need to address in 11bn.

**Result: 134Y, 85N, 68A.**

* + **SP2:**

Do you support adding in TGbn a short common signal (enough for legacy 11g+ STAs to detect) that may be sent in EDCA whenever a STA may send a PPDU, fitting within one slot, and not requiring TGbn STAs to defer?

Supporting list: [[24/0284r2](https://mentor.ieee.org/802.11/dcn/24/11-24-0284-02-00bn-low-latency-low-collision-low-power-uhr-medium-access.pptx), [24/1183r1](https://mentor.ieee.org/802.11/dcn/24/11-24-1183-01-00bn-low-latency-low-collision-low-power-medium-access-continued.pptx)]

* + - Discussion: none.

**Result: 41Y, 181N, 69A.**

* Technical Submissions: Roaming
  + [11-24/0679](https://mentor.ieee.org/802.11/dcn/24/11-24-0679-04-00bn-thoughts-on-functionality-and-security-architecture-for-uhr-seamless-roaming.pptx)r4: Thoughts on Functionality and Security Architecture for UHR Seamless Roaming Thomas Derham (Broadcom)

C: There is so much information here. So, we need a lot of more time to go through it all and decipher it. When you optimize for FT, you can get BSS transitions down to less than 8 milliseconds. That is actually today and I guess it is consistent with your experimental results. After the exhaustive debate in 11r, we decided that the best we could do is just provide requirements and allow other organizations to define the protocols. I just wanted to bring how things have gone in the past.

C: Single PTK seems to have many issues on this data plane handling. And I agree we can solve all those by having the unique PTK per AP in general. Wireless LAN has such a long history of whole security solutions like WEP and TKIP. There is no room for any more of such a disaster.

A: I agree with that. I think it is possible to get this right in practice.

C: I agree with your direction to improve the current protocol. Even PTK is negotiated, it will increase the roaming delay. PTK sharing doesn’t provide any benefit and will introduce security risk.

C: In the slide 32, this experimental result was done with the current protocols, and then you play with it or I could not understand it.

A: This slide 29 is a result using completely off-the shelf smartphone product. The slides 30 and 31 are very similar, where we took our reference design and made some small changes, not to the protocol. Protocol is exactly the same, but just in terms of the timing is changed. It is completely compliant with FT. It is just some sort of tweaks to the timing of the implementation.

C: I do agree with the direction. I have concern about the continuous sequence number handling. I think we haven’t seen a clean solution there yet.

What we have seen is some thoughts about introducing a gap. It looks like a hacky solution to me. So, I don’t want this to be the only solution.

A: We did see some study of the amount of sort of traffic burst that might arrive in the AP’s queue, and depends on a lot of factors. We don't think it's reasonable for a lot of implementations that they're going to transfer data over DS.

C: In the slide 15, this increases the attack surface and the risk of PTK compromise due to implementation vulnerability. The most secure wireless networks do PTK sharing outside the AP and almost everyone in this room has used their technology. They use it at their place of work.

The PTK sharing is important for scalability. It’s valuable in panic roaming situations

6 - 8 milliseconds are the good number but we are actually aiming for better numbers.

A: We can definitely discuss we are most concerned about the types of architectures that maybe are not the homogeneous single vendor cases that you described there and other types of networks that you do need to work and work in a secure manner. I would not mention that 8 milliseconds is not a result of key derivation or key installation time. In fact, FT that happens way in advance. That's mostly due to the timing for the FTA exchange.

C: I disagree with the final conclusion.

Some of the examples may be focused on implementation that is not done correctly. But I believe some of the issues that have been highlighted can be solved by current implementation and careful testing in general. The direction is probably we need to make the roaming seamless to cut down association, authentication time and maybe define seamless mobility domain.

A: We would not be proposing something if it actually had an impact on the on the wrong time. I've been involved in other organizations and security task groups, testing this type of issues between multiple devices.

C: I want to reiterate on the PTK sharing part. We have covered benefits of PTK sharing in terms of scalability both on the station and the AP sides, and in terms of reducing the complexity especially on the client side. In enterprise networks, there is a centralized architecture where PTK is actually shared. And there is an assumption for a secured backhaul. So the same secured channel is used today for exchange of PTK in many deployments. So, we don’t see any issue with that and don’t see much concern extending that. It is already done today in the current set of deployments.

A: I agree there are obviously different security levels and different levels of trust, different levels of interoperability and heterogeneous versus homogeneous architectures you need to support locally.

C: One concern is regarding the benefit of single PTK sharing. If we go down the path of mandating or disallowing it completely, it impacts the exiting architecture that uses it. Some of the items that you mentioned about the security vulnerability, there are other ways to address it. We have to be careful disallowing it completely.

A: Thank you. I will be happy to discuss on it.

C: You specifically talk about PTK, but I don’t see PTK sharing have all these issues, but for PMK sharing, I don’t see those issues.

