IEEE P802.11  
Wireless LANs

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| TGbn November December 2023 teleconference minutes | | | | |
| Date: 2023-12-18 | | | | |
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Abstract

This document contains the minutes for TGbn November December 2023 teleconferences.

Revision history:

* Rev0: initial version.
* Rev1: minutes added for the 2nd, the 3rd, the 4th, the 5th, the 6th and the 7th calls.

Abbreviations:

* A: Answer
* C: Comment

# 1st Conf. Call: November 27th Monday (19:00–21:00 ET)

* The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order.
* 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 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
* 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 “802.11 Telecons (<Month>)” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “<UHR SG > conference call that you are attending.
  + If you are unable to record your attendance, contact Alfred Asterjadhi ([aasterja@qti.qualcomm.com](mailto:aasterja@qti.qualcomm.com)) and Yusuke Asai ([yusuke.asai@ntt.com](mailto:yusuke.asai@ntt.com)) for assistance.
  + Please ensure that the following information is listed correctly when joining the call:
    - "[voter status] First Name Last Name (Affiliation)"
* Agenda
  + Chair reviews proposed agenda found in [11-23-2140r](https://mentor.ieee.org/802.11/dcn/23/11-23-1311-00-0uhr-uhr-sg-july-august-2023-teleconference-agendas.docx)1
  + Discussion:
    - C: Jiaoung could not present the submission and deferred it.
  + Agenda approved with unanimous consent.
* Submissions
  + [11-23/1832r](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx) Multi-AP Cooridinated Spatial Reuse Hassan Omar (Huawei Technologies)
    - C: In the simulation, received signal power between AP1 and AP2 varies from -80 dBm to -58 dBm. Does the APs detect the received signal by ED threshold or PD threshold? If PD is used, there is the risk that two signals are not aligned. If the energy detection is used and the traffic is not full buffered, an AP never read the preamble of the PPDUs transmitted by other BSSs.
    - A: The simulation is not based on full buffer traffic. The assumption of full buffer traffic is only calculated by maximum throughput that can achieved. But the delay is not based on full buffer. By the time AP2 obtain TXOP and its cue is empty, after that the arrival of the time of packet transmission, AP2 can not transmit a packet. That is an issue where two PPDUs do not start at the same timing, but it was not considered in this simulation.
    - C: In Slide 12, the MCSs both the sharing AP and the shared AP are the same for the AP coordination scheme?
    - A: Yes. All of interference are symmetric.
    - C: How about the power control / reduction?
    - A: Just the same TX power is applied to the sharing and the shared APs. In the case without coordinated SR, MCS 11 is still used. But in the coordinated SR case, MCS is reduced to optimize the increased interference level. Instead of transmit power control, MCS adjustment was applied.
    - C: In Slide 8, you mentioned about the co-trigger frame indicates DL frame transmission start time. Do you assume shared AP transmission is based on synchronized manner?
    - A: I don’t assume the start time is not synchronized, but the issue of transmission is delayed.
    - C: Is there the same issue on the TB PPDU and acknowledment packets?
    - A: The problem with acknowledgement is different. Downlink Tx power is controlled by an AP, but UL is not controlled by STAs. Maybe those ACK frames collide between the AP1 and the AP2. The sharing AP should have an option to determine ACK policy to prevent ACK collision.
    - C: In Slide 13, did you compare the proposed coordinated SR and the current SR in your simulation?
    - A: At this time, that is not included in this presentation. Current simulation is based on the standard channel access without MU spatial reuse.
    - C: The proposed coordinated SR requires extra frame exchange, and it is important to compare them and see the benefit of the coordinated SR.
  + [11-23/1868r1](https://mentor.ieee.org/802.11/dcn/23/11-23-1139-00-0uhr-relay-transmission-in-uhr.pptx) Coordinated Spatial Reuse Design Jason Yuchen Guo (Huawei Technologies)
    - C: In Slide 4, you propose the unified framework for any kind of coordinated SR. Do you consider all of operation is within TXOP level or “beyond TXOP” level?
    - A: The coordinated SR in this submission is considered as TXOP level. And other scheme like coordinated TDMA is also TXOP level.
    - C: Regarding the CSR trigger frame, can we use the padding?
    - A: The current design is to reuse the padding design same as today.
    - C: You mentioned the APID for the AID 12 and the question is whether it is the BSSID or a new ID definition?
    - A: The BSSID is too long and the AID 12 is shortrer. I think it should be to define a new ID.
    - C: AID is not going to be global unique, which is a huge problem. TA plus the APID provides uniqueness.
    - A: APID could work, and this short ID could be assigned by the shared AP. Each sharing AP assigns a short ID to all the potential shared APs, and on the other hands, external setup is needed.
    - C: Please clarify the intention about the SP. It seems to try to exclode the coordinated rTWT. Is that you intention or you’re not trying to be exclusionary?
    - A: It’s not my intention to exclusion. The CSR is TXOP based and if it’s not, it could have another name.
    - C: Earier in your presentation, you talked about minimum TX power. It has a bit confused. Why sould it be defined?
    - A: Minimum power is like a threshold. During the CSR setup, if Tx power is too small, coordination may be calcelled.
    - C: In Slide 5, there are different measurement schemes, including the request/response. Are you envisioning this is a long-term measurement, basically the measurement right before the CSR?
    - A: If we used the request/response, this method is used for scenarios where the station does not move frequently because the request/response may take some time. But if there are some senarios where the condition changes, there may need some other NDP-based schemes.
    - C: What is the thought for the needs of the diferrent measurements?
    - A: It totally depends on the how much scenarios are supported. There are not only static but also dynamic scenarios.
    - C: Basically, you assume that the primary aim is to protect the clients of the sharing AP and basically shared AP’s clients are on best effort basis. Is that the overall kind of assumption that you are making?
    - A: That’s a simpler design. It’s just the sharing AP does not a global calculation for all the STAs just caer about its own STAs.
    - C: In Slide 6, do there several APs form two or more groups?
    - A: The number of groups is not a discussion topic on this presentation and just one group is assumed. But here I just want to say is that a sharing AP initiates CSR transmission with more than two shared APs.
    - C: Does that mean the sharing AP negotiates with every neighbor AP and assign APID to everyone? Is this you intention?
    - A: Yes.
    - C: Regarding the channel information from the other BSSs at the stage not associated with, some protocol modification may be needed. It is with respect to the sounding protocol.
    - A: Existing measuremet, which are not based on NDP transmission, require long time duration. New procedure to know OBBS pathloss may be needed. I am open for proposal to discsuss this.
    - C: I agree with the policy of the redefining the trigger info field. We should consider the case where there are multiple caididate of shared APs.
    - C: In Slide 3, how does a sharing AP know the minimum TX power limitation of shared APs when the negotiation is happening before the coordinated SR trigger frame in the overall procedure?
    - A: A coordinated SR trigger frame indicates the maximum power for the shared AP. Minimum power is a kind of threshold of transmit power to be determimed by the negotiation.
    - C: OK. This is not the trigger frame, but you have a separate setpu procedure of that, is it correct?
    - A: Yes. It is just one setup of procedure (negotiation aggrement.)
    - C: Which step do you agree to negotiate the CSR?
    - A: This is out of setup.
    - C: In Slide 3, why do we need the CSR padding information at the first place?
    - A: In 11ax, the trigger-based UL transmission was defined, and a STA can indicate some padding needed to respond. Also in 11be, EMLSR is defined. There is an initial controlframe that needs to just set up a padding for the STAs having some time to prepare to respond. Similary for the shared AP. I just put a CSR pending delay during the setup.
    - C: Why do we need to delay for preparation?
    - A: There could need some calculation time for the shared AP to determine the transmission parameters for calculation of transmit power at the sharing AP.
    - C: In Slide 5, after the trigger frame is transmitted, PPDU1 is tnansmitted by the shared AP. Do you think it is enough? Would we need something for the response frame as well?
    - A: After the CSR setup, both sharing and shared APs will enter active SR mode and they start sending/receiving data. I think that is the next level discussion.
    - C: You see that scheme to be used in the symmetrical way. What is your opinion that should be dounlink on the case?
    - A: In downlink case, sources of interference are simple. In uplink case, we can also consider that. There need more discussions for unsymmetric cases.
  + [11-23/1975r1:](https://mentor.ieee.org/802.11/dcn/23/11-23-1146-01-0uhr-relaying-for-low-latency-traffic-in-uhr.pptx)  Cooordinated spatial re-use for UHR Rainer Strobel (MaxLinear)
    - C: In Slide 6, please clarify the condition of unassociated STAs.
    - A: The unassociated STAs are assumed to enable the coordinated SR answers to the sounding of the unanassociated APs.
    - C: How do the STAs that do not support current sounding procedure behave?
    - A: It needs more consideration. I didn’t do the detailed study on what changes need to be done. Rx responding has benefit for protection.
    - C: What is TDMA in simulation scenario? Do you mean the standard contention-based channel access or coordinated TDMA?
    - A: It was coordination in the sense that there was no collision.
    - C: How can TDMA perform a better than half-coordinated OBSS? In Slide 3, when you have those additional 3dB of the interference, what is the MCS reduction that you simulated?
    - A: It depends on the individual case but often there is one MCS number reduction and then some performance penalty occurs.
    - C: When TDMA operates better than the half-coordinated OBSS, the primary AP unnecessarily reduces its MCS and the secondary AP cannot exploit that granted TXOP. Is this understanding right?
    - A: Whanever the increased data rate of the secondary transmission is less than the data rate loss of the 3 dB interfrefence, AP increases, coordinate SR outperforms TDMA.
    - C: In Slide 6, how do you determine to transmit both data packets?
    - A: We assumed that the coordinated SR packet starts slightly later because the secondary transmission needs to figure out that the primary transmission is going and it’s now ready to transmit. In addition, some extra time is assumed.
    - C: In your scheme, you don’t need to use any trigger­-based operation, right?
    - A: Yes.
    - C: Considering the case where there are more than two AP, is the conclusion changed?
    - A: I need to check. In general, if APs get more separation, the better throughput is obtained.
    - C: I think separation is very important. One suggestion is that you should look at the other MAP that would combine with your scheme.
    - C: In Slide 10, secondary AP/STA performance degrade. Also in Slide 13, more degradation is found. I would like to know how the scheme can deal with such a degradation case.
    - A: Details are further study. Fairness and optimization are trade-off. We can take account of the penalty in terms of fairness on the optimized solution, but we need further study on that.
    - C: How much overhead for sounding did you assume?
    - A: It was not considered on the result.
    - C: I guess if overhead is considered, the CDF curves moves to left (degraded.)
    - A: I think the only additional part is the coordinated SR feedback packets, which are extremely short because it contains only one value. So, the additional complexity is the sounding sequence itself. Only this feedback is extra overhead.
    - C: In Slide 5, four STAs are assumed. Do you mean the BSS you are seeing and the OBSS do the transmission?
    - A: Yes. Two parallel MU-MIMO transmissions are assumed.
    - C: Did you randomly drop four STA and associated to an AP? Then it depends on the locations whether AP may get one, two or three STAs.
    - A: Yes.
    - C: Is all transmission beamformed or MU-MIMO?
    - A: Yes.
    - C: I think since in this case you have 4x2 MIMO, if all NDP feedback frames are received, better performance can be achieved. I think two single user transmission may be more simple approach in this scenario.
  + [11-23/2012r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1090-00-0uhr-seamless-roaming-follow-up.pptx) Location Dependent Performance of C-SR Jun Minotani (LG Electronics)
    - The presentation was postponed due to lack of remaining time.
* AoB:
  + None.
* Adjourned at 20:51 ET

# 2nd Conf. Call: November 30th Thursday (10:00-12:00)

* The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order.
* IEEE 802 and 802.11 IPR policy and procedure
  + Patent Policy: Ways to inform IEEE:
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**Copyright Policy was presented.**

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  + Participation slide: <https://mentor.ieee.org/802-ec/dcn/16/ec-16-0180-05-00EC-ieee-802-participation-slide.pptx>
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  + Please ensure that the following information is listed correctly when joining the call:
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* Agenda
  + Chair reviews proposed agenda found in [11-23-2140r2](https://mentor.ieee.org/802.11/dcn/23/11-23-1311-00-0uhr-uhr-sg-july-august-2023-teleconference-agendas.docx)
    - Discussion: None.
  + Agenda approved with unanimous consent.
* Announcements:
  + None.
* Technical Submissions: Coodinated Spatial Reuse
  + [11-23/1917r1](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx): Coordinated Spatial Reuse Jinyoung Chun (LGE)
    - C: In slide 7, there is the termination of the shared AP in the number three and then if the determinated ttransmit power is too small, what is happened? The AP 1 cannot support the state it is in the queued. I mean the case where TX power is too small for the shared AP to solve any state.
    - A: The sharing AP already knows the shared AP or channel status. So, the sharing AP doesn’t assign the too small power.
    - C: Hidden node problem is the one problem of a CSR. We need to discuss that.
    - A: OK.
    - C: In slide 8, I don’t see there is any trigger frame. How is the data transmission performed?
    - A: The frame of the number three in slide 7 is the confirmation message and it can be a trigger frame. If the number three frame is a trigger, the data transmission is possible after that.
    - C: But I think the frame number three is for set up. The setup frame is not action frame, usually. And the TXOP is separated. I didn’t include the trigger frame in slide 7. We need more discussion about that topic.
    - A: OK. Thank you.
    - C: In slide 5, what is the reason that we need that interference from the OBSS STA to the BSS STA? My understanding of the term of downlink CSR is both the BSS AP and the OBSS AP form downlink transmission. So why do we need that interference in that case?
    - A: Their transmission is not aligned, for example, the BSS AP transmits downlink while the BSS AP transmits downlink frame to the OBSS station to be obvious the STA can transmit only. At that time, we need that situation.
    - C: OK. So, the term downlink CSR that you mentioned at the second bullet in slide 5, what is the definition of the term?
    - A: Downlink CSR means while the BSS AP transmits downlink frame to two STAs.
    - C: This is only on the AP that obtains the TXOP. Thank you.
    - C: In silde 8, you mentioned the BA frame is TBD. Why this is TBD and also CSR is not allowed how this can be transmitted.
    - A: I’m not sure the downlink can operate the CSR and also the uplink can’t share. If we are not allowed to share uplink frame, then the OBSS STAs can transmit the frame at the number six.
    - C: The BA will be transmiteted within the same TXOP or it needs to transmit another TXOP.
    - A: It’s better to transmit in the same TXOP.
    - C: Do you assume the shared AP will transmit a BAR? How does the STA transmit the CSR is not allowed?
    - A: I think that is difficult point. Because the TXOP holder is sharing AP but the shared AP has to transmit the BAR in this case.
    - C: Need further discussions.
    - A: Thank you.
    - C: In slide 8, for a CSR case, the trigger frame has to be sent at the same time from the sharing AP and the shared APs. How do you think these APs send trigger frameat the same time for the uplink case?
    - A: They can transmit them at the same time and in that case, we are shared at the number seven and number five.
    - C: You mean both APs can transmit the trigger frames with power control?
    - A: I think so.

[11-23/2012r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1139-00-0uhr-relay-transmission-in-uhr.pptx): Location Dependent Performance of C-SR Jun Minotani (Panasonic)

* + - C: In slide 4, you said that the sharing AP determines combination of TX power and TX power level in each AP. Does it mean the sharing AP knows what is the MCS information from each AP to its own serving STAs?
    - A: In this simulation assumption, the destination of shared AP recognizes the path loss information and by using path-loss information from the shared APs.
    - C: I think it is idealistic assumption, not realistic. And the condition that the STA is close to the AP is natural to assume interference from OBSS is very small. That also can be done by 11ax and that most of the gain is from STAs nearby APs,
    - A: Thank you for your comment.
    - C: Quite interesting presentation. In slide 3, you assume AP can talk with STAs and OBSS APs which the AP need to report, is it correct?
    - A: Yes.
    - C: In simulation setup (slide 5), BF is used?
    - A: Yes.
    - C: But only pathloss is informed form OBSS AP/STA.
    - A: Pathloss information including CSI is needed.
    - C: In slide 6, there is pretty much gain is obtained compared with 11ax SR. Is it dut to not only CSR but also BF and power control, I understand.
    - A: Yes.
    - C: How does the sharing AP chooose the sets of MCS and Tx power for the shared APs? Do you use some great maximization utility?
    - A: We choose the best selection.
    - C: What metric do you use for the best selection?
    - A: In our assumption, the throughput of sharing AP is better than a shared AP. But sometimes throughput of a shared AP’s throughput is higher than that of a sharing AP.
    - C: Are you simulating the sum throughput of BSS 1 and BSS 2?
    - A: Yes.
    - C: Could you provide the throughput of each BSS? I am wondering if the sharing AP decreases transmit power of itself, its throughput performance may degrade. If you can provide the results of each BSS’s throughput, it would be helpful.
    - A: Let’s continue offline discussion.
    - C: In slide 5, I think 2 SS per STA is more pupular than single stream in the real-world and recommended the condition. Regaring sum throughput, I have the same comment with the previous commentor. IF AP1 is a TXOP holder, is it possible to allocate more power to AP2 than that of AP1?
    - A: The criterion of the simulation is to maximize sum throughput.
    - C: In slide 4, what is the reason to select -62dBm/20MHz as PBSS\_PD, not to an optimized value?
    - A: We want to simulate in home scenario with 2 rooms and we thought that OBSS\_PD max may be the best.
    - C: I would like to discuss later. High OBSS\_PD provides more Tx opportunities but increases collision.
  + Chair asked the presentor to inform via an e-mail if they have plans to run a SPs. Chair will arrange the dedicated time for the SPs.
* Technical Submissions: Use Cases/Requireiments
  + [11-23/1947r](https://mentor.ieee.org/802.11/dcn/23/11-23-1146-01-0uhr-relaying-for-low-latency-traffic-in-uhr.pptx)0: Consideration of Industrial Automation Scenarios - Follow Up

Akira Kishida (NTT)

* + - (One attendee was on the queue but there was an audio issue. Needs offline discussion.)
  + [11-23/2029r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1090-00-0uhr-seamless-roaming-follow-up.pptx): Overview of Enterprise Policy and Goals

Brian Hart (Cisco Systems)

* + - (The presentation is postponed due to absence of the presentor.)
* Agenda modification
  + Chair proposed to proceed more presentation (23/1836r2) and accepted without objection.
* Technical Submissions: Multi AP Security
  + [11-23/1836r](https://mentor.ieee.org/802.11/dcn/23/11-23-1090-00-0uhr-seamless-roaming-follow-up.pptx)2: MAP security consideration Jay Yang (ZTE)
    - C: We need to start thinking about Multi-AP coordination and basically the security concerns around it. It is a good start to find the problems to protect against. My question comes down to what kind of architecture, what relationship between the APs. If we use somethink like MLO, those APs are kinds of more like peers that anything else. In addition, we need to decice what keys we generate and things like that. Maybe we could use a limited implementation of mesh because mesh allows to authenticate with each other. We need to do architecture work and we probably want to make this flexible enough. It is seemed that infrastructure mode is really the right mode for security.
    - A: I would like to discuss later for multi-AP coordination.
    - C: What is the definition of a master AP in slide 7?
    - A: This is a relevant to another concept. A group consist of one master AP and other APs for a long-term operation.
* Agenda modification
  + Chair proposed to add 23/2029r1 again and approved proceed without objection.
  + [11-23/2029r1](https://mentor.ieee.org/802.11/dcn/23/11-23-1090-00-0uhr-seamless-roaming-follow-up.pptx): Overview of Enterprise Policy and Goals Brian Hart (Cisco Systems)
    - C: In slide 8, regarding synchronization, how can you know if the existing mechanisms can still hold?
    - A: I think we need to see the requirement of MLDs. Find out if work out or not. The co-location can be used for AP MLD identification.
* AoB:
  + Chair announced again if the presentors would like to run SPs, they should inform the chair via e-mails.
* Adjourned at 11:48 ET

# 3rd Conf. Call: December 4th Monday (19:00-21:00)

* The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order.
* IEEE 802 and 802.11 IPR policy and procedure
  + Patent Policy: Ways to inform IEEE:
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    - "[voter status] First Name Last Name (Affiliation)"
* Agenda

Chair reviews proposed agenda found in [11-23-2140r](https://mentor.ieee.org/802.11/dcn/23/11-23-1311-00-0uhr-uhr-sg-july-august-2023-teleconference-agendas.docx)4

Discussion:

* + - * No discussion.

