IEEE P802.11  
Wireless LANs

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| TGbi Teleconference Minutes September – October 2023 | | | | |
| Date: 2023-10-30 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Stéphane Baron | Canon | Cesson-Sévigné, France |  | [Stephane.baron](mailto:Stephane.baron)@crf.canon.fr |

Abstract

This document contains the minutes for the IEEE 802.11bi task group meetings that took place between

In September 2023 to October 2023 period.

Note: Highlighted text are action items.

Q – proceeds a question

A - proceeds an answer

C - proceeds a comment

Yellow highlight - action point

**September 28th:**

**Chair: Carol Ansley, Cox Communications**

**Secretary: Stéphane Baron**

**Vice-chairs: Jerome Henry, Cisco; Stephen McCann, Huawei**

**Technical editor: Po-Kai Huang, Intel**

Chair calls meeting to order at 10:06 ET.

Agenda slide deck: [11-23-1680r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1680-00-00bi-telecom-agenda-sept-oct-nov.pptx):

1. Reminder to do attendance
2. Review of policies and procedures.
   1. IEEE individual process slides were presented.
3. The chair mentioned the call for essential patents
   1. No one responded to the call for essential patents
4. The chair covered the IEEE copyright policy and participation rules.
   1. No questions
5. **Discussion of agenda 11-23-1680r0 (slide #16)**

1679 contribution added to the agenda upon author request.

* 1. Adoption of agenda by unanimous consent (18 participants).

1. **Administrative**
   1. Reminder of future telecon
      1. 2 2 more teleconferences are scheduled until next IEEE 802.11 Plenary meetings in Honolulu (Oct. 5, Oct. 12, Oct. 26, Nov. 2, Nov. 9)

1. **Technical Submissions**
   1. [11-23-1675r0](https://mentor.ieee.org/802.11/dcn/23/11-23-1675-00-00bi-epoch-structure-proposal.pptx) : Epoch structure proposal – Jerome Henry

Document presented by author and discussed around the Epoch boundaries determination.

Proposal is to make Epoch boundaries softer and Station needs driven.

* + 1. Discussion

C: Dummy authentication is also easy to determine for an observer. To avoid easy detection, you also need to do the 4-way handshake. I think this point requires more investigation

A: yes, this is problem we need to address.

C: We have a requirement allowing a client to change its MAC address by itself, but we also have another requirement for a change of all stations at the same time. I think the solution is rather a mixing.

A: I know there are those 2 requirements but I do not believe that having a mix is a good solution.

C: Dummy authentication needs to be differentiated by the AP so a differentiator is needed. But in that case, eavesdroppers can detect it. It is not clear to me how to have a fake undetectable authentication.

A: For the authentication frames, the AP just have to discriminate the validity of the authentication frame.

Q: You said we can use multiple MAC addresses, but at the moment, we only have link specific MAC addresses. So, I wonder how to go in this direction?

A: 11be has one MAC per link, but I think we can use MAC addresses per flow for instance, that may solve the problem.

Q: About epoch duration: I think making the Epoch at STA initiative is not good. I would prefer to avoid OTA signaling and prefer algorithm implemented by both sides to determine the boundaries without frame exchanges that may give an addition hint to eavesdroppers.

A: Yes, this is an interesting solution, but we need additional mechanism to do it.

C: Concerning additional mechanism to determine the Epoch boundaries without frame exchange, please have a look on previous contribution 11-22/0114r0.

A: I know this contribution, and I think it is good timing now to refresh the presentation and have a discussion on it.

Q: Regarding the dummy authentication mechanism you propose, this creates an important overhead, especially if we also need to implement fake 4-way handshake. What is your opinion on this?

A: Yes, I think this is a cost we need to pay to improve privacy, but we need to consider it.

Q: On slide 7, I cannot understand how your Boolean works, can you explain?

A: The Boolean can be randomly selected and indicates which of the AP or the non-AP will initiate the future Epoch by sending frames with the new MAC address.

Q: But if the AP initiate the transmission, it cannot initiate fake authentication, this is always the non-AP that initiate this procedure, right?

A: Yes, if the AP initiate the new Epoch, the AP may send a frame it usually sends to the STA, like a probe response for instance.

Q: typo on slide 9 it is MACn right?

A: Yes, thank you.