A: We didn’t talk about PMK sharing. If you compromise a PMK, you can pose as an AP at the same network appear. That is a different aspect of being able to decrypt someone’s data. So, that is not a part of our discussion today.

We are open to discuss it.

C: In the slide 31, you show there is certain amount of time, which is on the order of several milliseconds. Could you provide some insight into what is contributing to that time? Is it a implementation thing? Is it because of the channel access?

A: There wasn’t a lot of loads on this channel, but there have been cases where the first AP was still trying to send data to the station, even though it roams the way. And there were a bunch of RTS/CTS exchanges, that were delaying the completion of the ADDBA. There is obviously some internal processes, and then there is the ADDBA exchange itself, which took some time.

C: I agree with the direction of some of results and PTK renegotiation.

* Motions
  + [11-24/0171r1](https://mentor.ieee.org/802.11/dcn/24/11-24-0171-14-00bn-tgbn-motions-list-part-1.pptx)4: TGbn Motions List Part 1.  
    (After the meeting had adjourned, the motion list was revised as [11-24/0171r15](https://mentor.ieee.org/802.11/dcn/24/11-24-0171-15-00bn-tgbn-motions-list-part-1.pptx).)
  + **Motion 32 (PHY)**

Move to add to the TGbn SFD the following:

* + - ELR PPDU starts with a legacy preamble in the PPDU for the ELR transmission
      * The legacy preamble contains the L-STF, L-LTF, L-SIG, RL-SIG, and U-SIG

*Reference documents:[*[*24/1184r1*](https://mentor.ieee.org/802.11/dcn/24/11-24-1184-01-00bn-considerations-on-elr-transmission.pptx)*]. SP result: No objection.*

Move: Dongguk Lim Second: Ross J. Yu

* + - Discussion: None.

**Result: Approved with unanimous consent.**

* + **Motion 33 (PHY)**

Move to add to the TGbn SFD the following:

* + - In the U-SIG field of a UHR ELR PPDU, the PHY Version Identifier is set to 1. And the PPDU Type And Compression Mode is used to indicate ELR PPDU.

*Reference documents:[*[*24/1410r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-1410-00-00bn-legacy-preamble-for-elr-ppdu.pptx)*]. SP result: no objection.*

Move: Ross J. Yu Second: Dongguk Lim

* + - Discussion: None.

**Result: Approved with unanimous consent.**

* + **Motion 34 (PHY)**

Move to add to the TGbn SFD the following:

* + - Introduce new MCSs which are applicable to single spatial stream transmissions, as well as to equal modulation and unequal modulation cases in multiple spatial stream transmissions.

*Reference documents:[*[*24/1186r1*](https://mentor.ieee.org/802.11/dcn/24/11-24-1186-01-00bn-new-mcss-for-11bn-follow-up.pptx)*]. SP result: No objection.*

Move: Shenquan Huo Second: Stephen McCain

* + - Discussion:

C: It mentions about a new MCS, but the following part doesn’t describe what kind of MCS is. What is the intention of such a new MCS?

A: We have set free for MCS. The motion 42 gives the four new MCSs for the detailed modulation and coding rate combination.

**Result: Approved with unanimous consent.**

* + **Motion 35 (PHY)**

Move to add to the TGbn SFD the following:

* + - Define a mode with additional pilots, located within the data portion of the PPDU, which are used for interference estimation & mitigation
      * Note: zero-energy pilots alternative to be considered as well

*Reference documents:[*[*24/1264r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-1264-00-00bn-supporting-rx-interference-mitigation-in-tgbn.pptx)*]. SP result: 60Y, 17N, 34A*

Move: Shimi Shilo Second: Genadiy Tsodik

* + - Discussion:

C: I would like to request to count the vote because there is some controversial.

C: This is within the data portion. The real intention for this motion is within the data field, not in the preamble. But I have one interpretation as this tone has to be a part of the data tones. But that is not the intention. I just want to clarify and make sure everybody is on the same intention.

A: The whole meaning is that the pilots will be located after preamble. And I would like to request the recorded vote.

C: This SP just said interference estimation and mitigation, the added pilots could also be helpful for estimating residual CFO.

**Result: 148Y, 39N, 81A. Preliminary Passed.**

* + **Motion 36 (PHY)**

Move to add to the TGbn SFD the following:

* + - ELR-SIG is located right after ELR-LTF in ELR PPDU
      * Note that ELR-LTF is the short name of UHR-LTF for ELR PPDU

*Reference documents:[*[*24/1478r2*](https://mentor.ieee.org/802.11/dcn/24/11-24-1478-02-00bn-elr-ppdu-design.pptx)*]. SP result: 64Y, 3N, 15A.*

Move: Lin Yang Second: Rethna Pulikkoonatu

* + - Discussion: None.

