IEEE P802.11
Wireless LANs

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| TGbn November 2023 Meeting Minutes |
| Date: 2023-11-16 |
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|  |  |  |  |  |

Abstract

This document contains the minutes for the November 2023 IEEE 802.11 TGbn sessions.

Revision history:

* Rev0: First version of the document.
* Rev1: Added minutes for the 4th and 5th sessions.
* Rev2: Applied editorial corrections

Abbreviations:

* C: Comment.
* A: Answer.

# Monday, PM2 (16:00-18:00 HST)

* The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order.
* Ross Jian Yu (Huawei) is serving as the Pro-Tem 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:
	+ Ross Jian Yu (ross.yujian@huawei.com) & Alfred Asterjadhi (aasterja@qti.qualcomm.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); 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 speaks/writes up**.

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		- 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 Patent And Procedures
* Agenda
	+ The chair reviewed the agenda in [11/23-1713r4](https://mentor.ieee.org/802.11/dcn/23/11-23-1713-04-00bn-tgbn-nov-2023-meeting-agenda.pptx)
	+ Discussions:
		- None
	+ Agenda approved with unanimous consent
* Summary from September 2023 meeting
* SG motions
	+ Approve SG minutes from March meeting.

**Move to approve UHR SG minutes from Sept. meeting:**

[**https://mentor.ieee.org/802.11/dcn/23/11-23-1449-01-0uhr-uhr-sg-september-2023-meeting-minutes.docx**](https://mentor.ieee.org/802.11/dcn/23/11-23-1449-01-0uhr-uhr-sg-september-2023-meeting-minutes.docx)

Move: Ross Jian Yu Second: Yusuke Asai

Discussion: None

Result: Approved with unanimous consent

* Call for TG officers
* TG Timeline/TG Documents
* [11-23/1931r1](https://mentor.ieee.org/802.11/dcn/23/11-23-1931-01-00bn-tgbn-proposed-timeline.pptx) TGbn proposed Timeline Laurent Cariou (Intel)

C: Slide 9, the whole timeline is four years. We only have two years to develop feature, and another two years for maintainence. I think two years are not enough. I propose to have another one year. We have more time for discussion and everyone has time to think how to develop 11bn.

A: The timeline of four years is from industry requirement. The industry expects 11bn spec to be here. That’s the problem we have for each generation, we have designed too many features. We usually do more than we need to do. We focus on the key aspect.

C: During our investigation, the Wi-Fi industry is not hurrying to have 11bn in 2028, one more year, it is still OK.

C: What kind of contents are you expecting for D0.1? We expect to have a good quality of D0.1.

A: Try to deliver the draft in time for the industry. It is hard to predict the percentage. We were successful in 11be. The SFD time is slightly a bit more aggressive. We make a lot of work already in the SG. I believe the first motion of agreement is Nov. Five or six months after its start. I expect it will be earlier in 11bn.

C: The duration is shorter between D0.1 to D1.0, compared with 11be. What is the reason?

A: The driver is to deliver D1.0 in May 2025. We do get approach to give it a little bit more time.

C: The timeline can be fine. I want to make sure we have enough time for features. In 11be, 16SS, HARQ, Multi-AP features are dropped out.

A: Make sure we identify important features.

C: By comparing scope of 11be and 11bn, 11bn is more ambitious, 11be only defines two targets, only Tput and worst case lantency and jitter, in 11bn, we have diverse goals, Tput, latency, BSS transition packet loss, we have also defined AP power consumption, by considering a lot of features, would this time be much longer than 11be.

A: Trying to propose something significant for the industry world. Focusing on keeping those features simple. Back to 11be, we have multi-link, at the beginning, we don’t know how big the work will be.

C: I think people only pass the motion on KPIs, not the feature. The work loads depend on how many features we have.

A: The timeline is driven by the industry.

C: It is always easy to delay. It is good to start with a more aggressive timeline.

C: I am in favor of the timeline. The first thing is scope, I don’t think 11bn scope is wider than 11be. We have gone through the cycles of 11ax and 11be. We learn we need to be more focused. Meaningful to the industry and we get it done. The second, people get more efficient. 11be discussion, we spent many times on preambles. We build forward compatilibty preamble. In MAC, we have very good discussion of MLO. We have very good foundation. The third, the UHR SG, we have many contributions already going into technical details. Once the gate is open, we expect people will bring contributions, and converage quickly.

C: The duration between D3.0 LB and Initial Sponsor ballot is proposed for 4 months, where in TGbe it took 12 months (and only D5.0 is ready for SA ballot). Seems not realistic duration in TGbn...

A: We implemented the shift in 11be. Will adjust if needed.

Will continue discussion in Thur AM2.

* [11-23/1987r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1987-00-00bn-802-11bn-selection-procedure.doc) 802-11bn-selection-procedure Alfred Asterjadhi (Qualcomm)

C: No voting on FRD in this figure.

A: We have motion for the FRD for over 75%. Will amend and 75% entry here.

C: This SFD and draft, freeze the SFD when we have draft or there will be a duration of parallel.

A: After D0.1, need to bring new spec text.

* [11/23-2030r0](https://mentor.ieee.org/802.11/dcn/23/11-23-2030-00-00bn-proposed-802-11bn-functional-requirements.doc) Proposed 802.11bn Functional Requirements Ming Gan (Huawei)

C: Mention very specific target, it needs a baseline. The current baseline is not clear.