C: How many stations are there is a key element. If you change all STA’s MAC at once it makes things more difficult for observer. But if you change one by one, it may be easier to correlate.

C: In addition, being driven by the AP can be difficult but if there is a negotiation with the AP on acceptable interval, it seems ok.

Q: I wonder if MAC rotation is enough when looking at existing mechanism to track stations.

A: MAC address rotation, will probably not be sufficient, this is why I propose to have several active MAC addresses per STA.

C: A STA can always pop out; you cannot force a station to change its MAC address.

C: in the case where a lot of stations are associated, changing everything at once is enough. In other cases, changing one by one will be more efficient. I think that having multiple addresses and changing it more often makes life more difficult. So, we need more flexibility to the station to do what it needs.

No more questions.

Author requested to run the 3 SPs associated to its presentation:

**SP#1**: run by Jerome Henry

**Original SP text**: “Do you agree that epochs should be individual (i.e., each CPE Client has its own epoch negotiated with the AP)?”

Discussion:

Q: Do you mean that all Epoch have to be individual? Shouldn’t we mention “also individual” to allow support of MAC address change of all stations at once?

A: yes.

**SP#1 text changes** to : “Do you agree that epochs should also be individual (i.e., each CPE Client has its own epoch negotiated with the AP)?”

**SP#1 Results**: Yes: 9 / No: 1 / Abstain: 3 / No answer:2

**Sp#2**: run by Jerome Henry

**Original SP#2 text**: “Do you agree that the first frames in a CPE Client next epoch should resemble (for an eavesdropper) frames a newcomer STA would send?”

Discussion:

Q: not easy to understand for me

A: Sta will send frames it usually sends when associating

Q: 2 approaches: signaling to indicate the change or having a mechanism without frame exchange relying on predictable change time, which topic do you address here.

A: here I cover the individual change at STA level.

C: please clarify this is not a way to signal the change of MAC address but rather a way to hide it.

**SP#2 text changed** to: “Do you agree that a CPE Client MAC address change should optionally be obfuscated by additional signaling?”

**SP#2 results**: Yes:3 / No:6 / Abstain:4 / No answer:2

**SP#3**: run by Jerome Henry

**Original SP text** : “Do you agree on working on a solution for MAC address changing, in which the STA is allowed to use more than one MAC per epoch?”

Discussion:

C: I agree on two addresses: 1 old and 1 new, so I cannot vote no, but I do not support more (3,4,5), so I cannot really vote.

A: 2 is ok

C: I mean 2 including the one to maintain the continuity, not more than that. Probably we should indicate Active MAC addresses.

**SP#3 text changed** to: “Do you agree on working on a solution for MAC address changing, in which the STA is allowed to use more than two active OTA address per epoch and per link?”

**SP#3 results**: Yes:2 / No:6 / Abstain:6 / No answer:2

* 1. [11-23-1214r3](https://mentor.ieee.org/802.11/dcn/23/11-23-1214-03-00bi-text-for-mac-privacy-enhancements-section.docx) : Text for MAC Privacy Enhancements section – Carol Ansley

New revision of the document already presented during last F2F meeting in Atlanta.

* + 1. Discussion

Q: We have BPE requirements but BPE have not been discussed a lot.

Q: overall request would be to reserve second paragraph (about BPE) for a while?

A: yes

C: requirement is defined and software-based enhancement will come first and we should keep this line. I plan to do BPE presentation so I would like to keep this text.

C: I think that the secure identifier of the MLD is the key, and I think it is desirable that the AP is not trackable, but I agree we do not have to define it right now. We can come back on this part later on.

Chair then request a SP to get feeling of the group on the inclusion or not of the BPE related introductive text.

C: my suggestion is to keep the very first sentence and remove second paragraph.

A: I think we should wait and come back on this in future session

SP#4 text is then “Do you agree to include the proposed paragraph on BPE features in 11-13-1214r3 as proposed?”

Q: can we defer this SP to the next meeting since is a very fundamental part?

A: ok, SP deferred until next meeting.

Due to lack of time, remaining presentations are deferred to next meeting (October 05th 10:00 EDT).

1. **AoB**
   1. No other business.
2. Chair adjourned the meeting at 11:56 EDT.