**Result: Approved with unanimous consent.**

* + **Motion 37 (PHY)**

Move to add to the TGbn SFD the following:

* + - UL MU-MIMO is not applicable to DRU

*Reference documents:[*[*24/1510r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-1510-00-00bn-open-issues-on-dru.pptx)*]. SP result: No objection.*

Move: Lin Yang Second: Bin Tian

* + - Discussion: None.

**Result: Approved with unanimous consent.**

* + **Motion 38(PHY)**

Move to add to the TGbn SFD the following:

* + - DRU only supports up to 2ss

*Reference documents:[*[*24/1510r1*](https://mentor.ieee.org/802.11/dcn/24/11-24-1510-01-00bn-open-issues-on-dru.pptx)*]. SP result: No objection.*

Move: Lin Yang Second: Bin Tian

* + - Discussion: None.

**Result: Approved with unanimous consent.**

* + **Motion 39 (PHY)**

Move to add to the TGbn SFD the following:

* + - For 4 SS, the UEQM patterns only include:
      * 1st ss, 2nd ss, 3rd ss, 4th ss,
      * [M, M, M, M-1]
      * [M,M,M,M-2]
      * [M,M,M-1,M-2]
      * [M,M-1,M-1,M-2]

Note: M is the constellation index; M-1 refers to the constellation that is one order lower than M; M-2 refers to the constellation that is two orders lower than M.

*Reference documents:[*[*24/1409r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-1409-00-00bn-unequal-pattern-discussion-follow-up.pptx)*]. SP result: No objection.*

Move: Ross J. Yu Second: Rui Cao

* + - Discussion: No.

(The counting vote was requested.)

**~~Result: 175Y, 8N, 69A. Preliminary passed.~~**

**Result: 175Y, 8N, 69A. Passed.**

Note: The final result is the same as the preliminary result.

* + **Motion 40 (PHY)**

Move to add to the TGbn SFD the following:

* + - For a (non-ELR) UHR MU PPDU, there exists a 1-bit EQM/UEQM indication in a User field for non-MU-MIMO in the UHR-SIG field.

*Reference documents:[*[*24/1411r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-1411-00-00bn-signaling-for-uhr-ppdu.pptx)*]. SP result: 88Y, 6N, 12A.*

Move: Ross J. Yu Second: Shengquan Hu

* + - Discussion:

C: These design choices do foreclose certain options for more efficient or compact encoding. If we do want to use these bits most efficiently, I am not sure that is the right approach.

A: There is only a single bit indication We can further repurpose some of the other bits to reuse the same user field for equal modulation and unequal modulation.

C: We don’t have the equal number of EQM and UEQM MCSs. If we assign a whole bit to distinguish it, there is actually less than one bit, which leads to a suboptimal encoding.

A: It starts one bit, and there is usable to repurpose other bits. So, I do not think it makes some problems.

C: I do want to flag if there are opportunities here. We may want to revisit these motions, which I think we always can do with 75% of majority if there was the future direction of the group.

C: I agree with the request of the previous commenter. In the one hand, we wanted to save one bit. On the other hand, we don’t matter that much. I think type are on the proposals on the table. I think it is better to defer it, so give people some chance to harmonize. I understand the people put a lot of thinking into this one, but I do think that opportunity for future harmonization.

A: The method of merging some equal modulation and unequal modulation indication into the table means several other bits. Because the bits cannot be repurposed. I think the proposal fits well within the user field. You can refer to the details of my proposal.

**~~Result: 176Y, 37N, A53. Preliminary Passed.~~**

**Result: 159Y, 34N, A50. Passed.**

* + **Motion 41 (PHY)**

Move to add to the TGbn SFD the following:

* + - For a (non-ELR) UHR MU PPDU, when EQM/UEQM indicates UEQM in a User field for non-MU-MIMO, there exists a MCS field, a NSS field and a 2 bit field indicating UEQM patterns.

*Reference documents:[*[*24/1411r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-1411-01-00bn-signaling-for-uhr-ppdu.pptx)*]. SP result: 64Y, 10N, 12A.*

Move: Ross J. Yu Second: Hongyuan Zhang

* + - Discussion:

C: I have some concerns with the specific proposal. If we split it like this, I am afraid that there might be certain combinations of bits that are simply unused, which it would essentially be wasted. We have general agreements about that kind of MCSs. So, I would ask the attendees on PHY session whether we could defer this motion and consider other alternatives as well.

C: This put us in a straight jacket, which will make us very inefficient and make the coding of the SIG field harder to address.

A: For the equal modulation case, we have 22 bits in 11be. But we are able to put all the required information within the same 22 bits. However, if the overhead of the unequal modulation is not bigger than the equal modulation case, I don’t agree a further overhead. Also, the logic is very simple. We both have a MCS field and SS field. For unequal modulation, we have some further fields indicating the unequal modulation patterns. For the first two fields, they share the same logic. They are independent. I think this design should be OK and I still want to run this motion.