A: The baseline is EHT PHY and MAC. This is aligned with PAR and SFD.

C: My question is what is your next plan, we add more requirements in each of the subclause?

A: We have new parallel requirements of the 3 requirements. TGbe Rn is the notation.

C: There is no requirement that n should be in increasing order.

C: What is the purpose of this document? A mapping between PAR and this document.

A: This is a procedure document. We could add something more than the PAR document.

C: The functional requirement document which meets Rx, you meet FRD.

C: I don’t see p2p power saving.

A: It is more a scenario.

C: We can double check.

* Presentation of submissions
* [11/23-1835r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1835-00-00bn-ap-power-management.pptx) AP Power Management Yongsen Ma (Samsung)

No Q&A

* [11-23/1838r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1838-00-00bn-follow-up-on-the-relay-transmission.pptx) Follow up on the Relay Transmission Dongguk Lim (LGE)

C: Regarding the first case, in this case how does STA discover the AP?

A: All the operation is controlled by the AP.

C: Only one relay or more than one relays?

A: We can consider if there are many relays, the AP can know all the relay information. Can select some relay STA. That can be further studied.

C: For case 2, how is it difference from 11ah?

A: I don’t know exactly. It is determined by how we design the relay. AP has relay capability. Otherwise, we define a new relay STA. We need more discussion.

C: In 11ah, there is already relay defined.

A: I think we need more discussion.

C: Slide 7, the relay STA doesn’t perform encryption and decryption. In 11be, there is only one case for the data frame exchange when we consider cross-link data transmission. There is no AAD change. Cannot figure out how to do this in your method.

A: Regarding data encryption, relay STA just forwards the data. We assume encryption is not performed at relay STA. We need further discussion for the detail.

C: In the relay operation, the MAC header will not change?

A: We need further discussion.

C: In your case, who does the beaconing, how does the BSS maintain?

A: In previous presentation, some of the STA has poor SNR. We can perform the relay operation.

C: The STA should be within the range of AP? What is the point of having relay?

A: If the STA is in the out of the coverage. We need further discussion.

C: What is the architecture of your relay? In 11ah, they have the relay STA and relay AP built in one device.

A: 11ah has a relay, the object of relay is different. I think in 11bn, we target improvement of QoS. We have to think more other features besides the ones in 11ah for QoS improvement.

C: Just to confirm, an AP with relay function?

A: In option 2, two cases, the AP has relay capability, or new AP has relay function.

C: STA definition, AP definition and non-AP definition. Your intention is AP with relay function. What is your use case?

A: I don’t know the exact scenario. In my previous contribution, I also consider multi-AP case.

C: For the 2nd case, when relay has AP function. Is it transparent?

A: It is the design choice. We need more discussion when it has an AP function.

C: You provide two cases, which one do you prefer?

A: My document is targeting the non-AP STA case.

* [11-23/1839r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1839-00-00bn-evaluation-for-the-relay-transmission.pptx) Evaluation for the Relay Transmission Dongguk Lim (LGE)

Q&A will be delayed to next session.

* Recess at 18:00

# Wednesday, AM1 (8:00-10:00 HST)

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* Agenda
	+ The chair reviewed the agenda in [11/23-1713r7](https://mentor.ieee.org/802.11/dcn/23/11-23-1713-07-00bn-tgbn-nov-2023-meeting-agenda.pptx)
	+ Discussions:
		- None
	+ Agenda approved with unanimous consent
* Presentation of submissions
* [11-23/1839r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1839-00-00bn-evaluation-for-the-relay-transmission.pptx) Evaluation for the Relay Transmission Q&A Dongguk Lim (LGE)

C: In slide 6, the relay performs data transmission, however the end STA is out of the TXOP range of source AP. Should relay STA play backoff?

A: The end STA is located at the boundary, poor SNR. By using the relay STA, we can improve the edge SNR and enable high MCS.

C: Slide 6, the 2nd BA, the AP doesn’t need to know. Maybe a BA is not a right thing to do, maybe some other control frame.

A: Many methods can be considered on how to share and set the TXOP.

C: Do you agree the AP doesn’t need to know the contents of the 2nd BA.

A: I assume the transmission is controlled by the AP. For simplicity, the AP just decides the retransmission, needs the BA.

C: We have mesh AP configuration, what is the difference from mesh system?

A: The mesh AP can decide the parameter for the 2nd transmission if the relay has the AP function. If it has no AP function, different from mesh-AP function. For that, we need further question.

C: You have simulated one non-AP STA, have you considered multiple non-AP STAs?

A: We also think about that. It is not considered in this document.

* [11-23/1888r1](https://mentor.ieee.org/802.11/dcn/23/11-23-1888-01-00bn-mac-header-protection-follow-up.pptx) MAC Header Protection - follow-up Abhishek Patil (Qualcomm)

C: There will be format change. And if we are going to do this protection, we can also consider encryption.

A: There will be format change. This is UHR, individually addressed frame, we can change the information. This should not be a concern. The other part is about encryption, slide 4, whenever there is retransmission, the frame will change, you need to reencrypt the frame.

C: I am not talking misoperation of MAC header. When you do a MIC, you need a new PN. There is no difference.

A: Encyrption at the Rx side is very intensive. A MIC is far simpler and achieve the same goal.