**Attendance**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Breakout | Timestamp |  | Name | | | Affiliation | |
| TGbi | 9/28 |  | Ansley, Carol | | | Cox Communications Inc. | |
| TGbi | 9/28 |  | baron, stephane | | | Canon Research Centre France | |
| TGbi | 9/28 |  | Bredewoud, Albert | | | Broadcom Corporation | |
| TGbi | 9/28 |  | DeLaOlivaDelgado, Antonio | | | InterDigital, Inc. | |
| TGbi | 9/28 |  | Halasz, David | | | Morse Micro | |
| TGbi | 9/28 |  | Hawkes, Philip | | | Qualcomm Incorporated | |
| TGbi | 9/28 |  | Henry, Jerome | | | Cisco Systems, Inc. | |
| TGbi | 9/28 |  | Huang, Po-Kai | | | Intel | |
| TGbi | 9/28 |  | McCann, Stephen | | | Huawei Technologies Co., Ltd | |
| TGbi | 9/28 |  | Nezou, Patrice | | | Canon Research Centre France | |
| TGbi | 9/28 |  | RISON, Mark | | | Samsung Cambridge Solution Centre | |
| TGbi | 9/28 |  | Rodriguez, Stephen | | | Cisco Systems, Inc. | |
| TGbi | 9/28 |  | Sam, Harvey | | | Broadcom Corporation | |
| TGbi | 9/28 |  | Sevin, Julien | | | Canon Research Centre France | |
| TGbi | 9/28 |  | Smith, Luther | | | Cable Television Laboratories Inc. (CableLabs) | |
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**October 05th:**

**Chair: Carol Ansley, Cox Communications**

**Secretary: Stéphane Baron**

**Vice-chairs: Jerome Henry, Cisco; Stephen McCann, Huawei**

**Technical editor: Po-Kai Huang, Intel**

Chair calls meeting to order at 10:03 ET.

Agenda slide deck: [11-23-1680r2](https://mentor.ieee.org/802.11/dcn/23/11-23-1680-02-00bi-telecom-agenda-sept-oct-nov.pptx):

1. Reminder to do attendance
2. Review of policies and procedures.
   1. IEEE individual process slides were presented.
3. The chair mentioned the call for essential patents
   1. No one responded to the call for essential patents
4. The chair covered the IEEE copyright policy and participation rules.
   1. No questions
5. **Discussion of agenda 11-23-1680r2 (slide #16)**

**1679 contribution added to the agenda**

* 1. Discussion on agenda
     1. 1679r0 author request to defer the presentation of the document to next session (Oct12th)
  2. Adoption of agenda by unanimous consent (18 participants).

1. **Administrative**
   1. Reminder of future telecon
      1. 2 2 more teleconferences are scheduled until next IEEE 802.11 Plenary meetings in Honolulu (Oct. 12, Oct. 26, Nov. 2, Nov. 9)
      2. Reminder that according to our progress, we may cancel meeting after Oct 12th

1. **Technical Submissions**
   1. [11-23-1214r4](https://mentor.ieee.org/802.11/dcn/23/11-23-1214-04-00bi-text-for-mac-privacy-enhancements-section.docx) : Text for MAC Privacy Enhancements section – Carol Ansley

New revision of the document after discussion in previous teleconference, and reception of offline feedbacks.

* + 1. Discussion

No discussion

Chair ask if anybody object to the inclusion of this text into our future spec text.

No objection to the inclusion received.

* 1. [1160r2](https://mentor.ieee.org/802.11/dcn/23/11-23-1160-02-00bi-proposed-spec-texts-for-encrypting-re-association-request-response.docx): Proposed spec texts for encrypting (re)association request response – Po-Kai Huang

New presentation after modification of the text according to received offline comments

Presentation focused on solved comments the author received.

Still unresolved discussion point is now regarding 12.13.x.1 regarding the non MLO clause.

* + 1. Discussion

Q: concerning the request part. Does it work with SAE? It is not that clear.

A: yes, because the text is generic, it covers general authentication frame exchange without precising the type frame.

C: Concerning the 12.13.x.1 non-MLO, I think this is necessary because there is no requirement saying that you shall not change your MAC address unless you have a hardware modification.

A: I understand, but the discussion is on the DS address and the mapping that seems to be a big change that may also need hardware change. Discussion and then fall into the same discussion we had in the past for MAC address change.