**~~Result: 151Y, 57N, 56A. Preliminary failed.~~**

**Result: 137Y, 54N, 52A. Failed.**

* + **Motion 42 (PHY)**

Move to add to the TGbn SFD the following:

* + - Add the following modulation and code rate combinations as the new MCSs for 11bn:
      * Modulations of {QPSK, 16QAM, 256QAM} with code rate R=2/3
      * Modulation of 16QAM with code rate R=5/6

*Reference documents:[*[*24/1186r1*](https://mentor.ieee.org/802.11/dcn/24/11-24-1186-01-00bn-new-mcss-for-11bn-follow-up.pptx)*]. SP result: No objection.*

Move: Shengquan Hu Second: Jianhan Liu

* + - Discussion: None.

**Result: Approved with unanimous consent.**

* + **Motion 43 (PHY)**

Move to add to the TGbn SFD the following:

* + - UEQM patterns for Nss=3 are limited to three:
      * [M, M, M-1]
      * [M, M, M-2]
      * [M, M-1, M-2]

Note: M is the constellation index; M-1 refers to the constellation that is one order lower than M; M-2 refers to the constellation that is two orders lower than M.

*Reference documents:[*[*24/498*](https://mentor.ieee.org/802.11/dcn/24/11-24-0498-02-00bn-unequal-modulation-in-mimo-txbf-and-new-mcs-for-11bn.pptx)*]. SP result: 77Y, 3N, 14A.*

Move: Alice Chen Second: Sameer Vermani

* + - Discussion: None.

**Result: Approved with unanimous consent.**

* + **Motion 44 (MAC)**

Move to add to the TGbn SFD the following:

* + - Define a request frame sent by a non-AP MLD in state 4 to initiate the roaming procedure
    - The roaming procedure performs context transfer to the target AP MLD and perform the necessary changes of the DS mapping from the current AP MLD to the target AP MLD
    - Define a response frame sent to the non-AP MLD to indicate readiness for the non-AP MLD to send class 3 frames to the target AP MLD
    - TBD on data transmission from non-AP MLD to current AP MLD during the request/response frame exchange
    - NOTE – What context is transferred is TBD.
    - NOTE – TBD on which request/response frame to use

*Reference documents:[*[*23/1884*](https://mentor.ieee.org/802.11/dcn/23/11-23-1884-02-00bn-seamless-roaming.pptx)*,* [*23/1971*](https://mentor.ieee.org/802.11/dcn/23/11-23-1971-02-00bn-further-thoughts-on-seamless-roaming.pptx)*,* [*23/1996*](https://mentor.ieee.org/802.11/dcn/23/11-23-1996-00-00bn-improve-roaming-between-mlds.pptx)*,* [*24/0052*](https://mentor.ieee.org/802.11/dcn/24/11-24-0052-00-00bn-seamless-roaming-details.pptx)*,* [*24/0083*](https://mentor.ieee.org/802.11/dcn/24/11-24-0083-01-00bn-smooth-roaming-follow-up-2.pptx)*,* [*24/0101*](https://mentor.ieee.org/802.11/dcn/24/11-24-0101-03-00bn-mld-roaming.pptx)*,* [*24/0396*](https://mentor.ieee.org/802.11/dcn/24/11-24-0396-02-00bn-seamless-roaming-within-a-mobility-domain-follow-up.pptx)*,* [*24/0412*](https://mentor.ieee.org/802.11/dcn/24/11-24-0412-01-00bn-seamless-roaming-procedure-follow-up.pptx)*,* [*24/0679*](https://mentor.ieee.org/802.11/dcn/24/11-24-0679-04-00bn-thoughts-on-functionality-and-security-architecture-for-uhr-seamless-roaming.pptx)*,* [*24/0830*](https://mentor.ieee.org/802.11/dcn/24/11-24-0830-01-00bn-improve-roaming-between-mlds-follow-up.pptx)*]. SP result: 77Y, 19N, 42A.*

Move: Po-kai Huang Second: Giovanni Chisi

* + - Discussion

Request to change the note text as well as Motion 39

**Result: Approved with unanimous consent.**

* + **Motion 45 (MAC)**

Move to add to the TGbn SFD the following:

* + - An UHR STA that uses the power save mode to transition from lower capability (LC) mode to higher capability (HC) mode, advertises the amount of padding it needs in a received initial control frame
      * Padding values range between 0 and a maximum value that is TBD with a TBD resolution .