C: Similar AES operation. Format change, that is the major thing you need to do anyway.

C: You have additional protection, you need MIC, where is MIC?

A: The format of MAC frame needs to be changed. The format can be changed for individual addressed UHR MAC frame. I have another proposal.

C: Regarding retransmission, I am not sure we have enough time for reencyrption within SIFS.

A: I am not proposing reencryption. Our proposal is to do individual protection.

C: When MPDU fails, retry bit may change, then do we need to protect that frame again?

A: Generating a MIC is far simpler than encryption.

C: You mention PN space could be the same.

A: Everytime you retransmit, the PN space is the same. The PN number is different.

C: It could be different, right?

A: Yes.

C: In slide 6, you only mention individual addressed frame, how about broadcast frame?

A: For group addressed, you need similar IGTK’. That can be also used for control frame.

C: That’s super important for us. It is opportunity for privacy. I encourage more study.

C: This mechanism complicates the replay check. Now you have two PN space, when you encounter retry. Per TA, per TID. How to do this new parallel PN check. Or you simply use the old one? The old one could be confusing. You have PN, PN’ disagree with PN you do with the payload.

A: The existing replay check for data payload doesn’t change. The two processes are independent. For the MAC header protection, separate protection, you have different PN space. We can discuss more. There is no interacion between the two.

C: In slide 3, replay detection can be more complicated. Even you use dual PN, the Rx has to figure out the packet using new PN or not. Here, when transmitting multiple packets, the different PN can be used.

A: We can go into detail when I present another contribution. On the Rx, you perform your header check.

C: In slide 2, with 11bi, this problem may be less critical.

A: There are other fields, like A-control which needs protection.

C: Are you intending for the integrity the MAC header or encrypt the MAC header? How does the Rx identify that this frame is for me. DL is a not a problem.

A: I am not proposing encryption, just integrity based, MIC. At the Rx, you compare the MIC. If it doesn’t match, you could discard the packet.

* [11-23/1908r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1908-00-00bn-seamless-roaming-procedure.pptx) Seamless Roaming Procedure Yelin Yoon (LGE)

C: To preserve the context, to enable data continuity. Not doing reassociation. Need a transfer of context.

A: Agree.

C: In terms of the need to avoid out-of-order delivery, for management plan, can connect multiple APs. Before the data plan is switched over. In general, I like your SP.

C: In slide 3, what is the relationship between AP MLD for a seamless roaming and a normal AP MLD?

A: This goes back to the contribution I presented in the last meeting. It has an upper MAC, in charge of roaming, for a non-AP MLD to roam from one AP MLD to another AP MLD. Control the function of transfer the context. The AP MLDs in green are all affiliated with the same AP MLD for a seamless roaming.

C: Overall, it is a good generation. It should be as seamless as possible. Could you share somethoughts for the TID negotiation?

A: We are considering the situation, for some link, one link is only serving one TID, if that is deleted, that TID cannot be served. After roaming, all the link should have all the TIDs. That’s why the old TID mapping should be reset.

C: We can have further discussion offline. Should not affect the TID-to-link mapping.

C: Why do you consider delete link and add link. Why not for the 2nd option, link swith?

A: This is not deleting all links. We are having links connected to UFT MLD.

C: It doesn’t support data continuity.

C: If the non-AP MLD deletes one link from the left side, and add one link on the right side. This is non-AP MLD making the decision. The non-AP MLD will receive frames from both sides.

A: I have one example scenario in the appendix. Once the new link is added, the data is going to transmit by the added link, before that, it is going to be transmitted by the previous link. The UFT MLD will be in charge of that.

C: There is some performance drop. You just use one link to transmit data frame.

C: How does the non-AP MLD ask for the recommended link?

A: When the non-AP MLD try to roam, the AP MLD can also transmit in advance.

C: The non-AP MLD is out of range of the UFT AP MLD, how does the non-AP MLD ask?

A: There is going to be some UFT AP MLD in the range.

C: I want to express support of this proposal, which is similar to mine. I also use the same top MLD, with different name.

C: In slide 7, you mention non-AP MLD or target AP MLD sends this reconfiguration request, who sends this request?

A: It depends on which is triggering the roaming. We have two options.

C: The roaming scheme needs cooperation between AP MLDs.

A: UFT AP MLD, needs to share the information.

C: Three AP MLD in this case?

A: Yes.

C: Non-AP MLD wants to also to do a selection. This is very good.

Chair: Please send a request of SPs and will form a queue.

* [11-23/1910r1](https://mentor.ieee.org/802.11/dcn/23/11-23-1910-0%60-00bn-coordinated-tdma-follow-up.pptx) Coordinated TDMA (Follow up) GeonHwan Kim (LGE)

C: Slide 7, I agree with you other solutions are problematic. Unfairness to legacy STAs. This one is more promising. For the first CTS frame and NAV set, is NAV 0?

A: Yes

C: The NAV setting from the shared AP could be optional. The TXOP is very tight for voice category. For the last frame, TXOP return. If shared AP only uses for 1ms. The shared AP wants to return the TXOP. It could cause issues to legacy STA and Wi-Fi 8 APs. The legacy STAs may go to sleep, also for STAs which intend to do second channel access. Try to cut the overhead as much as possible.