Agenda approved with unanimous consent.

* Announcements:
  + None.
* Technical Submissions: Multi AP Grouping
  + [11-23/1837r1](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx) MAP group set-up operation discussion Jay Yang (ZTE)
    - C: I support the proposal. In slide 4, one challenge of your proposal is AP-GO. Coordinated transmission needs to be more flexible in terms of sounding frame, at least the puopose of coordination between the members of the group. For instance, if GC1 and GC2 need to coordinate something, they should communicate with AP-GO, which gives a lot better performance by facilitating more dynamic behavior. In that case there is bacically hidden-node situation.
    - C: In slide 7, I also think the idea of having multiple groups is good; however, all of AP and the gropus don’t have to interact together so they could be considered all of one group. I don’t think there should be central cooridination in the number one case. We need to figure out how we can basicall make these groups flexible for coordinate transmission.
    - A: This is not a centralized group. The AP-GO just maintain some information if it will not need to relay all the information bette APGC 1 and GC X. After this group is formed, they can do coordination without the participant of APGO. The role is vely limited.
    - C: Some provisions of the APs is needed, but I don’t think we need central coordinator. If each AP connunicates with other, there is no central coordination. AP controller can manege APID out of AP-AP communication.
    - A: For example, AP 1 assignment and recycle, this is a need of an owner to do that; otherwise, it is very hard to matchi the AP 1 assignement on the cycle.
    - C: We could have a management entity for APID.
    - C: I also thought about that kind of idea. It’s gonna be more complicated that it looks especially if we introduce mobily of clients. I think this group concept could create a lot of cases and disruptions. What is the purpose of a group and what is the coordination purpose? Does it look more like a mesh. Perhaps you don’t need a group ID, maybe just the AP MAC address is sufficient for APID.
    - A: Regarding the centralized AP, overhead issue of a new AP requiring more coordination. But once we have AP group, that kind of stuff is not needed because the AO-Go can broadcast this information to the new APs. We already define some ID, for example, the framework of the trigger frame. We can carry some proper information based on the group information.
    - C: I agree with the previous commentor. In your proposal, each AP can be a center of the group and that AP can manage the ID assignment and a lot of things. Also, in the trigger frame we can use the AP to indentify a shared AP. I think that is a simple solution. But there are some issues. To use the relay would be quite complinated. Who will do the relay for the new AP and who will assigne them for each of the APs? In slide 7, multiple groups, two or more IDs are assigned to group owners. How does AP 2 know which ID is going to be used?
    - A: If a new AP joins the new group, it communicates with only AP-GO and does not communicate to AP GCs to reduce overhead. Using GID, multiple groups can make simple.
    - C: Who will manage the group IDs among the two groups? Group IDs may collide.
    - A: The group owner maintains group IDs for APs.
    - C: I agree with the commentors before me. For the group formation, it is very complex and very quick response. Also has another aspect of creating boundary. Basically, in each group, there will be APs that are at the edge. The APs in the middle of the groups may get a different treatment. In general, I think I would encourage to stay away from fixed group formation like as in slide 4.
    - C: I think easy mesh protocol may be used for facilitating negotiation among APs. Do you think it is possible to us easy mesh is possible?
    - A: The problem assumes that the APs you can imagine in your home and another neighbor’s home. In this case, two Ps are not in the same ESS. In easy mesh, the APs communicate using backhaul but this case without controller is assumed.
    - C: What about we assume that there is a logical entity then other APs care assosication with the AP.
    - A: It will become more copmplicated if we assume there is another station fo forwarding some information between two APs, which causes some delay and other issues.
    - C: I don’t see where it’s complicated.
    - A: To forwarding something to another AP will occur some delay.
    - C: In the case 3 to cover the hidden nodes, you use relay. You mean that the MAP with relay.
    - A: Relay is used for far-from new APs. In the case 3 in slide 3, communication between AP-GO and new AP is via AP-GC2 as relay. In this case AP GC2 transmit trigger frame to APs.
    - C: Maybe we can think of it as slso a sessnoi-based operation. Is one of the AP may initiate carticular coordination methodi needed? For example, GC2 can send invitation its neighboring it. GC 2 may form their session with others, and on the other hands, this one may subsequently be interested in SCR and then sustained the same AP maybe part of one session whine not part of the other session.
    - A: Your thought is like what is described in slide 7.
    - C: No. What I want to say is, the case in slide 7 is some coordination mechanisms, e.g., TWT, is needed for initiating CSR session.
    - A: Thank you. I’ve got it.
  + [11-23/1841r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1139-00-0uhr-relay-transmission-in-uhr.pptx): Considerations on BSS color for Multi-AP Hirohiko Inohiza (Panasonic)
    - C: Why is there a need for the two APs to transmit with different BSS colors? A STA does not even need to be aware of joint transmission. Even a legacy device should be able to decode that frame.
    - A: Are you saing AP 2 may use BSS color 1 for joint transmission?
    - C: Yes.
    - A: For AP 2, if do so, non-AP STA associated with AP 1, which are using BSS color 1, do not filter out the PPDU from AP2. This results in the issue of power consumption increase.
    - C: A new BSS color 3 may resolve the power save issue, I understand.
    - A: If another BSS color is introduced and non-AP STAs which are not involued in the joint transmiss can ignore it, it will at least contribute to power consumption.
    - C: In joint transmission case in your presentation, do two AP transmit PPDUs simultaneously? How do you use the term of joint transiossion?
    - A: Yes, that right. It is simultaneous transmission using the same frequency channel.
    - C: In simultaneous transmittion, preambles of AP1 and AP2 are identical and so there is really a hard constraint. I think maybe you are second scenario where you have a kind of a common color.
    - A: In the proposal two, I have the same understanding. We have to set the same preambles for two PPDUs. We have also to take care about the order of the BSS color set.
    - C: In slide 5, which BSS color should be used in U-SIG?
    - A: It is assumed that 1st color is set in U-SIG and another one is set to another SIG. The BSS color to be set in U-SIG should be BSS color one.
    - C: How does the sta in the righg identify the BSS color? Legacy STAs identify U-SIG only.
    - A: That’s right. For legacy STAs, we need more consideration to study about that.
    - C: I agree with the comment that the preambles are exactly the same among the APs in joint transmission case. My question is do you assume UHR STA only or including legacy STAs?
    - A: I’m assuming UHR STA only.
    - C: I think unified procedure regarding the reception is needed.
    - A: I agree that. In terms of unified solution, maybe the solution one is better.
  + Chair announces general reminder for a SP. (To request an SP, please send an e-mail to the chair.)
  + [11-23/2100r](https://mentor.ieee.org/802.11/dcn/23/11-23-1146-01-0uhr-relaying-for-low-latency-traffic-in-uhr.pptx)0: Considerations on Multiple Multi-AP groups Gang Xie (BUPT)
    - C: In slide 4, you say that Cisco Systems has sorted out a number of possible roaming approach. I probably just would suggest we talk about individuals from Cisco Systems.
    - C (Chair): Actually, just individuals call out the names and they don’t mention companies. Because the attendees are individuals and they do not stick on behalf of companies.
    - C: In timeline of these different coordination, are you expecting that in every TXOP? In addition, what kind of information is exchanged between MAP groups in the intergroup request and response are you expecting?
    - A: Regarding timeline, it should allow these groups at least to communicate with each other. Regarding information exchange, we are still working on it and we are open on it.
    - C: Do you assume joint transmission in your framework?
    - A: It is possible, but we are still working on it.
    - C: I guess an STA associates with multiple APs?
    - A: We think we can make it.
    - C: Regarding the phases of MAP setup and MAP coordination, is it within TXOP or once in a while?
    - A: It is every transmission or integrated request and respoinse.
* Technical Submissions: Relay
  + [11-23/1840r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1090-00-0uhr-seamless-roaming-follow-up.pptx) Relay for 11bn Dongguk Lim (LGE)
    - A: C: In slide 5, it is called as two hops, source to relay and relay to destination. Does it mean single relay transmission?
    - A: Yes, one relay is using.
    - C: I think it is good to reduce complexity and latency. In slide 6, TXOP sharing sounds good to reduce ovehard for relay operation. I think we can consider some of the new TXOP sharing for the relay operation.
    - C: In slide 7, this measurement is for the channel between the relay and destination. The feature shows only throuthput enhancement use case. We need to consider sounding procedures 1st and 2nd links.
    - A: To support range extension, different sounding procedure is needed.
    - C: Thank you for very comprehensive covering any aspects. In slide 6, triggered TXOP sharing for DL transmission is good approach. Do you have any opinion of context that you would introduce if you do UL transmission?
    - A: Currently, 11be defines the TXS for DL case. I don’t know how to define the modify the TXS operation in relay operation. We need more offline discussion on that point.
    - C: In slide 7, to choose the relay and the destination, I understand that information about the link between the relay and the destination would be important. But you start with sounding PPDU. I am assuming this is channel information or channel measurements.
    - A: Just SNR value information is needed for MCS selection. If we need TxBF operation in relay operation, conventional sound procedure would be applied.
    - C: I am not clear on how the AP would use the actual channel feedback. In this diagram, the realay doesn’t even get the feedback, so I am wondering how hou imagine the AP would use the feedback.
    - A: I assume that all relay operation is controlled by the AP. The AP should know the channel information between the relay and the destination.
    - C: In slide 12 (SP1), what is different from the existing relay such as S1G relay and DMG relay?
    - A: 11ah/11ad defines relay transmission but the frequency bands are difference from 11bn. The relay in SP1 means relay operation defined in 2.4/5/6 GHz bands.
    - C: For clarification, I recommend adding frequency bands to the SP text. And on the 2nd bullet in slide 12, what is the intention to talk about 11be?
    - A: It is a typo of 11bn.
    - C: I understand the sound procedure happens periodically. If there are many relays, you need to consume the time resources for sounding procedure. I am curious how many relays can exist in your network environment.
    - A: I don’t know how many relays exist. But two operation the AP1 should be able to to know each capability and other things.
  + Chair proposed to add submission 11-23/148r0 related to relay operation.
    - Approved without objection.
  + [11-23/1948r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1090-00-0uhr-seamless-roaming-follow-up.pptx) TXOP Sharing based UL Relaying (Serhat@Offino)
    - C: In slide 5, the time window of T2, the CTS frame is followed by PPDU. Can you elaborate a little bit more on what is the intention of this CTS frame?
    - A: We are still under discussion in multi-location condition. CTS is to avoid hidden nodes.
    - C: A preamble portion of a PPDU itself also has a function of protection.
    - C: In slide 6, how does the realy station know whether relay should transmit an MRTT frame or not.
    - A: AP is aware STA is in the extended range or not. The MRTT frame could have an indication of extended range.
    - C: For the relay is it meant to have benn deployed by the AP deployer or is this something that’s gonna be ad-hoc selected? How does an AP select the relay? We should select a relay that are willing to relay a PPDU to the next end STA, for example.
    - A: This could be fixed in one case. In another case, the AP could know location and availability of the possible relay STAs. It depends on the topology and structure of the STA types.
    - C: This also gonna be ad-hoc basis, a kind of capability indication. So, there is not relly gonna be a deployed relays at any location.
    - A: That’s what I think, but of course there may be also some other views.
    - C: In slide 7, how do you devide T1, T2 and T3? Maybe devided at the equal?
    - A: It is based on AP’s assignment of the MCS to each STAs and duration. They may not be so that depends on the implementation.
    - C: What about the retransmission procedure of PPDU from the AP to the relay?
    - A: That’s a good question. Retransmission could be conducted in another TXOP if sufficient dulration cannot be prepared within the same TXOP.
    - C: You are assuming that the AP obtains TXOP, but how about the case of an end-STA obtain TXOP? Can the STA transmit a PPDU to the relay?
    - A: We assume the AP allocate each duration within TXOP.
    - C: My question is how about the case that the STA obtains TXOP.
    - A: The MRTT is only for the AP initiated. We should start looking to this topic.
    - C: In slide 5, how will the the AP set the RA of the MRTT if there are multiple STAs that should respond?
    - A: The RA address would be broadcast. The relays check use infor field and they could get their assignment.
    - C: Do you assume that the AP already know STAs’ buffer status information for uplink traffic?
    - A: Right. That’s an assumption.
    - C: Why don’t we simply use a trigger frame to solicit the status of the PPDU to the relay. That seems easier.
    - A: TXOP sharing is for multi-user allocation.
    - (Chair terminated the duscission and asked the people in the question queue to discuss offline due to out of time.)
* AoB:
  + Chair announced if there is need to run SP, please send an e-mail to the chair.
  + Chair requested presentors to upload a submission to the mentor more than twenty-four hours prior to teleconference.
* Adjourned at 21:00 ET

# 4th Conf. Call: December 7th Thursday (10:00-12:00)

* The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order.
* 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 speaks/writes up**.

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  + Please record your attendance during the conference call by using the IMAT system:
    - 1) login to [imat](https://imat.ieee.org/attendance), 2) select “802.11 Telecons (<Month>)” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “<UHR SG > conference call that you are attending.
  + If you are unable to record your attendance, contact Alfred Asterjadhi ([aasterja@qti.qualcomm.com](mailto:aasterja@qti.qualcomm.com)) and Yusuke Asai ([yusuke.asai@ntt.com](mailto:yusuke.asai@ntt.com)) for assistance.
  + Please ensure that the following information is listed correctly when joining the call:
    - "[voter status] First Name Last Name (Affiliation)"
* Agenda
  + Chair reviews proposed agenda found in [11-23-2140r](https://mentor.ieee.org/802.11/dcn/23/11-23-1311-00-0uhr-uhr-sg-july-august-2023-teleconference-agendas.docx)6
    - Discussion: None.
  + Agenda approved with unanimous consent.
* Announcements:
  + None
* Technical Submissions: Multi AP Grouping
  + [11-23/1990r](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx)0 MAP Transmissions: On the Link Quality Metric

Vamadevan Namboodiri (Samsung)

* + - C: I understand there are two types in LQM tables, one is for the link between an APs and the other is for the link between an AP and and an STA. I think the LQM value for fixed APs are stable, but LQM for STAs may vary as time goes by. So, it may be difficult in some cases to use for optimization. How do you consider that point?
    - A: There are two assumptions we set. The STAs’ movements are not violent. Individual STA moves around (within a limited area), and these STAs periodically update the LQM value. So, the AP continues the optimization process and update these table.
    - C: The amont of information volume will be huge when the number of STAs increase. I think there needs to be efficient scheme for information exchange for LQM table.
    - A: I agree with that. We should consider that.
    - C: In slide 3, why we need the coordinated AP to be an AP? Is the C-AP simply a controller?
    - A: Yes. The C-AP does not need to be an AP. My idea is that the C-AP has the control function, nothing more. I gave the name, but it doesn’t need to have AP function.
    - C: On the 2nd bullet in slide 12, you say “Data may or may not be routed through C-AP.” What are you looking here?
    - A: If there are two APs doing a joint transmission, the data should be available to these two APs. But it doesn’t. It can be routed to these APs directly rather than routing it through the controller. The bandwidth of the controller should be very huge. All the only the controlled information need to be handled by the C-AP.
    - C: Do you assume that AP receives all the deta from the system as the current architecture?
    - A: The distribution system would be independently connected to these APs and they are free to be consumers of the data from thet distribution system.
* Technical Submissions: Relay
  + [11-23/1889r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1139-00-0uhr-relay-transmission-in-uhr.pptx) Considerations for Relay Operation in Next Generation Wi-Fi Networks

Peshal Nayak (Samsung)