Move: Sharief Helwa Second: Abhishek Patil

*Reference documents:[*[*23/1873*](https://mentor.ieee.org/802.11/dcn/23/11-23-1873-01-00bn-post-fcs-mac-padding.pptx)*,* [*23/1875*](https://mentor.ieee.org/802.11/dcn/23/11-23-1875-01-00bn-power-save-proposal-for-non-ap-mobile-ap.pptx)*,* [*24/450*](https://mentor.ieee.org/802.11/dcn/24/11-24-0450-03-00bn-a-proposal-for-uhr-soft-ap-power-save.pptx)*,* [*24/451*](https://mentor.ieee.org/802.11/dcn/24/11-24-0451-00-00bn-ap-state-transitions-in-dps-mode.pptx)*,* [*24/503*](https://mentor.ieee.org/802.11/dcn/24/11-24-0503-01-00bn-power-save-follow-up.pptx)*,* [*24/544*](https://mentor.ieee.org/802.11/dcn/24/11-24-0544-01-00bn-power-save-protocols-for-uhr-follow-up.pptx)*,* [*24/671*](https://mentor.ieee.org/802.11/dcn/24/11-24-0671-00-00bn-enhancements-on-ap-power-save.pptx)*,* [*24/1129,*](https://mentor.ieee.org/802.11/dcn/24/11-24-1129-01-00bn-discussion-on-intermediate-fcs-signaling.pptx)[*24/1227*](https://mentor.ieee.org/802.11/dcn/24/11-24-1227-01-00bn-some-usage-of-intermediate-fcs.pptx)*,* [*24/1261*](https://mentor.ieee.org/802.11/dcn/24/11-24-1261-00-00bn-considerations-on-client-power-save-for-11bn.pptx)*]. SP result: 130Y, 35N, 26A.*

* + - Discussion:

**Result: Approved with unanimous consent.**

* + **Motion 46 (MAC)**

Move to add to the TGbn SFD the following:

* + - TGbn shall define a Coordinated TDMA (C-TDMA) procedure for an AP to share its time resources of an obtained TXOP with a set of APs.
      * Set of APs is TBD.
      * The set can consist of one AP.

*Reference documents:[*[*23/0041*](https://mentor.ieee.org/802.11/dcn/23/11-23-0041-00-0uhr-considerations-on-coordinated-tdma.pptx)*,* [*23/249*](https://mentor.ieee.org/802.11/dcn/23/11-23-0249-01-0uhr-extended-txop-sharing.pptx)*,* [*23/0261*](https://mentor.ieee.org/802.11/dcn/23/11-23-0261-00-0uhr-tdma-for-wifi-8.pptx)*,* [*23/739*](https://mentor.ieee.org/802.11/dcn/23/11-23-0739-01-0uhr-follow-up-on-coordinated-tdma-c-tdma.pptx)*,* [*23/1085*](https://mentor.ieee.org/802.11/dcn/23/11-23-1085-00-0uhr-thoughts-on-coordinated-tdma.pptx)*,* [*23/1692*](https://mentor.ieee.org/802.11/dcn/23/11-23-1692-00-000m-minutes-for-revme-2023-sept-interim-buckhead.docx)*,* [*23/1895*](https://mentor.ieee.org/802.11/dcn/23/11-23-1895-02-00bn-c-tdma-frame-sequence.pptx)*,* [*23/1910*](https://mentor.ieee.org/802.11/dcn/23/11-23-1910-01-00bn-coordinated-tdma-follow-up.pptx)*,* [*23/1912*](https://mentor.ieee.org/802.11/dcn/23/11-23-1912-01-00bn-coordinated-tdma-procedure.pptx)*,* [*24/93*](https://mentor.ieee.org/802.11/dcn/24/11-24-0093-03-00bn-nav-setting-for-coordinated-tdma.pptx)*,* [*24/227*](https://mentor.ieee.org/802.11/dcn/24/11-24-0227-01-00bn-txop-protection-in-c-tdma.pptx)*,* [*24/382*](https://mentor.ieee.org/802.11/dcn/24/11-24-0382-00-00bn-further-considerations-on-coordinated-tdma.pptx)*,* [*24/411*](https://mentor.ieee.org/802.11/dcn/24/11-24-0411-00-00bn-txop-return-in-c-tdma.pptx)*,* [*24/423*](https://mentor.ieee.org/802.11/dcn/24/11-24-0423-00-00bn-nav-rules-in-c-tdma.pptx)*,* [*24/462*](https://mentor.ieee.org/802.11/dcn/24/11-24-0462-01-00bn-mapc-sps.pptx)*,* [*24/842*](https://mentor.ieee.org/802.11/dcn/24/11-24-0842-00-00bn-multi-ap-set-configuration-for-c-tdma.pptx)*,* [*24/843*](https://mentor.ieee.org/802.11/dcn/24/11-24-0843-00-00bn-some-details-on-txop-sharing-in-c-tdma.pptx)*,* [*24/866*](https://mentor.ieee.org/802.11/dcn/24/11-24-0866-01-00bn-preemption-for-c-tdma.pptx)*,* [*24/887*](https://mentor.ieee.org/802.11/dcn/24/11-24-0887-00-00bn-consideration-on-relay-operation-for-11bn.pptx)*,* [*24/941*](https://mentor.ieee.org/802.11/dcn/24/11-24-0941-00-00bn-txop-sharing-group-shared-ap-selection.pptx)*,* [*24/1016*](https://mentor.ieee.org/802.11/dcn/24/11-24-1016-02-00bn-c-tdma-follow-up-additional-details-on-framing-sequence.pptx)*,* [*24/1017*](https://mentor.ieee.org/802.11/dcn/24/11-24-1017-00-00bn-mechanism-for-txop-return-in-c-tdma.pptx)*,* [*24/1225*](https://mentor.ieee.org/802.11/dcn/24/11-24-1225-00-00bn-initial-control-frames-in-c-tdma.pptx)*,* [*24/1250*](https://mentor.ieee.org/802.11/dcn/24/11-24-1250-00-00bn-discussion-on-txop-allocation-in-c-tdma.pptx) *]. SP result: No objection.*