1. **AoB**
   1. No other business.
2. Chair adjourned the meeting at 10:26 EDT.

**Attendance**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Breakout | Timestamp | | Name | Affiliation | |
| TGbi | 10/5 | | AbidRabbu, Shaima' | IMU, VESTEL | |
| TGbi | 10/5 | | Ansley, Carol | Cox Communications Inc. | |
| TGbi | 10/5 | | baron, stephane | Canon Research Centre France | |
| TGbi | 10/5 | | Bredewoud, Albert | Broadcom Corporation | |
| TGbi | 10/5 | | DeLaOlivaDelgado, Antonio | InterDigital, Inc. | |
| TGbi | 10/5 | | Halasz, David | Morse Micro | |
| TGbi | 10/5 | | Henry, Jerome | Cisco Systems, Inc. | |
| TGbi | 10/5 | | Ho, Duncan | Qualcomm Incorporated | |
| TGbi | 10/5 | | Huang, Po-Kai | Intel | |
| TGbi | 10/5 | | Levy, Joseph | InterDigital, Inc. | |
| TGbi | 10/5 | | Nezou, Patrice | Canon Research Centre France | |
| TGbi | 10/5 | | Rodriguez, Stephen | Cisco Systems, Inc. | |
| TGbi | 10/5 | | Sam, Harvey | Broadcom Corporation | |
| TGbi | 10/5 | | Sevin, Julien | Canon Research Centre France | |
| TGbi | 10/5 | | Yee, Peter | NSA-CSD | |
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**October 12th:**

**Chair: Carol Ansley, Cox Communications**

**Secretary: Stéphane Baron**

**Vice-chairs: Jerome Henry, Cisco; Stephen McCann, Huawei**

**Technical editor: Po-Kai Huang, Intel**

Chair calls meeting to order at 10:03 ET.

Agenda slide deck: [11-23-1680r4](https://mentor.ieee.org/802.11/dcn/23/11-23-1680-04-00bi-telecom-agenda-sept-oct-nov.pptx):

1. Reminder to do attendance
2. Review of policies and procedures.
   1. IEEE individual process slides were presented.
3. The chair mentioned the call for essential patents
   1. No one responded to the call for essential patents
4. The chair covered the IEEE copyright policy and participation rules.
   1. No questions
5. **Discussion of agenda 11-23-1680r4 (slide #16)**

**1679 contribution added to the agenda**

* 1. Discussion on agenda

No discussion, but presenter of the only document in the queue is not present.

* 1. Adoption of agenda by unanimous consent (15 participants).

1. **Administrative**
   1. Reminder of future telecon
      1. 2 2 more teleconferences are scheduled until next IEEE 802.11 Plenary meetings in Honolulu (Oct. 26, Nov. 2, Nov. 9)

Discussion on future contribution

Po-Kai indicated he has pending documents and will be able to present in next telecon

Jerome also indicates he will present an update of its previous contribution 1675r0 after offline discussion

* + 1. **Due to absence of the sole presenter, the chair proposes to adjourn**

1. **AoB**
   1. No other business.
2. Chair adjourned the meeting at 10:13 EDT.

**Attendance**

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| --- | --- | --- | --- |
| Breakout | Timestamp | Name | Affiliation |
| TGbi | 10/12 | Ansley, Carol | Cox Communications Inc. |
| TGbi | 10/12 | baron, stephane | Canon Research Centre France |
| TGbi | 10/12 | DeLaOlivaDelgado, Antonio | InterDigital, Inc. |
| TGbi | 10/12 | Henry, Jerome | Cisco Systems, Inc. |
| TGbi | 10/12 | Miwa, Shinya | Canon Research Centre France |
| TGbi | 10/12 | Nezou, Patrice | Canon Research Centre France |
| TGbi | 10/12 | Rodriguez, Stephen | Cisco Systems, Inc. |
| TGbi | 10/12 | Sam, Harvey | Broadcom Corporation |
| TGbi | 10/12 | Serafimovski, Nikola | pureLiFi |
| TGbi | 10/12 | Sevin, Julien | Canon Research Centre France |
| TGbi | 10/12 | Smith, Luther | Cable Television Laboratories Inc. (CableLabs) |

**October 26th:**

**Chair: Carol Ansley, Cox Communications**

**Secretary: Stéphane Baron**

**Vice-chairs: Jerome Henry, Cisco; Stephen McCann, Huawei**

**Technical editor: Po-Kai Huang, Intel**

Chair calls meeting to order at 10:01 ET.