* + - C: In slide 6, I think it is good to have both the APs and the STA have a function of announcement of the relay. In slide 7, do you assume that there are multiple relays?
    - A: This is not prohibited but it is not actually my intention.
    - C: Do you assume there is only one hop relay?
    - A: There is no assumption. Basically, this does not forbid. I’m not trying to advocate for how many hops should be there in this slide. That’s not my intention.
    - C: For a relay, do you assume it has both AP and STA function or STA function only? Because I see TV or non-AP devices in your figure, which are seemed to not implement AP function.
    - A: Maybe it is something like not an actual router of an AP, but maybe it is like a mobile AP and if smart home devices can have such a capability, they can be extended as the relay, which is an architectural issue.
    - C: Could an STA associate or connect with an AP and a relay at the same time, or only connect with a relay?
    - A: Do you mean association with both of them or maintaining association devices at the same time, which one is it?
    - C: I mean they could exchange data transmission to both of an AP and a relay.
    - A: Basically, this kind of discussion does not forbid. If we think of a situation where maybe the relay is doing some kind of transmission power control, there may be some constraints. On the other hands, maybe a wall-powered device may not have such constraint, so it is possible that the AP may be able to reach the STA directly. So, asymmetric communication UL/DL may be possible. (i.e., DL transmission from the AP to the STA is via relay and UL is directly from the STA to the AP.
    - (Comments and answers on the chat window --- from here---)
    - C: So far there was AP MLD (all affiliated entiies to that MLD are APs) and non-AP MLD (all affiliated entities to that MLD are non-APs)). Are you introducing a new MLD type where there could affiliated be a mix of APs and STAs affiliated to that MLD?
    - C: In my opinion, BA agreement can be done between the E2E devices (AP and STA).
    - (Comments and answers on the chat window --- to here---)
  + [11-23/1899r](https://mentor.ieee.org/802.11/dcn/23/11-23-1146-01-0uhr-relaying-for-low-latency-traffic-in-uhr.pptx)0 Relay-operation-for-11bn Guogang Huang (Huawei)
    - C: In slide 5, does a relay MLD have both AP and STA functions?
    - A: Yes, it has both logical entities. One is the relay, and another is the station.
    - C: I think it has a new feature. From the non-AP MLD perspective, is it logically associated with the AP MLD, right? I just want to know what’s the relationship between the AP MLD and the relay MLD.
    - A: I think it’s similar with the architecture discussion. The upper MAC has a wider platform.
    - C: In slide 5, what is the different on this architecture form the roaming AP MLD?
    - A: Not much difference. Difference is the relay scenario.
    - C: I have a question about cross link relay operation. I think the second architecture is more realistic in p.6. It’s good to have 2nd architecture as a baseline operation mode and need further discussion later.
    - A: In my opinion, it is not needed to limit the ways. The relay with multiple links and multiple channels should also be used.
    - C: I agree that this architecture in slide 5 is beneficial. After setting relay operation, does non-AP MLD continue to associate with the AP MLD, or relay MLD?
    - A: The AP MLD.
    - C: In this case, how about the BA negotiation? In slide 4, the rSTA has BA scoreboarding. How to setup the BA negotiation between rSTA and dSTA? (i.e. ADDBA request and response)
    - A: In this case, the relay device has the relay STA and relay AP functions. The relay STA can negotiate BA information with the AP MLD.
    - C: I appreciate to reuse the existing mechanism as much as possible. On STA side, some beacon or probe request is needed to relay discovery. Also, the establishing association with the AP MLD and block ACK negotiation are needed at the STA side. What are the changes at the STA side needed?
    - A: It’s possible to be transparent to the AP MLD.
    - C: It is very interesting architecture. In slide 6, rAP and AP work on the same channel. Are they (relay AP and AP12) with same address?
    - A: Different address.
    - C: Does it mean that two affiliated AP work on the same channel?
    - A: It is allowed based on the 11be draft text that non-AP MLD cannot transmit simultaneously use the same address with two links.
    - C: Very interesting. Let’s discuss offline.
    - (Comments and answers on the chat window --- from here---)
    - C: Actually, AP 12-rSTA can be regarded as the interface of the upper MAC sublayer of the AP MLD and the lower MAC sublay. This is similar to the non-colocated (roaming) AP MLD, in which the interface is wired.
    - C: I have a general comment to all the contributors on "relay". Such relay has to be an AP, in same ESS as the other AP/APs, and obviously allowing assoc from legacy devices is a must. For instance, if you want to do range extension with this in your house, you'll want all your IoT devices that will be legacy for a long time to be able to associate and benefit from it. Now we already have a standard way defined outside of 802.11 to emboard new APs (possibly client devices that want to act as an AP) to the home network in a mesh deployment. And in enterprise, we already have multi-AP deployments. Still unclear to me what is missing in current framework and why we would want to redefine all this (and on top of it have its usage be limited to only UHR STAs?). Instead of talking about defining a new relay AP, seems we should be talking about multi-AP mesh deployments and see if there are needs and ways to improve operation.
    - C: Agree with the previous commentor.
    - (Comments and answers on the chat window --- to here---)
  + [11-23/1928r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1090-00-0uhr-seamless-roaming-follow-up.pptx): Considerations for Relay Operation in Next Generation Wi-Fi Networks – part 2 Peshal Nayak (Samsung Research America)
    - C: I’m wondering about the capability Ralay. Does the relay also have AP capability?
    - A: Yes.In this presentation, for especially some of these smart home devices, it really can also have AP capability.
    - C: For your example, is a refrigerator or a TV implemented the AP capability?
    - A: Yes. And it is basically something like a hot spot kind of capability, not actual router capability.
    - C: In slide 9, are you considering that the relay function is implemented in legacy STA and regacy STA can be supported the relay link?
    - A: The relay might be able to communicate with the legacy AP. The main point is that the AP may not be aware that there is a relay, but the use may deploy some devices like Wi-Fi hotspot with some extended functionalities. The relay could work as something like an AP and the main home router itself is not aware.
    - C: I don’t understand the user experience of legacy devices because they don’t have any optional function for the relay. Some of the control frame exchange is needed from the AP.
    - A: Passive scanning like probe request and probe response is needed.
  + [11-23/1955r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1090-00-0uhr-seamless-roaming-follow-up.pptx): Considerations for Relay Operation in Next Generation Wi-Fi Networks – Part 3 Yue Qi (Samsung Research America)
    - C: In slide 4, do you assume that the relay has STR capability?
    - A: Of course, STR is one of the options. We also have some other consideration.
    - C: In slide 4, we can have some relay, we don’t have to tansmit all the indication of the frame if we use the monitoring or data transmission.
    - A: Basically, we want to do multiplexing at the same time by using some signaling in a PPDU. Regarding multiplexing option 1 is in frequency domain and option 2 is time domain.
    - C: In slide 6, The channel switching is needed only for the AP to change primary channel if it is indicated to the relay or the STA, is it right?
    - A: Do you mean you may also wanna have the channel switch request?
    - C: I mean the channel switching is only for the relay operation or a normal operation.
    - A: I think the channel switch request should be initiated by not only the AP but also the relay. Channel switch announcement should be transmitted by the AP.
  + Chair proposed to add a submission (11-23/1843r0) for Multi-AP JT because there is remaining time.
    - Approved with no objection.
* Technical Submissions: Relay
  + [11-23/1843r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1090-00-0uhr-seamless-roaming-follow-up.pptx) Multi-AP Joint Transmission Simulations with Impairments

Rainer Strobel (MaxLinear)

* + - C: Do you assume different channels is used for two APs?
    - A: Yes.
    - C: The signal is totally cancelled each other, even they have different channels.
    - A: If they’re perfectly the same, that is cancelled. If not, then we see the distractive interference but never cancels all this obvious there.
    - C: In slide 15, there is quite amount of cutoff (20 %) in the throughput curve.
    - A: It is related to the being too slow to follow this quick chages of the channel, very fast adaptation of received signal equqlizer and sometimes it doesn’t follow fast enough and loses the link, which results in a lot of errors. Rx equalizer should adapt very fast against channel variation. In slide 6, there is no pilot.
    - (Chair stopped the duscission and asked to offline discussion to the people in the question queue due to out of time.)
* AoB:
  + Chair announced the there is need to run SP, please contact
  + Chair requested to upload the submission to mentor more than 24 hours prior to teleconference.
* Adjourned at 21:00 ET

# 5th Conf. Call: December 11th Monday (19:00-21:00)

* The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order.
* 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 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

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* 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 “802.11 Telecons (<Month>)” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “<UHR SG > conference call that you are attending.
  + If you are unable to record your attendance, contact Alfred Asterjadhi ([aasterja@qti.qualcomm.com](mailto:aasterja@qti.qualcomm.com)) and Yusuke Asai ([yusuke.asai@ntt.com](mailto:yusuke.asai@ntt.com)) for assistance.
  + Please ensure that the following information is listed correctly when joining the call:
    - "[voter status] First Name Last Name (Affiliation)"
* Technical Submissions – TXOP Sharing:
  + [11-23/1846r](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx)0 Protection of Extended TXOP Sharing Si-Chan Noh (Newracom)
    - C: In slide 7, there are two potential challenges. One is that this will allow to reset NAV by UHR STA. But for EHT STA in the same network the NAV might still be set, which will call some fairness ussues. Another challenge is response freme from the sharing AP to the shared AP. CTS set the NAV to the surrounding STAs of the shared AP If they support a multi-primary access, they may go to the secondary channel. Basically, those two challenges may cause channel access reliability issue and option one is riskier.
    - A: Thank you for your comment.
    - C: In lide 7, how does the shared AP know when to terminate when the shared AP resumes transmissions to the OBSS AP?
    - A: To reuse a TXS trigger frame defined in 11be. Sharing ap can set allocation duration in that frame and the sharing AP or the shared AP can exchange the information before the sharing AP TXOP.
    - C: Basically, you are going with a fixed duration of allocation. How does the sharing AP determine its duration?
    - A: The sharing AP can predict when tha shared AP’s allocation is over because of the sharing AP’s fixed duration of allocation.
    - C: We need to think a bit more. You would need probably an explicit frame that is coming from the shared AP.
    - A: Need more detailed offline discussion.
    - C: In slide 10, here, the OBSS AP does not hear CTS frame and only TXS TF. So OBSSs AP maybe start to transmit a frame during allocated time?
    - A: The duration field is same as the allocation duration.
    - C: But in 11be, we already have a similar mechanism for returning TXOP to the sharing AP like that. I think the shared AP cannot resertve it’s a transmission duration and it’s a problematic.
    - A: In my opinion, the record system can also start or resume the frame exchange. I think the probability is an existing problem.
    - C: I think we can solve the problem how to design the mechanism so that we provide more reliablity.
    - A: Thank you for your comment.
    - C: I have similar comment to the previous commentor. The TXOP return procedure would not probably work if this OBSS transmission from AP 3 starts in parallel. Are you only looking at TXOP sharing for the purpose of coordinated TDMA? When two APs might want to transmit simultaneously, you don’t want the AP 3 to start transmission in parallel.
    - A: If we consider the return case, this is open to discuss. As you mentioned, we only consider the TDMA scenario.
    - C: In slide 10, can you explain how can the relay set the NAV to the OBSS AP by TXS TF?
    - A: In this topology, the OBSS AP can only hear the MU-RTS and the TXS TF from the sharing AP. And the OBSS AP cannot hear the CTS frame from the shared AP. When the AP3 overhears the trigger frame and if that duration fuield is not cover the shared AP’s frame exchange, the allocation duration can be resumed.
    - C: But the STA1 is associated with the AP3, is it correct?
    - A: Yes. This is a simple example.
    - C: The STA 3 may suffer from collision.
    - A: This is a kind of OBSS problems.
  + [11-23/1847r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1139-00-0uhr-relay-transmission-in-uhr.pptx) Non-AP initiated TXOP sharing follow-up Shawn Kim (WILUS)
    - C: In Slide 3, the AP expands the PPDU bandwidth. I see a lot of presentation talking about non-primary channel access. Following this procedure, in the middle of the TXOP, if the AP can exmand the bandwidth simply, it may have some conflict feature. Do you have some thought about that?
    - A: Do you mean the OBSS STAs may try to access the secondary channel?
    - C: Yes.
    - A: If we can insert some information on the response frame, the OBSS STAs may try to access the secondary channel during the time.
    - C: Some information to disallow on-primary channel access during this TXOP. Is it you intention?
    - A: I think we can solve the problem.
    - C: In slide 3, what trigger is needed to content? Do I just contend all the time and givine the channel to the AP or do I have data that I want to transmit? There needs to compare transfering the TXOP to the other STAs with blindly using the TXOP by the AP.
    - A: Non-AP STA exept the channel has its own traffic. The AP will transmit TF to reset the TXOP. The AP can utilize OFDMA operaetion, the legacy STAs can have chances to transmit data to the contention channel.
    - C: How does it compare with the trigger-based channel access by the AP all the time?
    - A: I don’t need to the STA intent can exito a channel using initiate procedure of the TXS-based TXOP sharing.
    - C: In slide 6, does it mean that non-AP STA, which is the TXOP holder, can transmit the transfer the TXOP to the AP in the middle of the TXOP?
    - A: Yes.
    - C: I think there can be an issue. If some of the STA around the BSS receive UL PPDU, does the non-AP STA not have a direct link with the AP?
    - A: It depends on the operation mode.
    - C: After the AP takeovers the TXOP, it does not know which non-AP STAs goes to doze mode.
    - A: There is an STA in the TXOP when the AP transmit the triger frame.
* Technical Submissions – Misc:
  + [11-23/1865r](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx)0 Discussion on SST and A-PPDU Ross Jian Yu (Huawei)
    - C: In slide 7, you proposed a A-PPDU with 80MHz HE PPDU and 80 MHz HE PPDU, but we already have 160 MHz PPDU, what is the difference between them? Signaling?
    - A: If there are HE STAs only and they does’t support 160 MHz PPDU, the UHR AP must transmit tha A-PPDU of two 80 MHz HE PPDUs.
    - C: The 3rd bullet in slide 5 says that the option C is preferred compared with the option A. In your proposal, is the UHR TB PPDU is transmitted by the UHR STA?
    - A: It can also be transmitted by some non-UH STAs.
    - C: Don’t you think directrly tranmit an UHR PPDU even in a TB?
    - A: I think the options a and c are doable.
    - C: You don’t really need UHR STA?
    - A: Yes. The UHR STA can participate.
    - C: You mean mixed mode inside an A-PPDU. If you want to SST the HT sta does not support, right?
    - A: Yes. It needs to beo capable of 320 MHz transmission.
    - C: On the figure (e) in slide 6, why do you have to use the secondary 80 MHz channel for the EHT PPDU? Can’t UHR PPDU with 240 MHz be transmitted?
    - A: That is also dorable. That is a future study.
    - C: I understand the lagecy STAs do not recognize whether the received PPDU is an existing PPDU or A-PPDU. Based on this understanding, on the case of the option in slide 5, my concern is that the receiver of HE PPDU adjacent to the 160 MHz UHR PPDU suffers from strong adjacent channel interference. How do you consider the issue?
    - A: I agree with the legacy device cannot distinguish A-PPDU. Basically, each symbol is aligned by a single AP so there is no strong adjacent channel interference.
    - C: But the 11ax amendment defined the minimum requirement of adjacent channel rejection. In high MCS case, the level is set to zero dB or less.
    - A: This specification is assumed that the PPDU is not aliged and A-PPDU is aligned.
    - C: You mean that just 80 MHz implemetentation is possible, in this case we can have some advantages.
    - A: Basically, in this case, the AP cannot transmit the MU-OFDMA PPDU. The AP transmit the UHR A-PPDU.
    - C: Does the HE PPDU have to be tranismitted on the primary channel? Otherwise, it wouldn’t be recognized by the HE STAs.
    - A: Yes.
    - C: So, does that also mean that the other band of the A-PPDU is based on dynamic subband operation?
    - A: Yes.
    - C: For instance, the HE PPDU is a part of the secondary channel, there is nothing different than tht HE PPDU. Is there any modification in the HE PPDU or just that UHR STA has been told with SST or DSO? To move to the sencary channels?
    - A: For the HE PPDU, I understand that the modificatios may be difficult. Just simple reusie the previous PPDU format.
    - C: What is the logic for sending an HE PPDU to a UHR sta?
    - A: During previous discussion, some receiver does MRC combining for HE PPDU.
    - C: What is the locic for sending the HE PPDU for the UHR STA?
    - A: We want to make th same in R-SIG field in different 80 MHz channels and we have to toransmit the HE PPDU. Because we have received the comment during the previous discussion that some receivers do MRC combination for HE PPDU.
    - C: Is this only for the TB-PPDU or for downlink as well?
    - A: Both.
    - C: If you are trying to transmit an A-PPDU with an UHR PPDU and and HE PPDU, the preamble structures of them are not the same, meaning the HE SU-PPDU does not have a SIG-B. I’m presuming that it’s gonna follow UHT which has the second SIG, right? We can use the HE MU-PPDU format but that means that you need to have multiple STAs participating the channel. That kind of the case is like a corner case, especially given that is already two generations ago.
    - A: Thank you for your comment via offline before. It needs o have so that we can achieve the symbol-by-symbol alignment. And, we should consider we still have so many lagecy HT IoT STAs. Regarding the constraint about the MU-PPDU format must include at least two destinations, it depends on the scenario for home case, but there is a possible way, for example to use some dummy users.
    - C: In the EHT standardization, we made all the wide bandwith support as mandatory, which was a great work. I think it might be a cleaner state if we think more from UHR starting from EH onwards and trying to strive out for more clearner solution.
    - A: I am open fo the study of the EHT plus UHR combinations. Thanks.
    - C: It’s important for the PPDU aggregation going through HE to EHT. But, we don’t have a chance to enable it. If EHT an UHR use the same channelbandwidth, SST or dynamic subchannel operation can be applied. EHT already have MU function by OFDMA 20 MHz to 320 MHz, one soluion is to use EHT format directly.
    - A: I agree with that. The option b in slide 5 has potential UHR feature. Need further study.
    - C: Regarding HE and UHT aggregation, HE supports up to 160 MHz PPDU. So, bandwidth of an aggregate PPDU is also 160 MHz or less, which wastes the 160 MHz bandwidth for the EHT STAs supporting 320 MHz channel. I think the extra aggregation features for UHR is not important for us. But to use 160 bMHz bandwidth is more important. Probably, we should consider UHR and HE.
    - A: Totally agree with you. In slide 7, we show an example of UHR plus HE as a preferred mode.
  + [11-23/1943r1](https://mentor.ieee.org/802.11/dcn/23/11-23-1090-00-0uhr-seamless-roaming-follow-up.pptx): Physical Layer Reliability Improvements – Follow Up