C: In slide 5, when the sharing AP is transmitting, do you assume all the non-AP STAs can hear? Will there be hidden non-AP STA from BSS2 to AP1? How do you handle those.

A: In that case, we can use MU-RTS and CTS frame.

C: Nominal TXOP only applies to UHR AP or can also to non-AP STA? The nominal TXOP duration in the frame body?

A: Could be similar as MU-RTS frame.

C: What is the motivation to have this nominal TXOP duration. Any additional gain to have this concept?

A: The second bullet (in slide 6) is the motivation.

C: Is this nominal TXOP duration only for UHR STA?

A: Yes.

C: How about legacy STA? May still get access to the channel.

A: The basic TXOP duration is set.

C: Slide 5, hidden node exists, you mention there is no issue? Probably the non-AP STA will transmit data. Spatial reuse may be a better scenario. Regarding CTS frame, what is the RA? Set to AP1.

A: CTS frame, duration is set to 0.

* [11-23/1911r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1911-00-00bn-secondary-channel-access-and-frame-transmission.pptx) Secondary Channel Access and Frame TX Dongju Cha (LGE)

C: Recommend European harmonized standard. The idea of simultanoues backoff channel, has been intensively discussed in European harmonized standard for 5 GHz. Will not be covered by these standards. With multiple backoff channel, you need to wait all of them to expire. You can switch the channel, according to their requirement, that cannot be happen more than once every second or multiple seconds. I strongly recommend to have a look. Thanks.

A: Will take a look.

C: Alignment of AP and STA using each secondary channel, if one but not the other one on secondary channel, this ambiguity becomes very crticial for channel access. Different level of observation from AP and non-AP side.

C: I agree with the previous commenters. You mention different switching time, the switching time of different non-AP STAs are not synchronized. Need to further analyze the starting time of channel switch.

C: Allocate 5 minutes in next session.

* Recess at 10:00

# Wednesday, AM2 (10:30-12:30 HST)

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	+ Discussions:
		- None
	+ Agenda approved with unanimous consent
* Final call for TGbn offcers
	+ The call for TGbn officers is closed.
* Presentation of submissions
* [11-23/1911r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1911-00-00bn-secondary-channel-access-and-frame-transmission.pptx) Secondary Channel Access and Frame TX Q&A Dongju Cha (LGE)

C: In general, I agree. Have you considered complexity what would be needed between concurrent vs parallel?

A: Concurrent would be more complicated.

C: The number of secondary channels need to be at least 1. How many do you consider?

A: It depends on how we design. We said we can start with a simple case, a single backoff channel. We can have more discussion.

C: Are you considering to run any simulations?

A: Not really.

* [11-23/1914r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1914-00-00bn-enhanced-security-considerations-in-uhr.pptx) Enhanced Security Considerations in UHR SunHee Baek (LGE)

C: In general, I agree with you. I support trigger frame protection and MAC header protection. You list different options.

C: You define the format of control frame integration. This can also be applied to AP and AP, or only AP to STA.

A: Coordiation between APs, it is possible.

C: If we can define a unified format, it will be more flexible.

C: Slide 8, can you elaborate extended AAD?

A: AAD adds HT control.

C: How about retransmission? HT control fields may be different, like BSR. All of these could possibly change.

A: I understand the retransmission issue. We can discuss more about it.

C: You mention you want to protect trigger frame, other frames?

A: BA can also be protected.

C: BA has variant BA types.

A: M-BA can be protected.

C: Maybe we can find simplied method that can cover as much frame exchange as possible.

* [11-23/1929r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1929-00-00bn-peer-to-peer-p2p-resource-management.pptx) Peer-to-peer (P2P) Resource Management Rubayet Shafin (Samsung)

C: Slide 5, how does STA change and become a group owner?

A: I mean it is already a group owner. You can communicate with the AP.

C: The AP shares the TXOP to the owner STA1, STA1 shares the TXOP to STA2, …, 5.

A: That’s already possible.

C: What is the issue you are trying to solve?

A: We want to reduce the hops. For example, the group owner should not need to broadcast to anyone.

C: The group owner needs to have knowledge of what traffic.

C: If you say there is group assignment. You need to have a coordinator. Is what already allowed in spec.

A: The details are missing. There can be contention between a specific set of users. The AP can allocate schedule.

C: The AP allocates time to STA1 and STA2. What does AP control here?

A: AP knows the resource need of the five STAs for P2P. The AP allocates trigger frame and allocate resources for groups of STAs. The resources would be within the group.

C: Slide 7, I have some headache here. It seems like STA2 and STA3 are coordinating with STA1. I am kind of questioning, spatial reuse. I don’t think the AP could coordinate something two hops away. It is like multi-AP. One level coordination feels better than what I see here. I just see a lot of complexity here.

A: We can definitely message here.

C: Why does AP have to coordinate the P2P transmission? How can AP handle the scheduling?

A: Motivation wise, AP is coordinating for P2P communications in order to for fast channel access for P2P. Do you see any issue with that? Half and half for P2P operation for base channel and off channel.

C: AP is aware of the resource requirement. Does AP need to know all the information. It may be not scalable.

C: Do you have some data you can share regarding half and half for base channel and off channel?

A: This is rough estimate from our implementation team. It depends on implementation as well.

C: When the AP assigns the TXOP to the P2P group. Is it contention based?

A: Open issue. Can be more coordinated or limited contention.