Agenda slide deck: [11-23-1680r6](https://mentor.ieee.org/802.11/dcn/23/11-23-1680-06-00bi-telecom-agenda-sept-oct-nov.pptx):

1. Reminder to do attendance
2. Review of policies and procedures.
   1. IEEE individual process slides were presented.
3. The chair mentioned the call for essential patents
   1. No one responded to the call for essential patents
4. The chair covered the IEEE copyright policy and participation rules.
   1. No questions
5. **Discussion of agenda 11-23-1680r6 (slide #16)**
   1. Discussion on agenda

Revision of the document 1160 is indicated as being r2 uploaded just before presentation

* 1. Adoption of agenda by unanimous consent (17 participants).

1. **Administrative**
   1. Reminder of future telecon
      1. 2 more teleconferences are scheduled until next IEEE 802.11 Plenary meetings in Honolulu (Nov. 2, Nov. 9)
      2. Chair calls for presentations

Chair called for contributions to setup F2F meeting agenda and required sessions for the TGbi task group.

**Technical Submissions**

* 1. [11-23-1679r2](https://mentor.ieee.org/802.11/dcn/23/11-23-1679-01-00bi-proposed-spec-text-for-mpdu-anonymization.docx) : Proposed spec text for MPDU Anonymization – Philip Hawkes

This document describes EDP anonymization. It intended to cover the spec text related to the figure to data plane architecture and add a new anonymization/de-anonymization layer at the bottom of the upper MAC, and associated introductory text describing high level behavior of those blocks.

* + 1. Discussion

Q: previous contribution indicates DS MAC address is not the MLD MAC address. At some point we will need to indicate the DS MAC. So I think that SN/PN block also needs to indicate MAC address modification. For instance, modification of the Addresses 12, or A3

A: we discussed about SN/PN encrypted so this part seems well accepted by the group. Regarding the OTA MAC address for the MAC addresses computed will be used in MPDU Header creation by using

Q: non AP MLD MAC changes ?

A: non-AP MLD is not intended to change

C: I think we need to check that since in some case like TDLS setup, the MLD MAC address is transmitted in clear.

Q: can we check that for instance offline?

A: yes sure.

Q: you have different behavior for the AP that do not change MPDU header. But we might have the same kind of settings for BSS privacy

Q: you have two colors on your document, what are the meaning? You should indicate it.

A: colors are just there for today explanation; in final text no color will be present.

Q: new blocks are anonymizing the MSDU or provide parameters for the anonymization?

A: I think this is implementation details for other parameters but for SN/PN, the modification can be done in this block.

Q: in this SN/TN anonymization you also have the TID to Link mapping, is intentional to not indicate it here?

A: We are not convinced that anonymizing the TID will bring big added value to the privacy but we can discuss on that.

C: change of the TID can be easily done by adding a constant value for instance, but I agree that if T2LM is in place we should not confuse it.

Q: Do you know where the CRC? is it like Frame sequence check?

Q: Address 1 filtering, is it only for A1 or is it more details on how it is done?

A: it is not so clear to me, but assuming the check of the A1 against address of the STA.

C: I think it is important to have a picture in architecture that allows all the mechanisms we discussed.

A: This is just introductory text and figures. We do not need to agree on the text today.

Q: can you indicate MPDU Header in yellow also for the AP side?

A: I take note and let’s discuss that offline.

C: I personally don’t have issue to extend the blocks that has to be changed

Q: What about the encryption key, do we have to generate another key ?

A: Encryption key remains the same and is linked to a fixed MAC address, potentially MLD MAC address

Q: SN/PN is just one element we want to change OTA, so a more generic name for this privacy block should be found because it will not only handle SN/PN but also potentially more tricky things like MAC addresses.

A: The picture is for unicast Data frame that is used for each DATA frames, upper MAC addresses are used for association that only happens once. The reason why we separated thinks and put the SN/PN anonymization at the bottom of the upper MAC is because this is not link specific. While MAC addresses are per link.