Shimi Shilo (Huawei)

* + - C (Hanging): In slide 5, in your simulation you assume to use 242 tone RU, so this repetiion you’re using just one 242 tone RU or two 242 tone RU?
    - A: We always use the same 20 MHz bandwidth and single 242 tone RU. MCS 4 is used for modulation of data.
    - C: For these two schems, did you use the same bandwidth?
    - A: Yes.
    - C: The exiting repetptition code is not sof efficient, I understand. Maybe the scenario is specific.
    - A: You are absolutoly right. If there is only noisy signal, not interference, there is no gain in using repetition, that’s correct. Different coding schemes would be far better. But because there is interference here then the results are completely different from the case where there is only noise.
    - C: In slide 7, what happens between 14 % and 18 %? and maybe something with you dingt adopt the MCS. How can it coppalpse to zero in the 14 % case? There is not so much difference between 14 % and 18%, which is somewhat strange.
    - A: This simulation is the link level result for further optimization. What we did here in this simulation is used for the later result in different across all SNR range and the MCS values. In 20% case, it would be every fixed subcarrier for pilot. Less pilot subcarriers (for example, 14 %) makes less accuracy of interference covariance.
    - C: What was the bandwith of the interferer?
    - A: The entire signal bandwidth. If 106 tone are used for data transmission, another 106 tone is used for pilot and estimate the interference on the entire bandwidth.
    - C: You mentioned that it can dealwith interference that happens in the middle of the packets So, I guess the train is not done during the preamble. Do you look at individual data symbols and then from that decide what the cancellation should be in symbol-by-symbol?
    - A: Generally speaking, yes. In this approach (called as second), we have interference mitigation pilots that are inserted or interlays across all the entire bandwidth within a data PPDU.We estimate the channel, and it might be interfered. What we did here is to apply across all the signals. If there is no interference, th BF would simply be maximum ratio combining. If there is interference, then modified beamforming to mitigate the interference is applied. In this simulation, we applied on every OFDM symbols.
    - C: How do you distinguishi between what is interference and what is signal without having a reference?
    - A: IM pilot is placed on specific subcarrier and covariance of interfence can be calculated and applied to data tones.
    - C: Do you estimate covariance of S+I or that of I?
    - A: In 106 tomes case, 30% IM pilots are used only for interference mitigation. The rest of the subcarriers are for data. Transmitter transmits a known sequence with what we call as “interference mitigation pilot.” At receiver side, we use those to estimate I+S covariance for interference mitigation.
    - C: What type of interference did you apply? Do you assign the kind of OBSS and with kind of the spatial special or just the white?
    - A: In this simulation here, the Wi-Fi unsyncuronous interference across the entire bandwidth was applied.
    - C: In the case of 14 %, the throughpu increase is somewhat surprising. What is your assumption of MCSs here? In slide 8, are you saying the MCS is senected assuiming you already know that the interference will come in the middle of a packet? How do you set your MCS? Do you assume the MCS is going to be set by certain SINR level?
    - A: Are you asking about about practice or simulation?
    - C: Both.
    - A: The goodput in the simulation is based on packet error rate and MCS used for the same interference regime. The relation between SNR and MCS is refereed to the MCS selection for the best throughput. In terms of practical, Link adaptation is always needed considering interference mitigation, the PDF characteristics of the post-processing SINR. Please see my previous submission.
    - C: In your PHY simulations to check the performance verification, is all of interference statistics estimated or known as “genie”?
    - A: Estimated.
    - C: Is the estimation based one symbol or accumulation of multiple symbols?
    - A: This is up to implementation, but in my simulation, we did filter across very few OFDM symbols not only in frequency domain but also in time domain.
    - C: Isn’t it instantenous for cureennt symbol?
    - A: It could do it, but not in this simulation.
  + [11-23/1877r](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx)0 Analysis on the LDPC rate matching Xiaogang Chen (Spreadrum)
    - (Due to lack of time, the submission was postoponed.)
* AoB:
  + None
* Adjourned at 21:00 ET

# 6th Conf. Call: December 14th Thursday (10:00-12:00)

* The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order.
* IEEE 802 and 802.11 IPR policy and procedure
  + Patent Policy: Ways to inform IEEE:
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    - Speak up now and respond to this Call for Potentially Essential Patents

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* 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 “802.11 Telecons (<Month>)” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “<UHR SG > conference call that you are attending.
  + If you are unable to record your attendance, contact Alfred Asterjadhi ([aasterja@qti.qualcomm.com](mailto:aasterja@qti.qualcomm.com)) and Yusuke Asai ([yusuke.asai@ntt.com](mailto:yusuke.asai@ntt.com)) for assistance.
  + Please ensure that the following information is listed correctly when joining the call:
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* The Chair, Alfred AsterjaLaurent (Qualcomm), calls the meeting to order.
* IEEE 802 and 802.11 IPR policy and procedure

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Participation slide: <https://mentor.ieee.org/802-ec/dcn/16/ec-16-0180-05-00EC-ieee-802-participation-slide.pptx>

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* Announcements:
  + The final call for nomination of TGbn ad-hoc chairs will be announced on the first session (Monday PM1), January 15th.
  + Voting will be conducted on the Monday PM2 session.
  + Chair asked to send an e-mail for nomination of ad-hoc chairs.
* Agenda
  + Chair reviews proposed agenda found in [11-23-2140r](https://mentor.ieee.org/802.11/dcn/23/11-23-1311-00-0uhr-uhr-sg-july-august-2023-teleconference-agendas.docx)9
    - Discussion:
      * Chair call for additional submissions regarding the MAP topic.
      * There was no offer.
  + Agenda approved with unanimous consent.
* Technical Submissions – TXOP Sharing:
  + [11-23/1874r](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx)0 Reverse TXOP sharing Sindhu Verma (Broadcom)
    - C: In slide 9, you can get better packet efficiency including the latency sensitive traffic within a BSS, but I don’t see how that works for OBSS.
    - A: Even across BSS, a lot of duration are wasted in terms of channel access or waiting for low latency or priority traffic to finish before high priority traffic can get on the air. This is a symmetrical solution to EHT triggered allocation. When the AP schedules multiple clients on the uplink, it also in a way omits the difrrent caps that could have existed before 11ax between multiple uplink transmission. However, from many evaluations we consider the benefits the latency performance of any system. So, it’s just a symmetry fot that. The same things will happen just that the non-AP STA is able to initiate it.
    - C: I’m worred about collisions when the attend to initiate. My assumption is that the AP is continueing on half of its TXOP, each AP triggers every associated STA, and they can coordinate amongst themselves and that works. And they can even coordinate over the wire. I don’t know it just feels quite disruptive.
    - A: We are not saying that one should take away the centralized scheduling and replace it with that. Even with centralized scheduling, there are decision at the AP where it would MU EDCA in some cases and not in some case, especially for latency traffic. Scheduled access can be resulted in low lagency. So, whenever scheduled centralized schedukling, the AP initiated scheduling has not been used whenever, and there is an occurrence of a TXOP be acquird by the non-AP STA. Increasing the percentage of time that the non-AP is trying to access, this may be useful but some clienets never responds with CTS because it is in the vicinity of some interference so that it cannot respond. In that case, it should allow a non-AP STA to initiate TXOP and transmit downlink data.
    - C: Regarding fairness, if TXOP choose a that extaly fits a data, this would push it to be more flexible, choose a longer duration and then share it with the AP. This can help DL latency traffic but if there are non-Wi-Fi devces that are operating in the same medium, it becomes moore difficult to obtain channel access. Also, for uplink latency sensitive traffic, I’m not fully sure if this would help because you are still relying on the AP to transmit trigger-based operation.
    - C: And 2nd Question is if a non-AP STAs sets a longer NAV, a lot of STA will do. But based on virtual NAV, they will back off or go to power save. Is this helpful for the AP?
    - A: You are assuming that TXOP sharing means reserving a certain NAV and thesharing with the AP; however, that is not. What we are trying to say here is that sharing a TXOP is permitted by the regulations, given tha wait time you have spent in orider to acquire it as long as you maintain safe between consecutive transmission. To keep others quitet and using it, you just maintain SIFS gaps between frames and continue the occupancy of the channel as per the limits the regulations allow. Regarding UL latency sensitive traffic, if the AP gets to schedule more often than it was getting to, then it wil be able to schedule traffic more often. So, for example, if transmission was conducted upon the AP acquireing the TXOP, it is coordinated upon the AP acquiretng the TXOP or the AP etting a shared resource from another non-AP. SO, in that way, the probability of transmission of latency sensitive traffic on the uplink also can increase.
    - C: My point is that it puts the control at the AP rather than getting the non-AP STA.
    - C: I am thinking that AP has buffer traffic, we need the AP to report traffic to the STAs? The buffer information is not only for non-AP STAs but also but also for an AP.
    - A: Are you asking should the AP have buffer status report form other non-APs associated with it, too? If do so, it can decide which traffic to priotrize downlink and applying place as well as low-langecy and non-low lagency traffic and accordingly utilize TXOP.
    - C: Do we need buffer status for every STA?
    - A: I’m not able to understand the question. The AP utilized whatever information it’s utilizes for transmitting any downlink or scheduling traffic.
    - C: I mean you assume non-AP does not have this information.
    - A: It is just terminated so the sharing could be as simple as in the last packet that is transmitted, and this was the access category. If the AP has traffic to send, it can follow it up with SIFS gaps or it can simply or abandonment. The AP and any other transmitter can then get on the channel with the conventional EDCA.
    - C: Are you planning to apply some modification of the MU-RTS trigger frame for this TXOP sharing?
    - A: That remains to be decided not yet. If a new frame is defined, that can be used for uplink transmission.
    - C: I have a concern about overehead increase due to wasting the rest of remaining TXOP.
    - A: One would assume that the AP ultimately would have a control over whather this feature is getting exercised or not, and it should be probably light it up only in cases where it is beneficial. In some cases where the non-AP transmits its last packet with the sharing information, the overhead can be minimal.
    - C: If we have two BSSs and most of them are using those stuff, it affets each other negatively. It would introduce that each STA obtains much longer TXOPs since they give opportunisticly to others. What I’am trying to say is there a trade-off between introducing longer TXOP in the channel and medium efficiency. In addition, it is very hard to think about asking this scheme as mandatory. It should be at the STA’s decision to do or not.
    - A: On the second question, to regulate that scheme, we are open to all kinds of mechanism including existing TXOP sharing or reverse direction, et cetra. The AP schedules multiple uplink client int the same TXOP based on triggerd access in 11ax. I can share simulation results in a follow-up presentation. It would enhance the performance of the proposed scheme.
    - C: When you say like the VI or VO might occupy the channel this might be me because if you lookat this not from an OBSS poercpevtive but from a network perspective, if a long TXOP block in a BSS, OBSS APs/STAs are blocked from VI or VO to access the channel. If we have to put in mind that introducing longer TXOPs and everybody is using it, at the end, it’s gonna be harmful to latency performance.
    - A: I disagree.
    - C: Your proposal seems to be opportunistic manner. When some TXOP remains, then you allocate it to another STA. In order to process this work, I think there needs to be some expectations setup like so that other STAs can depends on timely arrival of such TXOP.
    - A: We don’t envision any interaction between two different non-APs. So, from the perspective of the AP, which is a beneficially of this scheme. This is just a trigger from that comes from its AP.
    - C: Can the non-AP allocate the remaining TXOP to another non-AP STA?
    - A: No. Because a non-AP STA does not have buffer status or scheduring information between them. What we are saying is that a non-AP handle resource fairly.
    - (Comments and answers on the chat window --- from here---)
    - C: Thinking out loud one way it might work without any BSR is: STA just sets NAV for duration of {frame allocating remaining TXOP to AP + any short response} + PIFS and the AP simply sets NAV for actual transmission time.
    - C: If AP doesnt have anything to transmit to anyone, then it doesnt send anything in response to the frame from non-AP STA allocating TXOP to AP.
    - A: I agree to your last point.
    - A: The non-AP shares its TXOP only after it has finished its own transmission. The AP can use this remaining TXOP for its own transmissions (if it has such low latency data to transmit). If the AP doesn't have such data, then it doesn't use the TXOP; in which case any other contending device steps into the channel and wins a new TXOP for itself.
    - C: No response means the sharing request fails or there is no buffer?
    - C: Whether ap can send an indication for preemption?
    - A: In both cases the shared TXOP naturally lapses and any other contending device can step in and win the channel. So, both these cases can lead to the same outcome.
    - C: Preemption indication can be transmitted at any time in a TXOP, but R-TXS can occur if the TXOP holder ends its transmission.
    - A: Increasing the average TXOP does not harm latency in this scenario. An OBSS would be harmed by another BSS using this scheme only if this BSS uses a larger share of the channel than the OBSS. This does not happen in this case.
    - C: If preemption is allowed, the AP may transmit a preemption request to a TXOP holder and transmit LL traffic at any time in a TXOP without R-TXS. No need to transmit R-TXS request for this case.
    - (Comments and answers on the chat window --- to here---)
* Technical Submissions – MAP:
  + [11-23/1844r](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx)0 Buffer Status Report in Multi-AP Pei Zhou (TCL)
    - C: I understand you are assuming a TXOP owner like sharing sharing AP correct buffer status report (BSR) form shared APs, is that correct?
    - A: Yes. My intension is that the shared AP report of their BSR through sharing AP.
    - C: In that case, how should shared APs transmit unsolicited CBSR? I think a trigger frame is necessary for this case.
    - A: For example, a shared AP may transmit management freme ro QoS frame to sharing AP before the coordination happens.
    - C: Regardless of the existing of request frame from the sharing AP, right?
    - A: Yes. This can also be considered as an indication to the sharing issue. The shared ap may need to coordinate as media.
    - C: How do we understand why it is better to report the buffer status rather than to report the required time if the sharing AP doesn’t know transmission parameters of the shared AP?
    - A: The buffer status is just assistant information. We need more information to determine jointly how much time allocated to the shared AP.
    - C: In that case, because you have some claims that reporting the time is not preferred. So, why not just report the time?
    - A: If the shared AP request more resource than needed then to share the sharing AP may not know how to form the allocation.
    - C: But BSR information has the same issue.
    - A: Yes. For example, there is BSR information for three shared APs, the there is the sharing issue, and some algorithms is needed to resolve that. To execute that, BSR information is needed. That is my thinking.
    - C: I have a question about solicited report. When the AP obtains the TXOP by itself and it reports the TXOP to another AP, which will be holder in the future is that a way?
    - A: Yes.
    - C: If there are multiple shared APs, you cannot expect who will be needed as the owner of the next TXOP. It is hard to for an AP to unsolicitly expect that. Some information such as bradcast way is needed.
    - A: I think maybe we will have more AP coordination if we have this concepot, there will be several APs coodinated. I don’t think we need to broadcast the BSR maybe the groupcast or unicast transimission is needed.
    - C: Are the AP groups fixed?
    - A: Maybe not fixed I assume two or three candidate groups.
    - (Comments and answers on the chat window --- from here---)
    - C: q: how does an AP-1 create a resource allocation for AP-2 based on queue size info at AP-2? if it doesnt know MCS, NSS to be used by AP-2.
    - (Comments and answers on the chat window --- to here---)
  + [11-23/1871r](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx)0 M-AP Coordinated Transmission framework Arik Klein (Huawei)
    - C: Agree in principle for unified framework. In slide 6, you define 4 steps. If backhaul is available, steps can the steps 1 and 2 be skippied?
    - A: We are not looking into the situation. If the wireless backhauls between the AP that we also do it through the wireless. We can also be done via wireless.
    - C: If they don’t have backhaun connection, the coordination agreement of two APs such as authentication can be avoided.
    - A: We are not getting into details, but I agree it in principle that autencitation need to be part of the negthation before AP coordination.
    - C: I totally agree with the importance of unified framework for AP cooridnation. On the second bullet in slide 9, you say that “Switching primary channel in Co-OFDMA coordination scheme.” Could you tell the reason of it?
    - A: Because at least in case that the coordinated OFDMA is done where the each of the BSS is going to use part of the entire bnadwidth, that is third by the sharing ap each BSS will use only a portin of that. According to agreement and the sharing AP, resource assignments of the BSS will work. It’s optional if it do not have to done and it does not have to be for all the shared APs but we have identified that it will be needed in case of coordination.
    - C: Generally, it makes a lot of sense. Slide 6 states the discovery and agreenment and so on. Do you envision defining the signaling specifically for all cases or basically it is more of a conceptual view?
    - A: We are ging to hear the opinion of TGbn members that such a movement needs to be taken afterward we will have some other further submission. This submission is the basis.
    - C: I suggest that you should consider there are different deployment scenarios. (e.g., explicit signaling may not requird when backhaul links works in enterprise environment.) When you think about the next level details, I suggest to leave the door open for both of the cases where signaling is needed and not needed.
  + [11-23/1981r](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx)2 Multi-Link based Multi-AP Coordination for Low-Latency Traffic Jiayi Zhang (Ofinno)
    - C: In slide 3, I do not totally agree with your problem statement. Generally, you want to give your low latency streams exist to all the links so that whichever is available free they can transmit on, and you may make sure that one link is more likely to work or low-cost traffic. I think that would not be a good design. I would want a more genera solution. As earlier presentations show, effective reporting such as BSR thereby covers not only the low latency traffic but also other classes of traffic, too. This seems like a general solution that would address this particular use case also.
    - A: We are not limited to one link for low-latency traffic in silide 4. For example, link 2 may have higher priority to the traffic. To try to avoid latency and interference, another link can be available.
    - C: In slide 5, there would be a notification exchange from the AP MLDs 1 and It is seemed to be periodic.
    - A: If it is It can be scheduled or unscheduled.
    - C: If it is not scheduled, is it is a kild of prediction-besed?
    - A: In either way one’s prediction or notification after making setup, then maybe the AP MLDs one or two, they can then set a priority for links. But the concept is still the same. It works both of scheduled and non-scheduled fashion.
  + [11-23/2064r](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx)0 STA Assisted Multi-AP Coordination Tuncer Baykas (Ofinno)
    - (The presentation was postponed due to absence of the presenter.)
  + Call for presentation.
    - Xiangxing offered to present 11-23/2015r0.
    - The agenda change was approved with unanimous consent.
  + [11-23/2015r](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx)0 HT Control field extension Xiangxin (Spreadrum)
    - C: In slide 3, +HTC field indicates whether there is an HT control field. In HT control field, there are some bits which tell you whether it’s HT, VHT or HE. If it indicates HE, that contains A-Control. I am not quite understanding what you are signaling with the retry of 0 +HTC of 1. Could you please clarify it.
    - A: With +HTC subfield of 1 and the retry of 0, it’s HT control field. With +HTC of 1 and retry of 1, it’s A-Contorl Expansion to indicate UHR.
    - C: You don’t need an extra bit because with the retry of 0 and +HTC of 1 then it’s an A-Control according to Table 9-15 (HT Control field format (11ax)) in REVme D4.0.
    - A: I propose to define the A-control expansion, not A-control.
    - C: What is the difference between the A-Control and the A-Control Expansion?
    - A: A-Control Expansion is a new field, which overrides the the HT Control field. Let’s take offline discussion.
    - C: The current A-Control is a kind of older control ID. However, when the control ID is equal to 15 that is already used for future extension. We can define additional IDs.
    - A: Previously, we planned expansion a control field, I think my proposal is easier and there is no overhead.
    - C: Basically, A-Control will be used not only UHR even for HT PPDU. We may still use some of the functions in the A-Control. SO, you cannot combine withing assuming that with UHR. To use retry bit may cause interoperability problem with lagecy STAs.
    - A: We can take further discussion. A legacy STA just uses the retry field as retry indication. A UHR or beyond STA uses it to indicate the A-Control Expansion field.
    - C: It causes confusion. The receiver needs to understand what the bit, especially in the field control what does it mean, that s not very robust.
    - C: I have a similar comment to the previous commentor. We have some reserved ID control value and can use it for expansion.
    - C: This way is easier and no overhead.
    - (Comments and answers on the chat window --- from here---)
    - C: The problem is that there are only 5 A-Control IDs are reserved. And the assumption he is making is that we will need more of these in the future. So, the presentor is proposing a way to expand it.
    - C: The presentor may think entries in current A-control are not enough, then it requires expansion.
    - C: So, by "Expansion" means "Alternative"?
    - C: Addtional A-control IDs
    - C: The format could be completely different from the current A-Control format?
    - C: Yes or no, up to the author.
    - C: The forma is TBD yet.
    - (Comments and answers on the chat window --- to here---)
  + Call for presentation.
    - Jiayi offers to present 11-23/1980r0.
    - The agenda change is approved with unanimous consent.
  + [11-23/1980r](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx)1 Coordinated AP-assisted Medium Synchronization Recovery