C: Does AP do schedule for P2P group owner?

A: Yes, AP will provide some resrouces for P2P group.

C: Motivation of introducing the concept, why do you want AP to manage the P2P?

A: I’d like to clarify one more time, this is not AP managing P2P, that is a lot of dangerous things. P2P is still under client control. Just trying to get some resources from AP. Nothing is imposed. Everything is ad-hoc. Why needs to bother AP? It is difficult to get channel access in time for latency sensitive/critical applications.

C: Whether the enhancement for TDLS is in the scope?

A: Yes. Also want to provide some feature for protocol independent.

C: The TDLS is not implemented in the current product. I am wondering whether it is meaningful to cover TDLS.

A: TDLS is implemented.

C: I am not convinced the motivation. What do you mean by group assignment? How much information does the AP need to know to do group assignment? STA 1 can do whatever it wants.

A: Group assignment, the group is already there.

C: Allocation for the group. What is the different from the current TXS?

A: One STA can get resources, and the other STAs are aware of that.

* [11-23/1942r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1942-00-00bn-inter-ppdu-low-power-listening-scheme.pptx) Inter-PPDU Low Power Listening Scheme Yunsi Ma (HiSlicon)

C: Slide 6, how STA2 (target) can send ACK to AP if STA2 can only receive the PHY header?

A: The STA2 may demodulate the whole PPDU1 and send ACK.

C: Slide 4, we can change the PHY parameters, could you give some examples?

A: NSS, MCS, and bandwidth.

C: Slide 6, how does AP distinguish BA from STA1 and ACK from STA2?

A: AP can allocate small RU for target STA. The target STA can respond ACK by the allocated RU, as an example.

C: This scheme only works if there are more than one STAs within the TXOP?

A: The notification carries the data for any STA. Can avoid sends the control frame to the target STA. It also works for the case where there is only one target STA. For case 2, AP can transmit short packet to target STA. STA2 can begin to change the PHY parameters. Don’t need additional control frame.

C: PPDU 1 will be transmitted in low data rate. Will probably consume the whole TXOP.

A: In practical, AP can carry the indication using the data PPDU of other STAs.

C: Did you consider retransmission for the PPDU1? Same PPDU transmits to STA1. The transmission could consume the TXOP. STA2 has already opened its hi-capability Rx.

A: If PPDU1 is retransmitted, STA2 will start changing hi-capability Rx after sending ACK.

C: It is good to continue to work on LPL mode. I do have some suggestions. Slide 3, generally before we dive into the protocol, we do need some analysis on the numbers. I suggest you have a table of switching and the time required for switching. The number I can only agree is order of ns for RF chain turn on or off. I am not saying this is not correct. Why bandwidth switching needs several ms? There are some people need to debate on.

C: What kind of information does PHY header need to carry?

C: We can further talk offline.

* [11-23/1953r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1953-00-00bn-two-dimensional-resource-allocation.pptx) Two Dimensional Resource Allocation Srinivas Kandala (Samsung)

C: In slide 10, you will destroy the AGC of long RUs.

A: That can be a problem. We are studying the problem.

C: If AP is aware, AP can just have multiple short PPDUs.

C: The preemption could come from anywhere. I am not sure it solves enough of the problem.

A: We do have proposal for DL. Shorter PPDU is always the best way to go. A balance, we evaluate it again.

C: Could have Collision. What if the traffic needs more than K OFDM symbols?

A: There is collision. Could intercept the next one. The AP could allocate more resources like this. The non-AP provide feedback to AP that it needs resources.

C: Does orange RA-RU STA participate in preamble transmission?

A: Only STF and LTF.

C: How do the nearby STAs detect there is a transmission?

A: A third STA could collide. That can happen, we are working on some solutions.

C: Can some STA in RA-RU 1.1?

A: Yes.

C: If there are several STAs waiting in the orange part, are you expecting each STA can detect other STAs’ transmission.

A: The collison can help. We need solution.

C: What type of traffic that the scheme could benefit?

A: AR/VR. Or some sort of control frames. Could be anything.

C: How often does AP need to allocate these RA-RU. If there isn’t anything, it could be a waste of resources.

A: The AP doesn’t have to do it everytime.

C: AP side, it also needs to detect packet. The main radio cannot only do packet detection and decoding.

A: I will get my PHY colleague and get back to you.

C: For power control, you need to align with existing OFDMA.

A: I agree with that.

* [11-23/1954r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1954-00-00bn-two-dimensional-a-ppdu.pptx) Two Dimensional A-PPDU Srini Kandala (Samsung)

Will continue in next slot.