Chair close the queue to allow next presentation

* 1. [11-23-1160r3](https://mentor.ieee.org/802.11/dcn/23/11-23-1160-03-00bi-proposed-spec-texts-for-encrypting-re-association-request-response.docx) : Proposed spec texts for encrypting (re)association request response – Po-Kai Huang

New revision of a document presented in previous session.

Presenter goes along the few changes.

* + 1. Discussion

Q: What if we don’t put the text you added?

A: this is more a clarification after received comment and based on 11aq. So, if we remove it people may ask questions. Concerning the “shall” addition, I think we have to do it, because if we put a “may”, and don’t do it, then we do not have privacy.

A: (chat): I think “may” allows STA to always use the same single address. The “shall” ensures that addresses are randomized and changing.

C: In 11bh, they never put this (indicating the local address space) is the spec.

A: Maybe they should, because otherwise people may ask questions. The addition of this reference just indicates the address space, not how the MAC addresses are randomized or generated.

C: I believe there will be a sub section for the randomization, so here we should put a “if needed”.

A: in the current spec we do not say how to generate the MAC address.

Q: What is the problem here : address space or address generation?

A: Here we are dealing with the probe request only, so I guess there will be a more generic part of the spec dealing with MAC addresses. We should put it there instead.

A: I think this is technically correct and we should keep the text.

C: Randomization is needed in my mind to avoid having a STA using the same address again and again. I think this text is welcome to define the randomization mechanism. If commenters have contribution on better randomization this would be nice to present.

A: I understand people are now discussing the quality of the randomization, but 11aq do not include that and current text do not prevent additional future mechanism.

Q: For transition, we are close to 11bh since the AP in the new BSS have to recognize the STA, right?

A: Here we are talking of an OTA MAC address randomization, the DS MAC address remains the same.

C: it seems like we are restating the 11bh requirements.

A: 11bh is not doing change of MAC address when you roaming.

C: if you implement 11bh IRM, you OTA can be the IRM MAC address, so let me think of it offline to see if our requirements contain enough information to differentiate from 11bh.

A: 11bh do not address the privacy issue during transition, and this is what 11bi is supposed to do. So, I think this is OK.

C: (chat) I would like to keep shall randomize. I am OK to remove reference how to randomize.

A: As 11bh did, I think we need to indicate another section related to the securisation of the randomization

Author then ask if there is an objection to remove the reference to the randomization and address space. No objection.

Author to propose new revision without this part of the text.

Revision 4 is then uploaded on the fly and author request for a straw poll on modified text ([11-23-1160r4](https://mentor.ieee.org/802.11/dcn/23/11-23-1160-04-00bi-proposed-spec-texts-for-encrypting-re-association-request-response.docx))

**SP#1**: run by Po-Kai Wang

Chair ask : “Does anyone has any objection to include the document in the future 11bi spec text ?”

**No objection**.

1. **AoB**
   1. No other business.
2. Chair adjourned the meeting at 11:49 EDT.

**Attendance**

|  |  |  |  |
| --- | --- | --- | --- |
| Breakout | Timestamp | Name | Affiliation |
| TGbi | 10/26 | Ansley, Carol | Cox Communications Inc. |
| TGbi | 10/26 | baron, stephane | Canon Research Centre France |
| TGbi | 10/26 | DeLaOlivaDelgado, Antonio | InterDigital, Inc. |
| TGbi | 10/26 | Hawkes, Philip | Qualcomm Incorporated |
| TGbi | 10/26 | Henry, Jerome | Cisco Systems, Inc. |
| TGbi | 10/26 | Hervieu, Lili | Cable Television Laboratories Inc. (CableLabs) |
| TGbi | 10/26 | Ho, Duncan | Qualcomm Incorporated |
| TGbi | 10/26 | Huang, Po-Kai | Intel |
| TGbi | 10/26 | Magrin, Davide | Meta Platforms Inc. |
| TGbi | 10/26 | McCann, Stephen | Huawei Technologies Co., Ltd |
| TGbi | 10/26 | Mutgan, Okan | Nokia |
| TGbi | 10/26 | Nezou, Patrice | Canon Research Centre France |
| TGbi | 10/26 | Patwardhan, Gaurav | Hewlett Packard Enterprise |
| TGbi | 10/26 | Petrick, Albert | InterDigital |
| TGbi | 10/26 | Rodriguez, Stephen | Cisco Systems, Inc. |