Jiayi Zhang (Ofinno)

* + - C: In slide 4, some message then you can send another framework because the block ACK is not received at a transmitter side. It may seem that this packet recetpion is fail and the transmitter transmits another packet maybe with lower MCS at least just increase the possibility of received.
    - A: Yes.
    - C: What is the possibility for that case (long time interference)?
    - A: The OBSS intefrence obvouisly the AP may not aware because the OBSS interference is outside of ESS.
    - C: I think maybe that possiblily is quite low.
* AoB:
  + Chair asks for uploading the submission 24 hours prior to the teleconference.
  + Chair answered the remaining teleconference in 2023 and there is only one time schedule on 18th December.
  + Chair clarified the colors of marker in the agenda. Yellow, green, and red mean “scheduled”, “completed”, and “cancelled” respectively.
* Adjourned at 12:00 ET

# 7th Conf. Call: December 19th Monday (19:00-21:00)

* The Chair, Alfred Asterjadhi (Qualcomm), calls the meeting to order.
* 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 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

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* Attendance reminder.
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  + Please record your attendance during the conference call by using the IMAT system:
    - 1) login to [imat](https://imat.ieee.org/attendance), 2) select “802.11 Telecons (<Month>)” entry, 3) select “C/LM/WG802.11 Attendance” entry, 4) click “<UHR SG > conference call that you are attending.
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  + Please ensure that the following information is listed correctly when joining the call:
    - "[voter status] First Name Last Name (Affiliation)"
* Agenda
  + Chair reviews proposed agenda found in [11-23-2140r](https://mentor.ieee.org/802.11/dcn/23/11-23-1311-00-0uhr-uhr-sg-july-august-2023-teleconference-agendas.docx)10
    - Discussion: None.
  + Agenda approved with unanimous consent.
* Technical Submissions – MAP:
  + [11-23/2064r](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx)0: STA Assisted Multi-AP Communication Tuncer Baykas (Offino)
    - C: In slide 7, is a RTWT frame broadcasted, right? I don’t understand how this would generalize to muptiple STAs. The AP 2 doesn’t know which STAs would actually get scheduled. Is your intention that the AP 2 will get information for all members and then calculate the worst case transmit power and then do something?
    - A: If such a thing happens, probably, the AP 2 will receiver too many STAs. If the number of STAs is limited this can be done. All STAs which can hear beacon with the power. So, the AP 1 can configure the STA which is the closest to the AP 2 to announce the RTWT at that. That is the grouping by itself while giving RTWTs as well. Sending all of the STAs this information will basically decrease the total system throughput.
    - C: Typically, enterprise scenarios APs wouldn’t rely on the STAs’ announcement. A critical function of enterprise APs is to know information between APs. But even if they’re not managed by their networks, the APs will siten to these other beacons and channel switching is done. The idea of STA-relying information in AP is probably not most natural approach.
    - A: We were looking for a probably a last mile solution because if the AP can communicate directly with each other, of course, we don’t need to such STA-relaying approach. However, we believe that there could be some cases that on the edge STAs which are affected. We would like to provide less interference environment to such STAsinterference free.
    - C: We are still early in the process to define what the actual operation is gonna be. Probably it can be simpler and more scalable. Two level of TWT and RTWT should be considered. And then we may have some additional mechanisms working on top like spatial reuse, coordinated spatial reupse or TXOP sharing which define how the actual communication happens.
    - C: There is a trust issue. Somewhat problemacic like the main kind fo question rises that why would I follow this advice? What is the benefit I am getting from the advice? Why could this station be kind of providing such information or vice versa? Why anybody would listen to the information is a kind of a challenge on this proposal.
    - A: Regarding trsut issue, since the AP 2 can listen to the enviromnment actually if nothing happens in the RWTW. The AP 2 can basically learn from it. If there is untrusuted information in the environment, it can remove from there. I would say warning to the AP 2 that OK, there will be higher interference at that time and it will affect you or if you communicate it will affect me. The trust problem is still there even if those APs communicate to each other directly and it is general trust issue.
    - C: For AP coordination, 11be faces the risk consensus that two AP could directly hear with each other so that will make the cooperation simpler. If we try to discuss this scenario that they cannot hear each other, then I think maybe first we should first consider the case where two AP could directly hear with each other and should considere whether there is enough benefit. Question is in slide 8, if the two AP’s area overlap with each other, the transmit power or rate is reduced. Is there any coordinator to optimize the two APs?
    - A: A kind of coordinator could be one of the solutions. It will require more coordination between the APs and here I was assuming that the STA should start link the information between APs. I think TGbn may look at the pros and cons of such solutions in the futhre.
    - C: If thereis a codinator or negotioation that may make it more complex because of the prioritizing between neighbor APs.
    - (Comments and answers on the chat window --- from here---)
    - C: STA1 set up trust mode with AP2 before coordination happened?
    - (Comments and answers on the chat window --- to here---)
* Technical Submissions – Misc:
  + [11-23/1877r](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx)1: Analysis on the LDPC rate matching Xiaogang Chen (Spreadrum)
    - C: In your option 1, the reason of this work is because you’re assuming that you like to know exactly where the padding bits are. But there is no padding in option 1. You just hava symbol boundary or segment baoundary here.
    - A: Yes.
    - C: The major inmact seems to be the spanning up the boundaries, right? Depending on how many boundaries you have, is this mostly about short packets?
    - A: In the reference, I give some analysis on the real packet length distribution, and most are short.
    - C: What’s happening in the field in terms of packet sizes? I’m just trying to understand theoretically. Is this effect mostly seen for short packet?
    - A: If you see slide 7, the x axis is up to 3,000 bytes. Some gain is still observed. The larger the packet size, the smaller the gain.
    - C: In slide 3, as I remember, the reason that we changed the padding mechanism from 11ac is that you do not need to indicate the exact length for each user in MU mode and the other case. How do you think we can balakce the power consumption of the users receiving short packets and you want to change that power consumption for this reason.
    - A: The power consumption is saved by the small code word. Regarding the padding, I assume it is done at MAC layer opportunisticly.
    - C: For option 3a, you still want to increase the granularity but keep the prefex factor?
    - A: It’s a little bit not intuitive, I metion finer granurality is only applied when you calculated padding.
    - C: When you calculated a large PSDU, does it still use the large grarunarity?
    - A: Yes. If the legend in the figures has the extra symbol, it means it’s enforced.
    - C: What are differences between two green curves?
    - A: Some of the green cross is on the top and overlaped with the green cross. The green cross plot is the case with extra symbol.
    - C: But for the options there plus Extra is also five bits.
    - A: Yes.
    - C: Current LDPC scheme in 11ac onward, equires the receiver to decode at least one code word per user at the end of the data field even for users with very narrow RU. It really hurts user scability and is much harder to support high user counts. That does seem like your option one is potentially favorable for user scalability because I don’t think it has that property ir it does seem to have a pretty high preamble cost. Have you looked at that would make high user scalability more or achievable?
    - C: You mentioned 32 users, obviously we can do a lot more potentially with OFDMA?
    - A: Maybe you talk about enterprise scenarios, and I don’t have 32 STAs. The reason I’m thinking 32 is a really a lot.
    - C: 32 is good number, but if you wante nto build something with much more, I guess there’s constraint number of users int terms of complexity of Tx/Rx side. I think the biggest one is that you need to decode, at least one code with per user at the end of the data field, even if it’s only a few extra data bits.
    - A: Your point is you want to extend the number of the users and, to accomplish it, you want to remove the limitation of one code per use, I guess.
    - C: If some of the data for a user finished well before the end of the data firld, then you wouldn’t need to decode LDPC with for the user at the very end so that would be a good way to get to more users without requiring more legacy decoding resources or reducing the number of iterations, et cetra.
    - A: I didn’t think pretty much on that direction. I want to talk it offline.
    - C: Sounds good.
  + [11-23/1938r](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx)1: Beacon design with and without multiple BSSID support

Liwen Chu (NXP)

* + - C: We have to make sure that we don’t compromise security. Because now that we protect beacons and we advertise security parameters, we need to make sure we are doing it consistency on all links.
    - A: I think so, too.
    - C: Also, we should take a look at basically what the process is for a non-AP STA or non-AP MLD to discover the AP or the AP MLD. Because sometimes when you simplify their things on the AP side, you increase the amount of power consumption it takes to discover the networks.
    - A: I think I consider that one.
    - C: I just think if we start developing this more, we need to make sure.
    - A: We have to do the procedure if a single link to do the link operation. This problem we have to do that.
    - C: This starts looking to me like essentially pilot frames that were defined in back in 11k. and maybe one of the ways to do this with minimal overhead is to just take what already has been done for the pilot frame rather than create sometiong totally new.
    - A: If that is applicable, yes, we can do something based on that.
    - C: In slide 3, if the AP doesn’t have lagecy devices associated, further optimization could be. I think it is correct but if you dont’transmit normal beacon, lagecy devices can not discover the AP.
    - A: I put it on the bullet below and such information is carried by a beacon frame.
    - C: Are you saying that you don’t come up with new type and subtypes for the new frame you want and use the existng beacon type even if much information is missed in a beacon?
    - A: Yes.
    - C: I need to check that if that is really the case.
    - A: We can double check for this.
    - C: I do follow your thinking kind of analyzing that what is the most relevant filed and then kind of selecting those for the “mini-beacon” themselves. Some of the STAs are passive scanning and they monitor constantly beacons on different channels. So, a kind of forcing active scanning is the only way to discover on an AP might not be disabled on all the case. I think it is good choice, but passive scanning should be still able to work even if we have to do active scanning.
    - A: At least for me, it is not needed to move away from passive scanning in some sense.
    - C: About your light beacon, if there is no legacy device, then you transmit it. But in most practical cases, there would be some legacy devices. This is not something like aggregation of new information in separate part of another link and transmission. You are not saying that, right?
    - A: This proposal tries to address the beacon broading issue. Beacon will keep increase in 11bn and future amendments. Once we have this kind of mechanism, we can avoid beacon broating.
    - C: In slide 8, you are saying if no legacy devices is associated to the AP.
    - A: This is only for the UHR relating information. If this AP allow legacy association, it cannot use this optimization.
    - C: Question about the beacon bloating. You are not saying about splitting of beacon and transmitting separetely, right?
    - A: If’s a group decide with the not full UHR client information, it is not currently confusing indicated.
    - C: I understand that the direction the main derection here is not to advertise all the UHR IEs and not to increase the size of peak. I think it is a good goal. But having it is in separate, that would affect a few things. It would affect several processes at the decision side, so we should really be careful. We have listed in Slide 5 and 6 that would go into this slide. Repetitition of the existing field in legacy beacon. maybe we can achieve the same goal as you said.
    - A: We do not propose a new frame. We want to remove UHR information from beacon and carry the information by another frame.
    - C: Does it mean the information is carried by another legacy beacon frame?
    - A: No. In this proposal, we will avoid overhead.
    - C: Where does the content of slides 4, 5 and 6 what are they supporsed to appear?
    - A: This is supposed to be in the beacon of the try to avoid removing further information from a beacon.
    - C: On the 2nd bullet in slide 7, do you think it possible to prohibit the AP transmit a beacon if it doesn’t support legacy STAs’ association? Because we already allow it for the mobile APMLD. I think we can do it in that way.
    - A: We need further discussion. If you start to select channel it will do some scanning to see that the neighbor environment.
    - C: What abou the advertising that is done also by the beacon-like broadcast TWT or advertised they need to link-maping?
    - A: For the associated APMLD, this is on demand if the AP update this, like other critical date update update. We will announce it, otherwiseit will not just like other predicted updates.
    - C: Thank for your clarification.
  + [11-23/1945r](https://mentor.ieee.org/802.11/dcn/23/11-23-1138-01-0uhr-features-to-consider-for-efficient-relay-operation.pptx)1: Information sharing between layers 　Atsushi Shirakawa (Sharp)
    - C: Are you trying to introduce new RXVECTOR parameter?
    - A: We are studying more but we want change to get some information from PHY layer.
    - C: I maen that this RXVECTOR between PHY and MAC layer is an internal interface. So, this is proprietary solution, isn’t it? For examplw, CSI metrics we do only define the matrix size, so we don’t know the limit any size and thus we can measure any CSI information and upload it to the upper layer and use it for the own purpose. What RXVECTOR paremeter would you like to define?
    - A: I understand your point. But I don’t have an actual parameter now. But my intention is only to open the parameters to the AI/ML areas.
    - C: We have discussed before, and I share similar view as some of information is transmitted internally from lower layer to high layer. It is more of a propoeiaetary design ans also depends on, for example, chip designs.
    - A: Thank you for your comment.
    - C: What do you propose to defineing informatin exchange, frame format, information bit, and so on, for standardization? What exactry is it that you’re proposeing will do in 802.11?
    - A: My understanding is that 11k already standardized some kinds of interface measurement and sharing the result to upper layer. The measurement results can be shared to the SME. It means that application can access the measuirement results from upper layer.
    - C: What it that is not there today that you want to inetroduce that will help this to happen.
    - A: For example, frame dropping rate, the number of STAs in a link. These kinds of information will help application layer.
    - C: Regarding application corol on the PHY performance, is there only one entity application layer that controls the PHY performance? I mean, what if there are multiple applications which want PHY layer performance differently?
    - A: We consider only one AI/ML function which control PHY layer.
    - C: You mean there would be only one AI/M L which chould control PHY Layer.
    - A: Yes.
* AoB:

None.