* Recess at 12:30

# Thursday, AM2 (10:30-12:30 HST)

* The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order.
* Ross Jian Yu (Huawei) is serving as the Pro-Tem 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:
	+ Ross Jian Yu (ross.yujian@huawei.com) & Alfred Asterjadhi (aasterja@qti.qualcomm.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); 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 speaks/writes 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 Patent And Procedures
* Agenda
	+ The chair reviewed the agenda in [11/23-1713r10](https://mentor.ieee.org/802.11/dcn/23/11-23-1713-08-00bn-tgbn-nov-2023-meeting-agenda.pptx)
	+ Discussions:
		- None
	+ Agenda approved with unanimous consent
* Review of TG formation
	+ The chair reviewed the proposed TG structure as described in the Slice 44 of 11/23-1713r10.
	+ The chair appointed Yusuke Asai (NTT) as the TGbn Secretary.
	+ The chair appointed Ross Jian Yu (Huawei) as the TGbn Editor.
	+ **Motion: to confirm TGbn Secretary**
		- Move to confirm Yusuke Asai as TGbn Secretary.
		- Move: Tomoko Adachi Second: Jay Yang
		- No discussion.
		- **Result: Approved by acclamation.**
	+ **Motion: to confirm TGbn Technical Editor**
		- Move to confirm Ross Jian Yu as TGbn Technical Editor.
		- Move: Stephen McCann Second: Bo Sun
		- No Discussion.
		- **Result: Approved by acclamation.**
* Vice-chair election process
	+ The Chair explain the options election processes according to the Slide 47 of 11/23-1713r10.
	+ **Straw Poll: How many Vice Chairs do you prefer for TGbn? (Vote either of them)**
		- Option 1: One
		- Option 2: Two
		- Option 3: Three
		- Discussion:

C: Vice chairs should help the chair such as Web page update, maintain DB, closing report if Alfred is busy.

C: Vice chairs should help chair and manege in the team.

C: How many vice chairs will be elected?

A: Baseically two but open for discussion. We will take a straw poll.

C: Is it SP?

A: Yes.

C: Prefer option 3 in the Slide 48 (three Vice Chars).

C: More than two is preferred.

C: Two is preferred.

C: Support option 3.

C: Support Ootion 3 (thrre vice chairs) because the TGbn is a major TG.

C: Option 3 is preferred because the chair has many works and need support of the vice chairs.

* + - **Result: 4/92/171 = Option 1 / Option 2 / Option 3** (including verbal votes due to unavailability of the network connection.)
	+ The Chair decided TGbn will have three vice chairs.
	+ The candidates of five vice chairs (Jianhan Liu (Mediatek), Laurent Cariou (Intel), Kiseon Ryu (NXP), Rubayet Shafin (Samsung) and Matthew Fisher (Broadcom)) made a short speech for introduction of themselves.
	+ Election was conducted (choose 3 of 5 candidates, multiple chices via Webex poll)
	+ C: Confirmation of the number of votes
	+ A: Three.
	+ **The Vice Chair vote was conducted.**
		- **The candidates are Jianhan Liu, Laurent Cariou, Kiseon Ryu, Rubayet Shafin and Matthew Fischer**
		- **Select three candidates.**
		- No Discussion
		- **Result: 167/187/167/101/154 = Jianhan Liu / Laurent Cariou / Kiseon Ryu / Robayet Shafin / Matthew Fisher** (including the votes via chat window text)
	+ **Motion: to confirm TGbn 1st Vice Chair**
		- **Move to confirm Laurent Cariou as TGbn 1st Vice Chair**
		- **Move: Robert Stacey Second: Sean Coffey**
		- No Discussion.
		- **Result: Apprived by acclamation.**
	+ **Motion: to confirm TGbn 2nd Vice Chair**
		- **Move to confirm Jianhan Liu as TGbn 2nd Vice Chair**
		- **Move: Ross Jian Yu Second: Bo Sun**
		- No Discussion.
		- **Result: Apprived by acclamation.**
	+ **Motion: to confirm TGbn 3rd Vice Chair**
		- **Move to confirm Kiseon Ryu as TGbn 3rd Vice Chair**
		- **Move: Sai Nanda Second: Xiaofei Wang**
		- **No Discussion.**
		- **Result: Apprived by acclamation.**
* Ad-hoc group formation
	+ **Straw Poll 1:** How many ad-hoc groups do you prefer?
		- Options: Two Ad-hoc groups / Three ad-hoc groups / None / Abstain (multiple choices were possible.)
		- Discussion:

The chair call for opinions regarding the number of the ad-hoc groups in TGbn. TGbe has two ad-hocs, MAC and PHY.

C: Two is preferred and expected to work well. There is huge cost of having multiple sessions.

C: Three ad-hoc co-chair is preferrable. PHY, MAC and probably another one such as multi-AP.

C: The number of ad-hoc grops is preferred to be small.

C: Historically, TGac and TGax have four ad-hocs and three ad-hoc chairs per ad-hoc. MAC has a lot of work. I suggeste PHY, MAC, and another ad-hoc are needed. Three ad-hoc chairs per ad-hoc are reasolable for spilt work.

C: In TGbe, converged to two ad-hoc (PHY and MAC) and it is preferred to TGbn.

C: Two ad-hoc is preferred because of the nature of PHY and MAC. Two parallel work is possible. Also, three ad-hoc chairs are acceptable.

C: Three ad-hoc chairs are preferrable. Chairng and recording work are needed.

* + - **Result: 187/37/4/13 = Two / Three / None / Abstain**
	+ **Straw Poll 2:** How many ad-hoc chair(s) do you prefer per ad-hoc group?
		- Options: One ad-hoc chair, two ad-hoc chairs, three ad-hoc chairs, abstain (select one)
		- Discussion:

C: Will the election of the ad-hoc group chairs be taken place on this session?

A: No. It will be conducted on the next January session.

C: Two is severe obviously for ad-hoc group operation.

* + - **Result: 36/105/97/50 = One/Two/Three/Abstain**

C: It is a just majority. Another round poll is needed.