Move: Abhishek Patil Second: Binita Gupta

* + - Discussion: None.

**Result: Approved with unanimous consent.**

* + **Motion 47 (MAC)**

Move to add to the TGbn SFD the following:

* + - If an initial control frame includes an intermediate FCS for UHR STA(s) that precedes padding and the FCS field, the intermediate FCS has the size of 32 bits.

*Reference documents: [*[*24/1129*](https://mentor.ieee.org/802.11/dcn/24/11-24-1129-01-00bn-discussion-on-intermediate-fcs-signaling.pptx)*,* [*23/1873*](https://mentor.ieee.org/802.11/dcn/23/11-23-1873-01-00bn-post-fcs-mac-padding.pptx)*,* [*24/485*](https://mentor.ieee.org/802.11/dcn/24/11-24-0485-01-00bn-low-power-listening-mode-for-clients.pptx)*,* [*24/497*](https://mentor.ieee.org/802.11/dcn/24/11-24-0497-00-00bn-security-enhancement-control-frame-protection-follow-up.pptx)*,* [*24/544*](https://mentor.ieee.org/802.11/dcn/24/11-24-0544-01-00bn-power-save-protocols-for-uhr-follow-up.pptx)*,* [*24/1227*](https://mentor.ieee.org/802.11/dcn/24/11-24-1227-01-00bn-some-usage-of-intermediate-fcs.pptx)*,* [*24/1246*](https://mentor.ieee.org/802.11/dcn/24/11-24-1246-00-00bn-low-power-listening-mode-for-clients-follow-up.pptx)*,* [*24/1256*](https://mentor.ieee.org/802.11/dcn/24/11-24-1256-00-00bn-the-padding-after-intermediate-fcs.pptx)*]. SP result: No objection.*

Move: SunHee Bark Second: Insun Jang

* + - Discussion: None.

**Result: Approved with unanimous consent.**

* + **Motion 48 (MAC)**

Move to add to the TGbn SFD the following:

* + - Define mechanisms that enable APs to coordinate their rTWT schedule(s) and/or to ensure that one AP provides the protection of the rTWT schedule(s) of the other AP.
    - NOTE – TBD mechanisms including negotiation between 2 APs and advertisement.

*Reference documents:[*[*22/1530*](https://mentor.ieee.org/802.11/dcn/22/11-22-1530-01-0uhr-multi-ap-coordination-for-next-generation-wi-fi.pptx)*,* [*23/0250*](https://mentor.ieee.org/802.11/dcn/23/11-23-0250-00-0uhr-ap-coordination-with-r-twt.pptx)*,* [*23/860*](https://mentor.ieee.org/802.11/dcn/23/11-23-0860-00-0uhr-further-thoughts-on-coordinated-twt.pptx)*,* [*23/1871*](https://mentor.ieee.org/802.11/dcn/23/11-23-1871-05-00bn-m-ap-coordinated-transmission-framework.pptx)*,* [*23/1887*](https://mentor.ieee.org/802.11/dcn/23/11-23-1887-01-00bn-coordinated-medium-access-for-multi-ap-deployments.pptx)*,* [*23/1916*](https://mentor.ieee.org/802.11/dcn/23/11-23-1916-01-00bn-r-twt-coordination-in-multi-bss.pptx)*,* [*23/1932*](https://mentor.ieee.org/802.11/dcn/23/11-23-1932-03-00bn-further-considerations-on-coordinated-twt.pptx)*,* [*23/1952*](https://mentor.ieee.org/802.11/dcn/23/11-23-1952-03-00bn-coordinated-r-twt-for-multi-ap-scenarios-follow-up.pptx)*,* [*23/1962*](https://mentor.ieee.org/802.11/dcn/23/11-23-1962-01-00bn-gain-analysis-for-coordinated-ap-transmissions.pptx)*,* [*23/2212*](https://mentor.ieee.org/802.11/dcn/23/11-23-2212-01-00bn-r-twt-protection-in-11bn.pptx)*,* [*23/2022*](https://mentor.ieee.org/802.11/dcn/23/11-23-2022-01-00bn-r-twt-for-multi-ap-follow-up.pptx)*,* [*23/2084*](https://mentor.ieee.org/802.11/dcn/23/11-23-2084-01-00bn-enhanced-r-twt-for-uhr.pptx)*,* [*24/0160*](https://mentor.ieee.org/802.11/dcn/24/11-24-0160-01-00bn-r-twt-coordination-negotiation-in-multi-bss.pptx)*,* [*24/0161*](https://mentor.ieee.org/802.11/dcn/24/11-24-0161-01-00bn-r-twt-announcement-in-multi-bss.pptx)*,* [*24/0388*](https://mentor.ieee.org/802.11/dcn/24/11-24-0388-00-00bn-impact-of-network-topology-on-coordinated-r-twt.pptx)*,* [*24/0407*](https://mentor.ieee.org/802.11/dcn/24/11-24-0407-00-00bn-r-twt-multi-ap-coordination-follow-up.pptx)*,* [*24/0678*](https://mentor.ieee.org/802.11/dcn/24/11-24-0678-02-00bn-coordinated-r-twt-follow-up.pptx)*,* [*24/827*](https://mentor.ieee.org/802.11/dcn/24/11-24-0827-00-00bn-obss-interference-impact-on-cr-twt-and-enhanced-channel-access-rules.pptx)*]. SP result: 134Y, 19N, 26A.*