* Adjourned at 20:55 ET

# Appendix

* (Attendee List for the 1st and 2nd Conf. Call will be added.)
* Attendee List for the 3rd Conf. Call:

|  |  |  |  |
| --- | --- | --- | --- |
| Breakout | Timestamp | Name | Affiliation |
| TGbn | 12/4 | Adachi, Tomoko | TOSHIBA Corporation |
| TGbn | 12/4 | Aio, Kosuke | Sony Corporation |
| TGbn | 12/4 | Ajami, Abdel Karim | Apple Inc. |
| TGbn | 12/4 | Anwyl, Gary | Mediatek Inc |
| TGbn | 12/4 | Asai, Yusuke | Nippon Telegraph and Telephone Corporation (NTT) |
| TGbn | 12/4 | Asterjadhi, Alfred | Qualcomm Incorporated |
| TGbn | 12/4 | Baek, SunHee | LG ELECTRONICS |
| TGbn | 12/4 | Batra, Anuj | Apple Inc. |
| TGbn | 12/4 | Baykas, Tuncer | Ofinno |
| TGbn | 12/4 | Bian, Tong | Panasonic |
| TGbn | 12/4 | Cha, Dongju | LG ELECTRONICS |
| TGbn | 12/4 | Chen, Junbin | TP-Link Corporation Limited |
| TGbn | 12/4 | Chen, You-Wei | MediaTek Inc. |
| TGbn | 12/4 | CHENG, yajun | Xiaomi Communications Co., Ltd. |
| TGbn | 12/4 | CHERIAN, GEORGE | Qualcomm Incorporated; Qualcomm Technologies, Inc |
| TGbn | 12/4 | Chitrakar, Rojan | Huawei Technologies Co., Ltd |
| TGbn | 12/4 | Cho, Hangyu | LG ELECTRONICS |
| TGbn | 12/4 | Choi, Jinsoo | LG ELECTRONICS |
| TGbn | 12/4 | Chu, Liwen | NXP Semiconductors |
| TGbn | 12/4 | CHUN, JINYOUNG | LG ELECTRONICS |
| TGbn | 12/4 | Cui, Yaoshen | TP-Link Corporation Limited |
| TGbn | 12/4 | Dong, Xiandong | Xiaomi Communications Co., Ltd. |
| TGbn | 12/4 | Erkucuk, Serhat | Ofinno |
| TGbn | 12/4 | Fang, Juan | Intel Corporation |
| TGbn | 12/4 | Fang, Yonggang | MediaTek Inc. |
| TGbn | 12/4 | feng, Shuling | MediaTek Inc. |
| TGbn | 12/4 | Fischer, Matthew | Broadcom Corporation |
| TGbn | 12/4 | Gao, Ning | Guangdong OPPO Mobile Telecommunications Corp.,Ltd |
| TGbn | 12/4 | Ghosh, Chittabrata | Apple Inc. |
| TGbn | 12/4 | Gu, Junrong | Clourney Semiconductor |
| TGbn | 12/4 | Gu, Xiangxin | Spreadtrum Communications (Shanghai) Co., Ltd. |
| TGbn | 12/4 | Gupta, Binita | Cisco Systems, Inc. |
| TGbn | 12/4 | Ha, Taeyoung | Samsung Electronics Co., Ltd. |
| TGbn | 12/4 | Haider, Muhammad Kumail | Meta Platforms, Inc. |
| TGbn | 12/4 | Hamilton, Mark | CommScope |
| TGbn | 12/4 | Hart, Brian | Cisco Systems, Inc. |
| TGbn | 12/4 | Hedayat, Ahmadreza | Apple Inc. |
| TGbn | 12/4 | Hervieu, Lili | CableLabs |
| TGbn | 12/4 | Ho, Duncan | Qualcomm Technologies, Inc |
| TGbn | 12/4 | HUANG, CHIHAN | MediaTek Inc. |
| TGbn | 12/4 | Huang, Po-Kai | Intel Corporation |
| TGbn | 12/4 | Inohiza, Hirohiko | Canon |
| TGbn | 12/4 | Jang, Insun | LG ELECTRONICS |
| TGbn | 12/4 | Jeon, Eunsung | SAMSUNG ELECTRONICS |
| TGbn | 12/4 | Kabbinale, Aniruddh | SAMSUNG |
| TGbn | 12/4 | Kain, Carl | USDOT; Noblis |
| TGbn | 12/4 | Kalamkar, Sanket | Qualcomm Incorporated; Qualcomm Technologies, Inc |
| TGbn | 12/4 | Kamel, Mahmoud | Interdigital Inc. |
| TGbn | 12/4 | Kim, Geon Hwan | LG ELECTRONICS |
| TGbn | 12/4 | Kim, Sang Gook | LG ELECTRONICS |
| TGbn | 12/4 | Kim, Sanghyun | WILUS Inc. |
| TGbn | 12/4 | Kim, Youhan | Qualcomm Technologies, Inc. |
| TGbn | 12/4 | Kishida, Akira | NTT |
| TGbn | 12/4 | Klein, Arik | Huawei Technologies Co., Ltd |
| TGbn | 12/4 | Kuo, Chih-Chun | MediaTek Inc. |
| TGbn | 12/4 | Lee, Gwangho | Korea National University of Transportation |
| TGbn | 12/4 | Lee, Hong Won | LG ELECTRONICS |
| TGbn | 12/4 | Li, Jialing | Qualcomm Technologies Inc. |
| TGbn | 12/4 | Li, Weiyi | Spreadtrum Communications, USA |
| TGbn | 12/4 | li, yan | ZTE Corporation |
| TGbn | 12/4 | Li, Yapu | Guangdong OPPO Mobile Telecommunications Corp.,Ltd |
| TGbn | 12/4 | Lim, Dong Guk | LG ELECTRONICS |
| TGbn | 12/4 | Lu, Liuming | Guangdong OPPO Mobile Telecommunications Corp.,Ltd. |
| TGbn | 12/4 | Ma, Yongsen | SAMSUNG ELECTRONICS |
| TGbn | 12/4 | Ma, Yunsi | HiSilicon Technologies Co., LTD. |
| TGbn | 12/4 | Mehrnoush, Morteza | Apple Inc. |
| TGbn | 12/4 | Minotani, Jun | Panasonic Corporation |
| TGbn | 12/4 | Monajemi, Pooya | Apple Inc. |
| TGbn | 12/4 | Montemurro, Michael | Huawei Technologies Co., Ltd |
| TGbn | 12/4 | Morioka, Hitoshi | SRC Software |
| TGbn | 12/4 | Motozuka, Hiroyuki | Panasonic Holdings Corporation |
| TGbn | 12/4 | Mutgan, Okan | Nokia |
| TGbn | 12/4 | Naik, Gaurang | Qualcomm Technologies, Inc |
| TGbn | 12/4 | Nayak, Peshal | Samsung Research America |
| TGbn | 12/4 | Neishaboori, Azin | General Motors Company |
| TGbn | 12/4 | Noh, Si-Chan | Newracom Inc. |
| TGbn | 12/4 | Nurani Krishnan, Neelakantan | Apple Inc. |
| TGbn | 12/4 | Ouchi, Masatomo | Canon |
| TGbn | 12/4 | Park, Minyoung | Intel Corporation |
| TGbn | 12/4 | Park, Sungjin | Senscomm |
| TGbn | 12/4 | Patwardhan, Gaurav | Hewlett Packard Enterprise |
| TGbn | 12/4 | Petrick, Albert | InterDigital |
| TGbn | 12/4 | Qi, Yue | Samsung Research America |
| TGbn | 12/4 | Quan, Yingqiao | Spreadtrum Communications (Shanghai) Co., Ltd.; Unisoc (Shanghai) Technologies Co., Ltd. |
| TGbn | 12/4 | Ratnam, Vishnu | Samsung Research America |
| TGbn | 12/4 | Redlich, Oded | Huawei Technologies Co., Ltd |
| TGbn | 12/4 | Ryu, Kiseon | NXP Semiconductors |
| TGbn | 12/4 | Sato, Takuhiro | SHARP CORPORATION |
| TGbn | 12/4 | Schelstraete, Sigurd | MaxLinear |
| TGbn | 12/4 | Seo, Sangho | Broadcom Corporation |
| TGbn | 12/4 | Serizawa, Kazunobu | Advanced Telecommunications Research Institute International(ATR) |
| TGbn | 12/4 | Sevin, Julien | Canon Research Centre France |
| TGbn | 12/4 | Shafin, Rubayet | Samsung Research America |
| TGbn | 12/4 | shi, shuyu | TP-Link Corporation Limited |
| TGbn | 12/4 | Shilo, Shimi | Huawei Technologies Co., Ltd |
| TGbn | 12/4 | So, Youngwan | Samsung Electronics Co., Ltd. |
| TGbn | 12/4 | Son, Ju-Hyung | WILUS Inc. |
| TGbn | 12/4 | SUH, JUNG HOON | Huawei Technologies Canada; Huawei Technologies Co., Ltd |
| TGbn | 12/4 | Sun, Bo | Sanechips Technology Co., Ltd. |
| TGbn | 12/4 | Talarico, Salvatore | Sony Corporation |
| TGbn | 12/4 | Tanaka, Yusuke | Sony Corporation |
| TGbn | 12/4 | Taori, Rakesh | Infineon Technologies |
| TGbn | 12/4 | Tsodik, Genadiy | Huawei Technologies Co., Ltd |
| TGbn | 12/4 | Tsujimaru, Yuki | Canon |
| TGbn | 12/4 | Urabe, Yoshio | Panasonic Holdings Corporation |
| TGbn | 12/4 | Wang, Qi | Apple Inc. |
| TGbn | 12/4 | Ward, Lisa | Rohde & Schwarz |
| TGbn | 12/4 | Wei, Dong | NXP Semiconductors |
| TGbn | 12/4 | Wu, Kanke | Apple Inc. |
| TGbn | 12/4 | Wullert, John | Peraton Labs |
| TGbn | 12/4 | Xia, Qing | Sony Corporation |
| TGbn | 12/4 | Xie, gang | Beijing University of Posts and Telecommunications |
| TGbn | 12/4 | Yamada, Ryota | SHARP CORPORATION |
| TGbn | 12/4 | Yang, Jay | ZTE Corporation |
| TGbn | 12/4 | Yano, Kazuto | Advanced Telecommunications Research Institute International (ATR) |
| TGbn | 12/4 | Yoon, Yelin | LG ELECTRONICS |
| TGbn | 12/4 | Yu, Jian | Huawei Technologies Co., Ltd |
| TGbn | 12/4 | Zhang, Jiayi | Ofinno |
| TGbn | 12/4 | Zhang, John | GuangDong OPPO Mobile Telecommunications Corp., Ltd. |
| TGbn | 12/4 | Zhang, Maolin | Huawei Technologies Co., Ltd |
| TGbn | 12/4 | Zhang, Yan | Apple Inc. |
| TGbn | 12/4 | Zhao, Yue | Huawei Technologies Co., Ltd |
| TGbn | 12/4 | Zhu, Yu | TP-Link Corporation Limited |

* Attendee List for the 4th Conf. Call:

|  |  |  |  |
| --- | --- | --- | --- |
| Breakout | Timestamp | Name | Affiliation |
| TGbn | 12/7 | AbidRabbu, Shaima' | VESTEL |
| TGbn | 12/7 | Abouelseoud, Mohamed | Apple Inc. |
| TGbn | 12/7 | Aio, Kosuke | Sony Corporation |
| TGbn | 12/7 | Ajami, Abdel Karim | Apple Inc. |
| TGbn | 12/7 | Ali, Sawaira | Istanbul Medipol University, Vestel |
| TGbn | 12/7 | Asai, Yusuke | Nippon Telegraph and Telephone Corporation (NTT) |
| TGbn | 12/7 | Asterjadhi, Alfred | Qualcomm Incorporated |
| TGbn | 12/7 | Baek, SunHee | LG ELECTRONICS |
| TGbn | 12/7 | Baykas, Tuncer | Ofinno |
| TGbn | 12/7 | Bian, Tong | Panasonic |
| TGbn | 12/7 | Bredewoud, Albert | Broadcom Corporation |
| TGbn | 12/7 | Cha, Dongju | LG ELECTRONICS |
| TGbn | 12/7 | Chen, Junbin | TP-Link Corporation Limited |
| TGbn | 12/7 | Chen, You-Wei | MediaTek Inc. |
| TGbn | 12/7 | CHENG, yajun | Xiaomi Communications Co., Ltd. |
| TGbn | 12/7 | CHERIAN, GEORGE | Qualcomm Incorporated; Qualcomm Technologies, Inc |
| TGbn | 12/7 | Chisci, Giovanni | Qualcomm Technologies, Inc |
| TGbn | 12/7 | Chng, Baw | BAWMAN LLC |
| TGbn | 12/7 | Choi, Jinsoo | LG ELECTRONICS |
| TGbn | 12/7 | Chu, Liwen | NXP Semiconductors |
| TGbn | 12/7 | CHUN, JINYOUNG | LG ELECTRONICS |
| TGbn | 12/7 | Cui, Yaoshen | TP-Link Corporation Limited |
| TGbn | 12/7 | Das, Subir | Peraton Labs |
| TGbn | 12/7 | Dong, Xiandong | Xiaomi Communications Co., Ltd. |
| TGbn | 12/7 | Erkucuk, Serhat | Ofinno |
| TGbn | 12/7 | Fan, Shuang | Sanechips Technology Co., Ltd. |
| TGbn | 12/7 | Fang, Yonggang | MediaTek Inc. |
| TGbn | 12/7 | feng, Shuling | MediaTek Inc. |
| TGbn | 12/7 | Fischer, Matthew | Broadcom Corporation |
| TGbn | 12/7 | Fujimori, Yuki | Canon Research Centre France |
| TGbn | 12/7 | Gao, Ning | Guangdong OPPO Mobile Telecommunications Corp.,Ltd |
| TGbn | 12/7 | Ghosh, Chittabrata | Apple Inc. |
| TGbn | 12/7 | Gu, Xiangxin | Spreadtrum Communications (Shanghai) Co., Ltd. |
| TGbn | 12/7 | GUIGNARD, Romain | Canon Research Centre France |
| TGbn | 12/7 | Ha, Taeyoung | Samsung Electronics Co., Ltd. |
| TGbn | 12/7 | Handte, Thomas | Sony Group Corporation |
| TGbn | 12/7 | Hervieu, Lili | CableLabs |
| TGbn | 12/7 | Hu, Chunyu | Spreadtrum Communications US |
| TGbn | 12/7 | HUANG, CHIHAN | MediaTek Inc. |
| TGbn | 12/7 | Inohiza, Hirohiko | Canon |
| TGbn | 12/7 | Jang, Insun | LG ELECTRONICS |
| TGbn | 12/7 | Kabbinale, Aniruddh | SAMSUNG |
| TGbn | 12/7 | Kain, Carl | USDOT; Noblis |
| TGbn | 12/7 | Kalamkar, Sanket | Qualcomm Incorporated; Qualcomm Technologies, Inc |
| TGbn | 12/7 | Kamel, Mahmoud | Interdigital Inc. |
| TGbn | 12/7 | Kancherla, Sundeep | Infineon Technologies |
| TGbn | 12/7 | Kim, Geon Hwan | LG ELECTRONICS |
| TGbn | 12/7 | Kim, Jeongki | Ofinno |
| TGbn | 12/7 | Kim, Myeong-Jin | SAMSUNG ELECTRONICS |
| TGbn | 12/7 | Kim, Sanghyun | WILUS Inc. |
| TGbn | 12/7 | Kishida, Akira | NTT |
| TGbn | 12/7 | Klein, Arik | Huawei Technologies Co., Ltd |
| TGbn | 12/7 | Koo, Jonghoe | Samsung Electronics Co., Ltd. |
| TGbn | 12/7 | Kuo, Chih-Chun | MediaTek Inc. |
| TGbn | 12/7 | Lanante, Leonardo | Ofinno |
| TGbn | 12/7 | Lee, Hong Won | LG ELECTRONICS |
| TGbn | 12/7 | LEE, JOONSOO | Newracom Inc. |
| TGbn | 12/7 | LEE, Mingyu | Samsung Electronics Co., Ltd. |
| TGbn | 12/7 | Lee, Wookbong | Apple Inc. |
| TGbn | 12/7 | Li, Haozheng | TP-Link Corporation Limited |
| TGbn | 12/7 | Li, Jialing | Qualcomm Technologies Inc. |
| TGbn | 12/7 | Li, Weiyi | Spreadtrum Communication USA, Inc |
| TGbn | 12/7 | Li, Yapu | Guangdong OPPO Mobile Telecommunications Corp.,Ltd |
| TGbn | 12/7 | Lim, Dong Guk | LG ELECTRONICS |
| TGbn | 12/7 | Lim, Yeon Geun | Newracom Inc. |
| TGbn | 12/7 | Lorgeoux, Mikael | Canon Research Centre France |
| TGbn | 12/7 | Lou, Hanqing | InterDigital, Inc. |
| TGbn | 12/7 | Lu, Liuming | Guangdong OPPO Mobile Telecommunications Corp.,Ltd. |
| TGbn | 12/7 | Luo, Chaoming | Beijing OPPO telecommunications corp., ltd. |
| TGbn | 12/7 | Ma, Yongsen | SAMSUNG ELECTRONICS |
| TGbn | 12/7 | Madni, Haji Muhammad | VESTEL |
| TGbn | 12/7 | Maguluri, Anilkumar | SYNAPTICS |
| TGbn | 12/7 | MAO, ZHI | Huawei Technologies Co., Ltd |
| TGbn | 12/7 | Morioka, Hitoshi | SRC Software |
| TGbn | 12/7 | Motozuka, Hiroyuki | Panasonic Holdings Corporation |
| TGbn | 12/7 | Namboodiri, Vamadevan | SAMSUNG ELECTRONICS |
| TGbn | 12/7 | Nayak, Peshal | Samsung Research America |
| TGbn | 12/7 | Ng, Boon Loong | Samsung Research America |
| TGbn | 12/7 | Noh, Si-Chan | Newracom Inc. |
| TGbn | 12/7 | Ouchi, Masatomo | Canon |
| TGbn | 12/7 | Palayur, Saju | Maxlinear Inc |
| TGbn | 12/7 | Park, Minyoung | Intel Corporation |
| TGbn | 12/7 | Park, Sungjin | Senscomm |
| TGbn | 12/7 | Patil, Abhishek | Qualcomm Incorporated |
| TGbn | 12/7 | Patwardhan, Gaurav | Hewlett Packard Enterprise |
| TGbn | 12/7 | Qi, Yue | Samsung Research America |
| TGbn | 12/7 | Quan, Yingqiao | Spreadtrum Communications (Shanghai) Co., Ltd.; Unisoc (Shanghai) Technologies Co., Ltd. |
| TGbn | 12/7 | Ratnam, Vishnu | Samsung Research America |
| TGbn | 12/7 | Ryu, Kiseon | NXP Semiconductors |
| TGbn | 12/7 | Schelstraete, Sigurd | MaxLinear |
| TGbn | 12/7 | Serizawa, Kazunobu | Advanced Telecommunications Research Institute International(ATR) |
| TGbn | 12/7 | Shafin, Rubayet | Samsung Research America |
| TGbn | 12/7 | Shen, Andy | Futurewei Technologies |
| TGbn | 12/7 | shi, shuyu | TP-Link Corporation Limited |
| TGbn | 12/7 | Shilo, Shimi | Huawei Technologies Co., Ltd |
| TGbn | 12/7 | Singh, Aditi | Charter Communications |
| TGbn | 12/7 | Strobel, Rainer | Maxlinear |
| TGbn | 12/7 | SUH, JUNG HOON | Huawei Technologies Canada; Huawei Technologies Co., Ltd |
| TGbn | 12/7 | Sun, Bo | Sanechips Technology Co., Ltd. |
| TGbn | 12/7 | Talarico, Salvatore | Sony Corporation |
| TGbn | 12/7 | Taori, Rakesh | Infineon Technologies |
| TGbn | 12/7 | Tsodik, Genadiy | Huawei Technologies Co., Ltd |
| TGbn | 12/7 | Urabe, Yoshio | Panasonic Holdings Corporation |
| TGbn | 12/7 | Vaidya, Maulik | Charter Communications |
| TGbn | 12/7 | Val, Inaki | MaxLinear, Inc. |
| TGbn | 12/7 | VIGER, Pascal | Canon Research Centre France |
| TGbn | 12/7 | Wang, Qi | Apple Inc. |
| TGbn | 12/7 | Wei, Dong | NXP Semiconductors |
| TGbn | 12/7 | Wentink, Menzo | Qualcomm Technologies, Inc |
| TGbn | 12/7 | Wilhelmsson, Leif | Ericsson AB |
| TGbn | 12/7 | Wu, Kanke | Apple Inc. |
| TGbn | 12/7 | Wullert, John | Peraton Labs |
| TGbn | 12/7 | Xia, Qing | Sony Corporation |
| TGbn | 12/7 | Xu, Yue | Huawei Technologies Co., Ltd |
| TGbn | 12/7 | Yamada, Ryota | SHARP CORPORATION |
| TGbn | 12/7 | Yang, Jay | ZTE Corporation |
| TGbn | 12/7 | Yano, Kazuto | Advanced Telecommunications Research Institute International (ATR) |
| TGbn | 12/7 | Yu, Jian | Huawei Technologies Co., Ltd |
| TGbn | 12/7 | Zhang, Jiayi | Ofinno |
| TGbn | 12/7 | Zhang, John | GuangDong OPPO Mobile Telecommunications Corp., Ltd. |
| TGbn | 12/7 | Zhang, Maolin | Huawei Technologies Co., Ltd |
| TGbn | 12/7 | Zhao, Yue | Huawei Technologies Co., Ltd |
| TGbn | 12/7 | Zhou, Lei | H3C Technologies Co., Limited |