C: MAC ad-hoc is quite busy. Two MAC ad-hoc chairs are heavy. Proposal is that PHY is two and MAC is three.

C: Especially MAC co-chairs in TGbe have huge burden. Support three.

* + Chair asked another round of SP for whether two or three ad-hoc co-chairs. SP2 was regarded as “pseudo-draw.”
	+ **Straw poll 3:** How many ad-hoc chars (two or three)
		- Options: Two ad-hoc chairs, three ad-hoc chairs, abstain (select one)
		- **Result: 89/132/14 = Two/Three/Abstain**
	+ **Motion: Formation of Ad-hoc groups**
		- **Move to create 2 ad-hoc groups for TGbn**
			* **One Ad-hoc group for PHY**
			* **One Ad-hoc group for MAC**

**NOTE-Each ad-hoc group has 3 ad-hoc chairs**

* + - **Move: Tuncer Baykas Second: Bo Sun**
		- **Result: Apprived with unanimous consent.**
	+ Chair has called for nomination of ad-hoc chairs.
* Timeline discussion:
	+ 11-23/1931r1: TGbn proposed Timeline Laurent Cariou (Intel)

C: Pointed out the UHR PAR approval timing is incorrect. Not Mar 23 but May 23.

C: “Initial Sponsor Ballot” should be “Initial SA ballot.”

C: Confirming the PAR approval timing.

C: The PAR is approved on physical plenary meeting. Mar or July is correct.

A: July is correct.

C: EC does not have a right to approved PAR.

C: SP pool timing should be revised.

C: SA ballot pool is formed again?

A: No.

* + **Motion: Timiline Motion**
		- **Move to adopt the following timeline for TGbn**
			* **PAR approved July 2023**
			* **First TG meeting Nov 2023**
			* **D0.1 Jan 2025**
			* **D1.0 Letter Ballot May 2025**
			* **D2.0 LB May 2026**
			* **D3.0 LB Jan 2027**
			* **Initial SA ballot (D4.0) May 2027**
			* **Final 802.11 WG approval Mar 2028**
			* **802 EC approval Mar 2028**
			* **RevCom and SASB approval May 2028**
		- **Move: Laurent Cariou Second: Bin Tian**
		- **No duscission**
		- **Result: Apprived with unanimous consent.**
* Selection procedure discussion:
	+ **Motion: Selection Procedure Motion**
		- **Move to adopt 11-23/1987r0 as the selection procedure document for TGbn**
		- **Move: Bin Tian Second: Ming Gan**
		- **Duscission**

C: Is this a live document. Is it possible to update?

A: Yes, if it is needed and allowed.

* + - **Result: Apprived with unanimous consent.**
* Functional Requirements discussion:
	+ 11-23/2030r1: Proposed 802.11bn Functional Requirements Ming Gan (Huawei)
	+ **Motion: Functional Requirements Motion**
		- **Move to accept 11-23/2030r1 as the functional requirements document for TGbn**
		- **Move: Srinivas Kandala Second: Rubayet Shafin**
		- **Duscission**

C: Will the document be changed very much?

A: SFD has changed but FR is not changed in TGbe.

* + - **Result: Apprived with unanimous consent.**
* Presentation of submissions

o 11-23/1954r0: Two Dimensional A-PPDU Q&A Srini Kandala (Samsung)

(Srini restarted the presentation from the last TGbn session.)

C: In side14, essentially, what you are creating is a new capability to insert traffic in a PPDU. It makes easier to have a longer PPDU and you don’t have to wait long. And the uplink proposal has the similar characteristic. Let’s say we have six three nine millisecond interval and empty second and settlments. It doesn’t solve the problem. In that sense, if the critical traffic happens from the uplink phase, you might have to wait.

A: I agree. Some situations never use the other solution, but I’m thinking that there will be other submission where people are acceptable.

C: In Slide 15, I understand the meaning of the word assigned in time domain. Does that mean switch over is known up-front?

A: Frequency domain assign is done. The designation step calls the list. Signaling is needed.

C: Confirms preamble arrival timing at any within PPDU? We hadn’t decided on the SIG. What are the things that we need to do?

A: In the PPDU header we find any time during the transition.

C: In Slide.8, latency sensitive PPDU is inserted. How do you schedule the calls? Does inserting latency sensitive PPDU make release intra-PPDU power saving state?

A: Do you mean that how the data insertion will be the problem?

C: I will discuss in more detail.

C: In Slide 14, I don’t see the need of A-PPDU aggregation bandwidth up to 320 MHz aggretion because we already made.

A: I think we need to start aggregation frequency discussion. I think that we still need that.

C: It is very difficult for aggregation in frequency domain because in HE PPDU does not have SIG-B. It’s gonna be practically very difficult and besides age is already two generations ago. I think we should just focus on the single thing.

C: I have similar comment to Brian. How many blocks do you assume? The receiver has to search MU reception potentially sent to itself. How does the receiver search for the PPDU that is potentially sent to it?

A: If the steup has some issues, we need to resolve.

C: This scheme is important and need one of possible solution for low latency traffic. Complexity should be considered.

C: Is it possible to combine your proposed 2D A-PPDU with the single dimension of OFDMA? Should we mandate A-PPDU?

A: It was certainly assumed that we have. If we can handle, I think it is acceptable.