Move: Giovanni Chisci Second: Liuming Lu

* + - Discussion: None.

**Result: Approved with unanimous consent.**

* + **Motion 49 (MAC)**

Move to add to the TGbn SFD the following:

* + - Define a new mechanism and/or enhance existing mechanism for AP power save

*Reference documents:[*[*11-23/10*](https://mentor.ieee.org/802.11/dcn/23/11-23-0010-00-0uhr-considerations-for-enabling-ap-power-save.pptx)*,* [*11-23/2002*](https://mentor.ieee.org/802.11/dcn/23/11-23-2002-02-00bn-in-device-coexistence-and-interference-follow-up.pptx)*,* [*11-23/2040*](https://mentor.ieee.org/802.11/dcn/23/11-23-2040-01-00bn-enabling-ap-power-save-follow-up.pptx)*,* [*11-24/659*](https://mentor.ieee.org/802.11/dcn/24/11-24-0659-01-00bn-thoughts-on-ap-power-save.pptx)*,* [*11-24/450*](https://mentor.ieee.org/802.11/dcn/24/11-24-0450-03-00bn-a-proposal-for-uhr-soft-ap-power-save.pptx)*,* [*24/544*](https://mentor.ieee.org/802.11/dcn/24/11-24-0544-01-00bn-power-save-protocols-for-uhr-follow-up.pptx)*,* [*24/671*](https://mentor.ieee.org/802.11/dcn/24/11-24-0671-00-00bn-enhancements-on-ap-power-save.pptx)*,* [*24/451*](https://mentor.ieee.org/802.11/dcn/24/11-24-0451-00-00bn-ap-state-transitions-in-dps-mode.pptx)*]. SP result: 133Y, 8N, 26A.*

Move: Laurent Cariou Second: Binita Gupta

* + - Discussion: None.

**Result: Approved with unanimous consent.**

* + **Motion 50 (Joint)**

Move to add to the TGbn SFD the following:

* + - 11bn defines a common framework of a M-AP Coordination for various coordination schemes.
      * Note - Coordination schemes such as (but not limited to): Co-SR (TXOP-based with power control), Co-BF, TBD Co-TDMA , TBD C-RTWT, etc.

*Reference documents:[*[*22/1530r1*](https://mentor.ieee.org/802.11/dcn/22/11-22-1530-01-0uhr-multi-ap-coordination-for-next-generation-wi-fi.pptx)*,* [*23/293r0*](https://mentor.ieee.org/802.11/dcn/23/11-23-0293-00-0uhr-follow-up-on-twt-based-multi-ap-coordination.pptx)*,* [*23/1871r5*](https://mentor.ieee.org/802.11/dcn/23/11-23-1871-05-00bn-m-ap-coordinated-transmission-framework.pptx)*,* [*23/1932r3*](https://mentor.ieee.org/802.11/dcn/23/11-23-1932-03-00bn-further-considerations-on-coordinated-twt.pptx)*,* [*23/2022r1*](https://mentor.ieee.org/802.11/dcn/23/11-23-2022-01-00bn-r-twt-for-multi-ap-follow-up.pptx)*,* [*24/0072r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-0072-00-00bn-map-channel-access-procedure.pptx)*,* [*24/453r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-0453-00-00bn-multi-ap-coordination-and-roaming.pptx)*,* [*24/511r1*](https://mentor.ieee.org/802.11/dcn/24/11-24-0511-01-00bn-requirements-and-functionalities-for-multi-ap-framework.pptx)*,* [*24/512r0,*](https://mentor.ieee.org/802.11/dcn/24/11-24-0512-00-00bn-considerations-for-coordinated-tdma.pptx)[*24/719r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-0719-00-00bn-map-set-operation.pptx)*,* [*24/842r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-0842-00-00bn-multi-ap-set-configuration-for-c-tdma.pptx)*,* [*24/1217r2*](https://mentor.ieee.org/802.11/dcn/24/11-24-1217-02-00bn-multi-ap-coordination-setup-scheme.pptx)*,* [*24/1220r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-1220-00-00bn-a-framework-for-coordinated-access-points.pptx)*]. SP result: 170Y, 30N, 42A.*

Move: Arik Klein Second: Genadiy Tsodik

* + - Discussion: None.