* Attendee List for the 5th Conf. Call:

|  |  |  |  |
| --- | --- | --- | --- |
| Breakout | Timestamp | Name | Affiliation |
| TGbn | 12/11 | Abouelseoud, Mohamed | Apple Inc. |
| TGbn | 12/11 | Adachi, Tomoko | TOSHIBA Corporation |
| TGbn | 12/11 | Ajami, Abdel Karim | Apple Inc. |
| TGbn | 12/11 | Asai, Yusuke | Nippon Telegraph and Telephone Corporation (NTT) |
| TGbn | 12/11 | Asterjadhi, Alfred | Qualcomm Incorporated |
| TGbn | 12/11 | Baek, SunHee | LG ELECTRONICS |
| TGbn | 12/11 | Batra, Anuj | Apple Inc. |
| TGbn | 12/11 | Baykas, Tuncer | Ofinno |
| TGbn | 12/11 | Bian, Tong | Panasonic |
| TGbn | 12/11 | Cha, Dongju | LG ELECTRONICS |
| TGbn | 12/11 | Chen, Junbin | TP-Link Corporation Limited |
| TGbn | 12/11 | Chen, You-Wei | MediaTek Inc. |
| TGbn | 12/11 | CHENG, yajun | Xiaomi Communications Co., Ltd. |
| TGbn | 12/11 | Chisci, Giovanni | Qualcomm Technologies, Inc |
| TGbn | 12/11 | Chitrakar, Rojan | Huawei Technologies Co., Ltd |
| TGbn | 12/11 | Cho, Hangyu | LG ELECTRONICS |
| TGbn | 12/11 | Choi, Jinsoo | LG ELECTRONICS |
| TGbn | 12/11 | Chu, Liwen | NXP Semiconductors |
| TGbn | 12/11 | CHUN, JINYOUNG | LG ELECTRONICS |
| TGbn | 12/11 | Coffey, John | Realtek Semiconductor Corp. |
| TGbn | 12/11 | Cui, Yaoshen | TP-Link Corporation Limited |
| TGbn | 12/11 | Derham, Thomas | Broadcom Corporation |
| TGbn | 12/11 | Dong, Xiandong | Xiaomi Communications Co., Ltd. |
| TGbn | 12/11 | Erkucuk, Serhat | Ofinno |
| TGbn | 12/11 | Fan, Shuang | Sanechips Technology Co., Ltd. |
| TGbn | 12/11 | Fang, Juan | Intel Corporation |
| TGbn | 12/11 | Fang, Yonggang | MediaTek Inc. |
| TGbn | 12/11 | feng, Shuling | MediaTek Inc. |
| TGbn | 12/11 | Fischer, Matthew | Broadcom Corporation |
| TGbn | 12/11 | Gao, Ning | Guangdong OPPO Mobile Telecommunications Corp.,Ltd |
| TGbn | 12/11 | Ghosh, Chittabrata | Apple Inc. |
| TGbn | 12/11 | Gu, Junrong | Clourney Semiconductor |
| TGbn | 12/11 | Gu, Xiangxin | Spreadtrum Communications (Shanghai) Co., Ltd. |
| TGbn | 12/11 | GUIGNARD, Romain | Canon Research Centre France |
| TGbn | 12/11 | Gupta, Binita | Cisco Systems, Inc. |
| TGbn | 12/11 | Ha, Taeyoung | Samsung Electronics Co., Ltd. |
| TGbn | 12/11 | Haider, Muhammad Kumail | Meta Platforms, Inc. |
| TGbn | 12/11 | Hamilton, Mark | CommScope |
| TGbn | 12/11 | Hervieu, Lili | CableLabs |
| TGbn | 12/11 | HUANG, CHIHAN | MediaTek Inc. |
| TGbn | 12/11 | Huang, Lei | Huawei Technologies Co., Ltd |
| TGbn | 12/11 | Huang, Po-Kai | Intel Corporation |
| TGbn | 12/11 | Inohiza, Hirohiko | Canon |
| TGbn | 12/11 | Jang, Insun | LG ELECTRONICS |
| TGbn | 12/11 | Jeon, Eunsung | SAMSUNG ELECTRONICS |
| TGbn | 12/11 | Kabbinale, Aniruddh | SAMSUNG |
| TGbn | 12/11 | Kakani, Naveen | Qualcomm Incorporated; Qualcomm Technologies, Inc |
| TGbn | 12/11 | Kalamkar, Sanket | Qualcomm Incorporated; Qualcomm Technologies, Inc |
| TGbn | 12/11 | Kamel, Mahmoud | Interdigital Inc. |
| TGbn | 12/11 | Kim, Geon Hwan | LG ELECTRONICS |
| TGbn | 12/11 | Kim, Jeongki | Ofinno |
| TGbn | 12/11 | Kim, Sang Gook | LG ELECTRONICS |
| TGbn | 12/11 | Kim, Sanghyun | WILUS Inc. |
| TGbn | 12/11 | Kim, Youhan | Qualcomm Technologies, Inc. |
| TGbn | 12/11 | Klein, Arik | Huawei Technologies Co., Ltd |
| TGbn | 12/11 | Kneckt, Jarkko | Apple Inc. |
| TGbn | 12/11 | Koo, Jonghoe | Samsung Electronics Co., Ltd. |
| TGbn | 12/11 | Lanante, Leonardo | Ofinno |
| TGbn | 12/11 | Lee, Hong Won | LG ELECTRONICS |
| TGbn | 12/11 | LEE, JOONSOO | Newracom Inc. |
| TGbn | 12/11 | LEE, Mingyu | Samsung Electronics Co., Ltd. |
| TGbn | 12/11 | Lee, Wookbong | Apple Inc. |
| TGbn | 12/11 | Levy, Joseph | InterDigital, Inc. |
| TGbn | 12/11 | Li, Haozheng | TP-Link Corporation Limited |
| TGbn | 12/11 | Li, Jialing | Qualcomm Technologies Inc. |
| TGbn | 12/11 | Li, Weiyi | Spreadtrum Communication USA, Inc |
| TGbn | 12/11 | Li, Yanchun | Huawei Technologies Co., Ltd |
| TGbn | 12/11 | Li, Yapu | Guangdong OPPO Mobile Telecommunications Corp.,Ltd |
| TGbn | 12/11 | Lim, Dong Guk | LG ELECTRONICS |
| TGbn | 12/11 | Lim, Yeon Geun | Newracom Inc. |
| TGbn | 12/11 | Lou, Hanqing | InterDigital, Inc. |
| TGbn | 12/11 | Lu, kaiying | MediaTek Inc. |
| TGbn | 12/11 | Lu, Liuming | Guangdong OPPO Mobile Telecommunications Corp.,Ltd. |
| TGbn | 12/11 | Luo, Chaoming | Beijing OPPO telecommunications corp., ltd. |
| TGbn | 12/11 | Ma, Yongsen | SAMSUNG ELECTRONICS |
| TGbn | 12/11 | Ma, Yunsi | HiSilicon Technologies Co., LTD. |
| TGbn | 12/11 | Mantha, Abhishek | Broadcom Corporation |
| TGbn | 12/11 | Mehrnoush, Morteza | Apple Inc. |
| TGbn | 12/11 | Minotani, Jun | Panasonic Corporation |
| TGbn | 12/11 | Montemurro, Michael | Huawei Technologies Co., Ltd |
| TGbn | 12/11 | Motozuka, Hiroyuki | Panasonic Holdings Corporation |
| TGbn | 12/11 | Mutgan, Okan | Nokia |
| TGbn | 12/11 | Naik, Gaurang | Qualcomm Technologies, Inc |
| TGbn | 12/11 | Nayak, Peshal | Samsung Research America |
| TGbn | 12/11 | Neishaboori, Azin | General Motors Company |
| TGbn | 12/11 | Noh, Si-Chan | Newracom Inc. |
| TGbn | 12/11 | Ouchi, Masatomo | Canon |
| TGbn | 12/11 | Palayur, Saju | Maxlinear Inc |
| TGbn | 12/11 | Park, Minyoung | Intel Corporation |
| TGbn | 12/11 | Park, Sungjin | Senscomm |
| TGbn | 12/11 | Patil, Abhishek | Qualcomm Incorporated |
| TGbn | 12/11 | Patwardhan, Gaurav | Hewlett Packard Enterprise |
| TGbn | 12/11 | Petrick, Albert | InterDigital, Inc. |
| TGbn | 12/11 | Qi, Yue | Samsung Research America |
| TGbn | 12/11 | Quan, Yingqiao | Spreadtrum Communications (Shanghai) Co., Ltd.; Unisoc (Shanghai) Technologies Co., Ltd. |
| TGbn | 12/11 | Ratnam, Vishnu | Samsung Research America |
| TGbn | 12/11 | Redlich, Oded | Huawei Technologies Co., Ltd |
| TGbn | 12/11 | Ryu, Kiseon | NXP Semiconductors |
| TGbn | 12/11 | Sato, Takuhiro | SHARP CORPORATION |
| TGbn | 12/11 | Schelstraete, Sigurd | MaxLinear |
| TGbn | 12/11 | Seo, Sangho | Broadcom Corporation |
| TGbn | 12/11 | Serizawa, Kazunobu | Advanced Telecommunications Research Institute International(ATR) |
| TGbn | 12/11 | Shafin, Rubayet | Samsung Research America |
| TGbn | 12/11 | Shen, Andy | Futurewei Technologies |
| TGbn | 12/11 | shi, shuyu | TP-Link Corporation Limited |
| TGbn | 12/11 | Shilo, Shimi | Huawei Technologies Co., Ltd |
| TGbn | 12/11 | Shirakawa, Atsushi | SHARP CORPORATION |
| TGbn | 12/11 | Son, Ju-Hyung | WILUS Inc. |
| TGbn | 12/11 | SUH, JUNG HOON | Huawei Technologies Canada; Huawei Technologies Co., Ltd |
| TGbn | 12/11 | Sun, Bo | Sanechips Technology Co., Ltd. |
| TGbn | 12/11 | Talarico, Salvatore | Sony Corporation |
| TGbn | 12/11 | Taori, Rakesh | Infineon Technologies |
| TGbn | 12/11 | Varshney, Prabodh | Nokia |
| TGbn | 12/11 | Wang, Lei | Futurewei Technologies/Huawei Technologies |
| TGbn | 12/11 | Wang, Qi | Apple Inc. |
| TGbn | 12/11 | Wei, Dong | NXP Semiconductors |
| TGbn | 12/11 | Wu, Kanke | Apple Inc. |
| TGbn | 12/11 | Wu, Tianyu | Apple Inc. |
| TGbn | 12/11 | Wullert, John | Peraton Labs |
| TGbn | 12/11 | Xia, Qing | Sony Corporation |
| TGbn | 12/11 | Xu, Yue | Huawei Technologies Co., Ltd |
| TGbn | 12/11 | Yamada, Ryota | SHARP CORPORATION |
| TGbn | 12/11 | Yang, Jay | ZTE Corporation |
| TGbn | 12/11 | Yang, Jimmy | Moxa Inc. |
| TGbn | 12/11 | Yano, Kazuto | Advanced Telecommunications Research Institute International (ATR) |
| TGbn | 12/11 | Yoon, Yelin | LG ELECTRONICS |
| TGbn | 12/11 | Zhang, Jiayi | Ofinno |
| TGbn | 12/11 | Zhang, John | GuangDong OPPO Mobile Telecommunications Corp., Ltd. |
| TGbn | 12/11 | Zhang, Yan | Apple Inc. |
| TGbn | 12/11 | Zhao, Yue | Huawei Technologies Co., Ltd |
| TGbn | 12/11 | Zhou, Pei | TCL |

* Attendee List for the 6th Conf. Call:

|  |  |  |  |
| --- | --- | --- | --- |
| Breakout | Timestamp | Name | Affiliation |
| TGbn | 12/14 | Adhikari, Shubhodeep | Broadcom Corporation |
| TGbn | 12/14 | Aio, Kosuke | Sony Corporation |
| TGbn | 12/14 | Ajami, Abdel Karim | Apple Inc. |
| TGbn | 12/14 | Anwyl, Gary | Mediatek Inc |
| TGbn | 12/14 | Asai, Yusuke | Nippon Telegraph and Telephone Corporation (NTT) |
| TGbn | 12/14 | Asterjadhi, Alfred | Qualcomm Incorporated |
| TGbn | 12/14 | Baek, SunHee | LG ELECTRONICS |
| TGbn | 12/14 | Bian, Tong | Panasonic |
| TGbn | 12/14 | Bredewoud, Albert | Broadcom Corporation |
| TGbn | 12/14 | Cha, Dongju | LG ELECTRONICS |
| TGbn | 12/14 | Chen, Junbin | TP-Link Corporation Limited |
| TGbn | 12/14 | Chen, You-Wei | MediaTek Inc. |
| TGbn | 12/14 | CHENG, yajun | Xiaomi Communications Co., Ltd. |
| TGbn | 12/14 | Chisci, Giovanni | Qualcomm Technologies, Inc |
| TGbn | 12/14 | Choi, Jinsoo | LG ELECTRONICS |
| TGbn | 12/14 | Chu, Liwen | NXP Semiconductors |
| TGbn | 12/14 | CHUN, JINYOUNG | LG ELECTRONICS |
| TGbn | 12/14 | Chung, Chulho | SAMSUNG |
| TGbn | 12/14 | Ciochina, Dana | Sony Corporation |
| TGbn | 12/14 | Cui, Yaoshen | TP-Link Corporation Limited |
| TGbn | 12/14 | Das, Subir | Peraton Labs |
| TGbn | 12/14 | Di Taranto, Rocco | Ericsson AB |
| TGbn | 12/14 | Dong, Xiandong | Xiaomi Communications Co., Ltd. |
| TGbn | 12/14 | Erkucuk, Serhat | Ofinno |
| TGbn | 12/14 | Fan, Shuang | Sanechips Technology Co., Ltd. |
| TGbn | 12/14 | Fang, Juan | Intel Corporation |
| TGbn | 12/14 | Fang, Yonggang | MediaTek Inc. |
| TGbn | 12/14 | feng, Shuling | MediaTek Inc. |
| TGbn | 12/14 | Fischer, Matthew | Broadcom Corporation |
| TGbn | 12/14 | Fujimori, Yuki | Canon Research Centre France |
| TGbn | 12/14 | Gao, Ning | Guangdong OPPO Mobile Telecommunications Corp.,Ltd |
| TGbn | 12/14 | Gupta, Binita | Cisco Systems, Inc. |
| TGbn | 12/14 | Ha, Taeyoung | Samsung Electronics Co., Ltd. |
| TGbn | 12/14 | Haider, Muhammad Kumail | Meta Platforms, Inc. |
| TGbn | 12/14 | Handte, Thomas | Sony Group Corporation |
| TGbn | 12/14 | Hart, Brian | Cisco Systems, Inc. |
| TGbn | 12/14 | Inohiza, Hirohiko | Canon |
| TGbn | 12/14 | Jang, Insun | LG ELECTRONICS |
| TGbn | 12/14 | Jeon, Eunsung | SAMSUNG ELECTRONICS |
| TGbn | 12/14 | Kabbinale, Aniruddh | SAMSUNG |
| TGbn | 12/14 | Kakani, Naveen | Qualcomm Incorporated; Qualcomm Technologies, Inc |
| TGbn | 12/14 | Kalamkar, Sanket | Qualcomm Incorporated; Qualcomm Technologies, Inc |
| TGbn | 12/14 | Kamel, Mahmoud | Interdigital Inc. |
| TGbn | 12/14 | Karamyshev, Anton | IITP RAS |
| TGbn | 12/14 | Keshmiri, Francis | Huawei Technologies Co., Ltd |
| TGbn | 12/14 | Kim, Geon Hwan | LG ELECTRONICS |
| TGbn | 12/14 | Kim, Sang Gook | LG ELECTRONICS |
| TGbn | 12/14 | Kim, Sanghyun | WILUS Inc. |
| TGbn | 12/14 | Kishida, Akira | NTT |
| TGbn | 12/14 | Klein, Arik | Huawei Technologies Co., Ltd |
| TGbn | 12/14 | Koo, Jonghoe | Samsung Electronics Co., Ltd. |
| TGbn | 12/14 | Kuo, Chih-Chun | MediaTek Inc. |
| TGbn | 12/14 | Lalam, Massinissa | SAGEMCOM BROADBAND SAS |
| TGbn | 12/14 | Lanante, Leonardo | Ofinno |
| TGbn | 12/14 | Lee, Hong Won | LG ELECTRONICS |
| TGbn | 12/14 | LEE, JOONSOO | Newracom Inc. |
| TGbn | 12/14 | LEE, Mingyu | Samsung Electronics Co., Ltd. |
| TGbn | 12/14 | Lee, Wookbong | Apple Inc. |
| TGbn | 12/14 | Li, Haozheng | TP-Link Corporation Limited |
| TGbn | 12/14 | Li, Jialing | Qualcomm Technologies Inc. |
| TGbn | 12/14 | Li, Weiyi | Spreadtrum Communication USA, Inc |
| TGbn | 12/14 | li, yan | ZTE Corporation |
| TGbn | 12/14 | Li, Yapu | Guangdong OPPO Mobile Telecommunications Corp.,Ltd |
| TGbn | 12/14 | Li, Yunbo | Huawei Technologies Co., Ltd |
| TGbn | 12/14 | Lim, Dong Guk | LG ELECTRONICS |
| TGbn | 12/14 | Lim, Yeon Geun | Newracom Inc. |
| TGbn | 12/14 | Lin, Wei | Huawei Technologies Co., Ltd |
| TGbn | 12/14 | Lorgeoux, Mikael | Canon Research Centre France |
| TGbn | 12/14 | Lou, Hanqing | InterDigital, Inc. |
| TGbn | 12/14 | Lu, kaiying | MediaTek Inc. |
| TGbn | 12/14 | Lu, Liuming | Guangdong OPPO Mobile Telecommunications Corp.,Ltd. |
| TGbn | 12/14 | Luo, Chaoming | Beijing OPPO telecommunications corp., ltd. |
| TGbn | 12/14 | Ma, Yongsen | SAMSUNG ELECTRONICS |
| TGbn | 12/14 | Mantha, Abhishek | Broadcom Corporation |
| TGbn | 12/14 | Max, Sebastian | Ericsson AB |
| TGbn | 12/14 | Mehrnoush, Morteza | Apple Inc. |
| TGbn | 12/14 | Minotani, Jun | Panasonic Corporation |
| TGbn | 12/14 | Montemurro, Michael | Huawei Technologies Co., Ltd |
| TGbn | 12/14 | Motozuka, Hiroyuki | Panasonic Holdings Corporation |
| TGbn | 12/14 | Naik, Gaurang | Qualcomm Technologies, Inc |
| TGbn | 12/14 | Nayak, Peshal | Samsung Research America |
| TGbn | 12/14 | Neishaboori, Azin | General Motors Company |
| TGbn | 12/14 | Nianhe, Bai | Xidian University |
| TGbn | 12/14 | Noh, Si-Chan | Newracom Inc. |
| TGbn | 12/14 | Park, Minyoung | Intel Corporation |
| TGbn | 12/14 | Park, Sungjin | Senscomm |
| TGbn | 12/14 | Patil, Abhishek | Qualcomm Incorporated |
| TGbn | 12/14 | Patwardhan, Gaurav | Hewlett Packard Enterprise |
| TGbn | 12/14 | Petrick, Albert | InterDigital, Inc. |
| TGbn | 12/14 | Pettersson, Charlie | Ericsson AB |
| TGbn | 12/14 | Qi, Yue | Samsung Research America |
| TGbn | 12/14 | Quan, Yingqiao | Spreadtrum Communications (Shanghai) Co., Ltd.; Unisoc (Shanghai) Technologies Co., Ltd. |
| TGbn | 12/14 | Ratnam, Vishnu | Samsung Research America |
| TGbn | 12/14 | Redlich, Oded | Huawei Technologies Co., Ltd |
| TGbn | 12/14 | RISON, Mark | Samsung Cambridge Solution Centre |
| TGbn | 12/14 | Ryu, Kiseon | NXP Semiconductors |
| TGbn | 12/14 | Schelstraete, Sigurd | MaxLinear |
| TGbn | 12/14 | Serizawa, Kazunobu | Advanced Telecommunications Research Institute International(ATR) |
| TGbn | 12/14 | Shafin, Rubayet | Samsung Research America |
| TGbn | 12/14 | So, Youngwan | Samsung Electronics Co., Ltd. |
| TGbn | 12/14 | Son, Ju-Hyung | WILUS Inc. |
| TGbn | 12/14 | Strobel, Rainer | Maxlinear |
| TGbn | 12/14 | SUH, JUNG HOON | Huawei Technologies Canada; Huawei Technologies Co., Ltd |
| TGbn | 12/14 | Taori, Rakesh | Infineon Technologies |
| TGbn | 12/14 | Tota, Kazuyuki | Canon |
| TGbn | 12/14 | Tsodik, Genadiy | Huawei Technologies Co., Ltd |
| TGbn | 12/14 | Urabe, Yoshio | Panasonic Holdings Corporation |
| TGbn | 12/14 | Verma, Sindhu | Broadcom |
| TGbn | 12/14 | VIGER, Pascal | Canon Research Centre France |
| TGbn | 12/14 | Wang, Lei | Futurewei Technologies/Huawei Technologies |
| TGbn | 12/14 | Wang, Qi | Apple Inc. |
| TGbn | 12/14 | Wei, Dong | NXP Semiconductors |
| TGbn | 12/14 | Wu, Kanke | Apple Inc. |
| TGbn | 12/14 | Xia, Qing | Sony Corporation |
| TGbn | 12/14 | Xu, Yue | Huawei Technologies Co., Ltd |
| TGbn | 12/14 | Yang, Jay | ZTE Corporation |
| TGbn | 12/14 | Yang, Jimmy | Moxa Inc. |
| TGbn | 12/14 | Yano, Kazuto | Advanced Telecommunications Research Institute International (ATR) |
| TGbn | 12/14 | Yee, James | MediaTek Inc. |
| TGbn | 12/14 | Yoon, Yelin | LG ELECTRONICS |
| TGbn | 12/14 | Yu, Jian | Huawei Technologies Co., Ltd |
| TGbn | 12/14 | Zhang, Jiayi | Ofinno |
| TGbn | 12/14 | Zhang, Yan | Apple Inc. |
| TGbn | 12/14 | Zhao, Yue | Huawei Technologies Co., Ltd |
| TGbn | 12/14 | Zhou, Pei | TCL |

* Attendee List for the 7th Conf. Call:

|  |  |  |  |
| --- | --- | --- | --- |
| Breakout | Timestamp | Name | Affiliation |
| TGbn | 12/18 | Adachi, Tomoko | TOSHIBA Corporation |
| TGbn | 12/18 | Aio, Kosuke | Sony Corporation |
| TGbn | 12/18 | Ajami, Abdel Karim | Apple Inc. |
| TGbn | 12/18 | Asai, Yusuke | Nippon Telegraph and Telephone Corporation (NTT) |
| TGbn | 12/18 | Asterjadhi, Alfred | Qualcomm Incorporated |
| TGbn | 12/18 | Au, Kwok Shum | Huawei Technologies Canada; Huawei Technologies Co., Ltd |
| TGbn | 12/18 | Baek, SunHee | LG ELECTRONICS |
| TGbn | 12/18 | Baykas, Tuncer | Ofinno |
| TGbn | 12/18 | Carney, William | Sony Group Corporation |
| TGbn | 12/18 | Cha, Dongju | LG ELECTRONICS |
| TGbn | 12/18 | Chen, Junbin | TP-Link Corporation Limited |
| TGbn | 12/18 | Chen, You-Wei | MediaTek Inc. |
| TGbn | 12/18 | CHENG, yajun | Xiaomi Communications Co., Ltd. |
| TGbn | 12/18 | CHERIAN, GEORGE | Qualcomm Incorporated; Qualcomm Technologies, Inc |
| TGbn | 12/18 | Cho, Hangyu | LG ELECTRONICS |
| TGbn | 12/18 | Choi, Jinsoo | LG ELECTRONICS |
| TGbn | 12/18 | Chu, Liwen | NXP Semiconductors |
| TGbn | 12/18 | CHUN, JINYOUNG | LG ELECTRONICS |
| TGbn | 12/18 | Cui, Yaoshen | TP-Link Corporation Limited |
| TGbn | 12/18 | Das, Subir | Peraton Labs |
| TGbn | 12/18 | Dong, Xiandong | Xiaomi Communications Co., Ltd. |
| TGbn | 12/18 | Erkucuk, Serhat | Ofinno |
| TGbn | 12/18 | Fan, Shuang | Sanechips Technology Co., Ltd. |
| TGbn | 12/18 | Fang, Yonggang | MediaTek Inc. |
| TGbn | 12/18 | feng, Shuling | MediaTek Inc. |
| TGbn | 12/18 | Gao, Ning | Guangdong OPPO Mobile Telecommunications Corp.,Ltd |
| TGbn | 12/18 | Ghosh, Chittabrata | Apple Inc. |
| TGbn | 12/18 | Gu, Junrong | Clourney Semiconductor |
| TGbn | 12/18 | Gu, Xiangxin | Spreadtrum Communications (Shanghai) Co., Ltd. |
| TGbn | 12/18 | Ha, Taeyoung | Samsung Electronics Co., Ltd. |
| TGbn | 12/18 | Haider, Muhammad Kumail | Meta Platforms, Inc. |
| TGbn | 12/18 | Hamilton, Mark | CommScope |
| TGbn | 12/18 | Hart, Brian | Cisco Systems, Inc. |
| TGbn | 12/18 | Hedayat, Ahmadreza | Apple Inc. |
| TGbn | 12/18 | Hervieu, Lili | CableLabs |
| TGbn | 12/18 | Ho, Duncan | Qualcomm Technologies, Inc |
| TGbn | 12/18 | Huang, Po-Kai | Intel Corporation |
| TGbn | 12/18 | Inohiza, Hirohiko | Canon |
| TGbn | 12/18 | Jang, Insun | LG ELECTRONICS |
| TGbn | 12/18 | Kabbinale, Aniruddh | SAMSUNG |
| TGbn | 12/18 | Kain, Carl | USDOT; Noblis |
| TGbn | 12/18 | Kakani, Naveen | Qualcomm Incorporated; Qualcomm Technologies, Inc |
| TGbn | 12/18 | Kalamkar, Sanket | Qualcomm Incorporated; Qualcomm Technologies, Inc |
| TGbn | 12/18 | Kamel, Mahmoud | Interdigital Inc. |
| TGbn | 12/18 | Kancherla, Sundeep | Infineon Technologies |
| TGbn | 12/18 | Kim, Geon Hwan | LG ELECTRONICS |
| TGbn | 12/18 | Kim, Myeong-Jin | SAMSUNG ELECTRONICS |
| TGbn | 12/18 | Kim, Sanghyun | WILUS Inc. |
| TGbn | 12/18 | Kim, Youhan | Qualcomm Technologies, Inc. |
| TGbn | 12/18 | Kishida, Akira | NTT |
| TGbn | 12/18 | Klein, Arik | Huawei Technologies Co., Ltd |
| TGbn | 12/18 | Kneckt, Jarkko | Apple Inc. |
| TGbn | 12/18 | Koo, Jonghoe | Samsung Electronics Co., Ltd. |
| TGbn | 12/18 | Lalam, Massinissa | SAGEMCOM BROADBAND SAS |
| TGbn | 12/18 | Lanante, Leonardo | Ofinno |
| TGbn | 12/18 | Lee, Hong Won | LG ELECTRONICS |
| TGbn | 12/18 | LEE, JOONSOO | Newracom Inc. |
| TGbn | 12/18 | LEE, Mingyu | Samsung Electronics Co., Ltd. |
| TGbn | 12/18 | Lee, Wookbong | Apple Inc. |
| TGbn | 12/18 | Li, Jialing | Qualcomm Technologies Inc. |
| TGbn | 12/18 | Li, Weiyi | Spreadtrum Communication USA, Inc |
| TGbn | 12/18 | li, yan | ZTE Corporation |
| TGbn | 12/18 | Li, Yapu | Guangdong OPPO Mobile Telecommunications Corp.,Ltd |
| TGbn | 12/18 | Li, Yunbo | Huawei Technologies Co., Ltd |
| TGbn | 12/18 | Lim, Dong Guk | LG ELECTRONICS |
| TGbn | 12/18 | Lim, Yeon Geun | Newracom Inc. |
| TGbn | 12/18 | Lin, Wei | Huawei Technologies Co., Ltd |
| TGbn | 12/18 | Lorgeoux, Mikael | Canon Research Centre France |
| TGbn | 12/18 | Lou, Hanqing | InterDigital, Inc. |
| TGbn | 12/18 | Lu, kaiying | MediaTek Inc. |
| TGbn | 12/18 | Lu, Liuming | Guangdong OPPO Mobile Telecommunications Corp.,Ltd. |
| TGbn | 12/18 | Ma, Yongsen | SAMSUNG ELECTRONICS |
| TGbn | 12/18 | Ma, Yunsi | HiSilicon Technologies Co., LTD. |
| TGbn | 12/18 | MAO, ZHI | Huawei Technologies Co., Ltd |
| TGbn | 12/18 | Minotani, Jun | Panasonic Corporation |
| TGbn | 12/18 | Monajemi, Pooya | Apple Inc. |
| TGbn | 12/18 | Morioka, Hitoshi | SRC Software |
| TGbn | 12/18 | Motozuka, Hiroyuki | Panasonic Holdings Corporation |
| TGbn | 12/18 | Mutgan, Okan | Nokia |
| TGbn | 12/18 | Naik, Gaurang | Qualcomm Technologies, Inc |
| TGbn | 12/18 | Nayak, Peshal | Samsung Research America |
| TGbn | 12/18 | Nianhe, Bai | Xidian University |
| TGbn | 12/18 | Norouzi, Sara | Huawei Technologies Canada; Huawei Technologies Co., Ltd |
| TGbn | 12/18 | Olip, John | Broadcom Corporation |
| TGbn | 12/18 | Ouchi, Masatomo | Canon |
| TGbn | 12/18 | Palayur, Saju | Maxlinear Inc |
| TGbn | 12/18 | Pare, Thomas | MediaTek Inc. |
| TGbn | 12/18 | Park, Minyoung | Intel Corporation |
| TGbn | 12/18 | Park, Sungjin | Senscomm |
| TGbn | 12/18 | Patwardhan, Gaurav | Hewlett Packard Enterprise |
| TGbn | 12/18 | Petrick, Albert | InterDigital, Inc. |
| TGbn | 12/18 | Qi, Yue | Samsung Research America |
| TGbn | 12/18 | Quan, Yingqiao | Spreadtrum Communications (Shanghai) Co., Ltd.; Unisoc (Shanghai) Technologies Co., Ltd. |
| TGbn | 12/18 | Ratnam, Vishnu | Samsung Research America |
| TGbn | 12/18 | Redlich, Oded | Huawei Technologies Co., Ltd |
| TGbn | 12/18 | Ryu, Kiseon | NXP Semiconductors |
| TGbn | 12/18 | Sato, Takuhiro | SHARP CORPORATION |
| TGbn | 12/18 | Schelstraete, Sigurd | MaxLinear |
| TGbn | 12/18 | Shafin, Rubayet | Samsung Research America |
| TGbn | 12/18 | Shen, Andy | Futurewei Technologies |
| TGbn | 12/18 | shi, shuyu | TP-Link Corporation Limited |
| TGbn | 12/18 | Shilo, Shimi | Huawei Technologies Co., Ltd |
| TGbn | 12/18 | Shirakawa, Atsushi | SHARP CORPORATION |
| TGbn | 12/18 | So, Youngwan | Samsung Electronics Co., Ltd. |
| TGbn | 12/18 | Son, Ju-Hyung | WILUS Inc. |
| TGbn | 12/18 | SUH, JUNG HOON | Huawei Technologies Canada; Huawei Technologies Co., Ltd |
| TGbn | 12/18 | Sun, Bo | Sanechips Technology Co., Ltd. |
| TGbn | 12/18 | Talarico, Salvatore | Sony Corporation |
| TGbn | 12/18 | Tanaka, Yusuke | Sony Corporation |
| TGbn | 12/18 | Taori, Rakesh | Infineon Technologies |
| TGbn | 12/18 | Tsodik, Genadiy | Huawei Technologies Co., Ltd |
| TGbn | 12/18 | Tsujimaru, Yuki | Canon |
| TGbn | 12/18 | Urabe, Yoshio | Panasonic Holdings Corporation |
| TGbn | 12/18 | Varshney, Prabodh | Nokia |
| TGbn | 12/18 | Wang, Lei | Futurewei Technologies/Huawei Technologies |
| TGbn | 12/18 | Wang, Qi | Apple Inc. |
| TGbn | 12/18 | Wei, Dong | NXP Semiconductors |
| TGbn | 12/18 | Wu, Kanke | Apple Inc. |
| TGbn | 12/18 | Wullert, John | Peraton Labs |
| TGbn | 12/18 | Xia, Qing | Sony Corporation |
| TGbn | 12/18 | Xin, Yan | Huawei Technologies Canada; Huawei Technologies Co., Ltd |
| TGbn | 12/18 | Xu, Yue | Huawei Technologies Co., Ltd |
| TGbn | 12/18 | Yamada, Ryota | SHARP CORPORATION |
| TGbn | 12/18 | Yang, Jay | ZTE Corporation |
| TGbn | 12/18 | Yang, Jimmy | Moxa Inc. |
| TGbn | 12/18 | Yano, Kazuto | Advanced Telecommunications Research Institute International (ATR) |
| TGbn | 12/18 | Yee, James | MediaTek Inc. |
| TGbn | 12/18 | Yoon, Yelin | LG ELECTRONICS |
| TGbn | 12/18 | Yu, Jian | Huawei Technologies Co., Ltd |
| TGbn | 12/18 | Zhang, John | GuangDong OPPO Mobile Telecommunications Corp., Ltd. |
| TGbn | 12/18 | Zhang, Maolin | Huawei Technologies Co., Ltd |
| TGbn | 12/18 | Zhang, Yan | Apple Inc. |
| TGbn | 12/18 | Zhao, Yue | Huawei Technologies Co., Ltd |
| TGbn | 12/18 | Zhou, Pei | TCL |