C: Usually, we know that the duration of the PPDU is short, less than 1 ms but the duration of an 2D A-PPDU is several ms.

A: If 1ms or less packet, the proposed technique may not be needed. In microsecond order, it is needed.

C: Are you considering only A-PPDU preemtion?

A: We have not been looking into alternative mechanisms. But we are working on it.

o [11-23/1969r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1839-00-00bn-evaluation-for-the-relay-transmission.pptx) Consideration on UHR Relay Architecture Kosuke Aio (Sony)

C: In Slide 10, much gain is delivered. More practical implementation such as latency sensitive traffic and not-well designed MCS selection. How about that? If an old AP exists, how will the performance be?

A: STA can use MCS under the condition of PER < 0.1. Optimization of Link Adaptation will help, I think. Legacy APs are not considered.

C: In Slide 8, are you saying that just for the relayed traffic or you want to bypass all of this?

A: This contribution is just focused on buffering and relay and encryption/decryption are future study item. Some additional frame exchange will be needed. Need of offline discussion.

C: Slide 8 has good direction. Skipping encryption/decryption is more efficient. When backhaul/fronthaul is considered, the complex is reduced.

A: Agree that.

C: In the last bullet of Slide 11, I guess that’s one way of approach it and make it a single MLD. Another way is perhaps to have two STAs to not go over to accept the decryption.

A: Thank you for your comment.

* Recess at 12:30

# Thursday, PM2 (16:00-18:00 HST)

* The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order.
* Yusuke Asai (NTT) is 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:
	+ Yusuke Asai (yusuke.asai@ntt.com) & Alfred Asterjadhi (aasterja@qti.qualcomm.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); 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 speaks/writes up**.

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		- 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 Patent And Procedures
* Agenda
	+ The chair reviewed the agenda in [11/23-1713r12](https://mentor.ieee.org/802.11/dcn/23/11-23-1713-05-00bn-tgbn-nov-2023-meeting-agenda.pptx)
	+ Discussions:
		- Submission of 1832, 1834 were added
		- 1969 and 2009 were carried from UHR SG, Others are submitted to TGbn.
	+ Agenda approved with unanimous consent
* Presentation of submissions
* [11-23/1969r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1839-00-00bn-evaluation-for-the-relay-transmission.pptx) Consideration on UHR Relay Architecturee Kosuke Aio (Sony)

Quick recap and then receive Q+A.

Call for additional questions/comments but there is none from the floor.

* [11-23/2009r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1839-00-00bn-evaluation-for-the-relay-transmission.pptx): Multi-AP for reliability with Coherent and Non-coherent transmissions Yanchun Li (Huawei Technologies)

C: How is CFO difference compensated? Is CFO considerd in Slide 11?

A: APs are synchronized via wire prior to transmission and residual CFO is adjusted by STAs on OTA basis.

C: Is it implemented in this result?

A: Not considered.

C: Very interesting topic. In Slide 9, non coherent joint sounding does not need trigger-sounding, but CSI sharing is needed? There is power level difference.

A: It depends on STA Rx algorithm and capability. If iterative interference cancellation, CSI sharing can be ignored.

C: Coherent/Non-coherent same procedure, but is there more procedure for noherent?

A: Coherent transmission requires higher resolution. Constant phase sync is needed.

C: In Slide 6, do you assume more than one antenna at STA side?

A: Yes. To receive two SS, two antennas are needed.

C: In Slide 11, could you please clarify the relation of backhaul and fronthaul.

A: Fronthaul is used for data transmission from a primary AP to secondary APs. Backhaul is used for data transmission to Primary AP.

C: I totally agree with the effectiveness of non-coherent joint transmission. Multiplexing mode needs new function to split bit streams at primary AP to secondary APs. Is my understanding correct? Why is data splitting optional (not mandatory)?

A: Because it depends on how APs are distributed.

C: In Slide 6, multiplexing is done by spatial streams. Is this physical layer, different PPDU or same PPDU? It is different concept from existing spatial stream definition?

A: Reusing existing standard is important.

C: The gain depends on the capability of APs/STAs.

A: Totally agree. It depends on scenario, channel model, antenna, and so on.

C: If two AP is different from each other, these use different channel with each other. In some scenarios, using different channels with each other may be a better option.

A: In using different channel, channel bandwidth becomes half.

* [11-23/1756r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1839-00-00bn-evaluation-for-the-relay-transmission.pptx) MIMO Dynamic Polarization Multiplexing and Beamforming: Proposed IEEE802.11bn PHY Carlos Rios (TWI)

C: Is the rank of 32x32 channel full? 2x32 is inserted easy in Rx side but predetermines channel matrix is used?

A: Polarization works any streams. Reciprocically equalization. MATLAB calculation is running.

* [11-23/1832r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1839-00-00bn-evaluation-for-the-relay-transmission.pptx) Multi-AP Coordinated Spatial Reuse Hassan Omar (Huawei)

The presentation is skipped due to the abesnse of the presentor.

* Teleconference schedule
* All are for joint calls.
* The proposed time slot was as follows:
	+ Mon 19:00-21:00 ET: November 27th to December 18th (4 calls)
	+ Thu 10:00-12:00 ET: Novmeber 30th to December 14th (3 calls)
* Goals for January 2024 session
* Ad-hoc chairs election
* Discuss technical submissions
* TGbn adjouned at 18:00