**Result: Approved with unanimous consent.**

* + **Motion 51 (Joint)**

Move to add to the TGbn SFD the following:

* + - 11bn defines a common framework of a M-AP Coordination that can enable the following procedures:
      * M-AP Coordination Discovery procedure
      * M-AP Coordination agreement negotiation procedure
    - Note: Details of the procedures and whether the above procedures are mandatory/optional - TBD

*Reference documents:[*[*22/1530r1*](https://mentor.ieee.org/802.11/dcn/22/11-22-1530-01-0uhr-multi-ap-coordination-for-next-generation-wi-fi.pptx)*,* [*23/293r0*](https://mentor.ieee.org/802.11/dcn/23/11-23-0293-00-0uhr-follow-up-on-twt-based-multi-ap-coordination.pptx)*,* [*23/1871r5*](https://mentor.ieee.org/802.11/dcn/23/11-23-1871-05-00bn-m-ap-coordinated-transmission-framework.pptx)*,* [*23/1932r3*](https://mentor.ieee.org/802.11/dcn/23/11-23-1932-03-00bn-further-considerations-on-coordinated-twt.pptx)*,* [*23/2022r1*](https://mentor.ieee.org/802.11/dcn/23/11-23-2022-01-00bn-r-twt-for-multi-ap-follow-up.pptx)*,* [*24/0072r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-0072-00-00bn-map-channel-access-procedure.pptx)*,* [*24/453r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-0453-00-00bn-multi-ap-coordination-and-roaming.pptx)*,* [*24/511r1*](https://mentor.ieee.org/802.11/dcn/24/11-24-0511-01-00bn-requirements-and-functionalities-for-multi-ap-framework.pptx)*,* [*24/512r0,*](https://mentor.ieee.org/802.11/dcn/24/11-24-0512-00-00bn-considerations-for-coordinated-tdma.pptx)[*24/719r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-0719-00-00bn-map-set-operation.pptx)*,* [*24/842r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-0842-00-00bn-multi-ap-set-configuration-for-c-tdma.pptx)*,* [*24/1217r2*](https://mentor.ieee.org/802.11/dcn/24/11-24-1217-02-00bn-multi-ap-coordination-setup-scheme.pptx)*,* [*24/1220r0*](https://mentor.ieee.org/802.11/dcn/24/11-24-1220-00-00bn-a-framework-for-coordinated-access-points.pptx)*]. SP result: 199Y, 8N, 46A.*

Move: Arik Klein Second: Shimi Shilo

* + - Discussion: No.

**Result: Approved with unanimous consent.**

* + **Motion 52 (PHY)**

Move to add to the TGbn SFD the following:

* + - UEQM patterns for Nss=2 are limited to two as:
      * [M, M-1]
      * [M, M-2]

Note: M is the constellation index; M-1 refers to the constellation that is one order lower than M; M-2 refers to the constellation that is two orders lower than M.

*Reference documents:[*[*24/474r3*](https://mentor.ieee.org/802.11/dcn/24/11-24-0474-03-00bn-uhr-unequal-modulation-pattern-and-new-mcs.pptx)*]. SP result: No objection.*

Move: Rui Cao Second: Wookbong Lee

* + - Discussion: None.

**Result: Approved with unanimous consent.**

* + **Motion 53 (PHY)**

Move to add to the TGbn SFD the following:

* + - UHR defines unequal modulation only for LDPC

*Reference documents:[*[*24/474r3*](https://mentor.ieee.org/802.11/dcn/24/11-24-0474-03-00bn-uhr-unequal-modulation-pattern-and-new-mcs.pptx)*]. SP result: No objection.*

Move: Rai Cao Second: Hongyuan Zhang

* + - Discussion: None.

**Result: Approved with unanimous consent.**

* Teleconference Plan
  + **Usual.**

(After the TGbn meeting had been adjourned, the teleconference plan was announced as described in [11-24/1364r14](https://mentor.ieee.org/802.11/dcn/24/11-24-1364-14-00bn-tgbn-sept-2024-meeting-agenda.pptx).)

* Goals for November 2024
  + Discuss technical submissions
  + Continue populating the TGbn SFD
* Any Other Business: None.
* Adjourned at 15:29.