IEEE P802.11
Wireless LANs

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| 802.11bi – Clause 10.71.2.1 |
| Date: July 22, 2025 |
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 Abstract

This submission addresses the comments with CID: 1040, 111, 112, 226, 231, 233, 234, 340, 341, 343, 522, 861, 865, 868, 878, 883, 908, 968, 1047, 1048, 1049, 1050, 519, 802

**Comment Resolution**

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| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Page** | **Line** | **Comment** | **Proposed Change** | **Resolution** |
| 1040 | 10.71.2.1 | 76 | 30 | This sentence is unnecessary | Delete the sentence | REVISEEditor please implement changes tagged with [1040] in document 25/1122r2 |
| 111 | 10.71.2.2 | 77 | 44 | The text should specify in detail how to distribute information on the available EDP group(s). E.g., for an available EDP group, Minimum EpochPacing Parameters does not make sense, such that it should not present in a EDP Group Parameter frame. | Add the following text: The CPE AP MLD shall not include Minimum Epoch Pacing Parameters field in the EDP Epoch Settings field it transmits. | REVISEEditor please implement changes tagged as [111] in document 25/1122r2. |
| 112 |  |  |  | The text should specify in detail which optional fields should not be included in a EDP Epoch Request frame or (Re)Assocation Request frame. Otherwise add text to specify what is the expected behavior if those fields are included. | The CPE non-AP MLD shall not include the First Epoch TSF Start Time field, Time Range field,  Epochs Remaining field, and Number Of Participating Affiliated STAs field in the EDP Epoch Settings field it transmits. | REVISEEditor please implement changes tagged as [111] in document 25/1122r2. |
| 226 | 10.71.2.2 | 79 | 15 | The STA should be able to control the maximum epoch lengths that may be assigned to it. Long epoch intervals may eliminate value of the anonymization. | Allow STA to signal whether it accepts only an epoch interval within 0.8 - 1.2 \* the requested interval duration. | REJECTThe duration of an epoch is clearly defined and STAs should comply to it and not request for arbitrary lengths. |
| 231 | 10.71.2.2 | 79 | 36 | NOTE 2 and sentence in l15 of p79 contradict each others. | Please allow AP to setup epoch that have 20% shorter interval than the requested epoch interval. | REJECTFirst Note 2 has been integrated into the normative text. Second, L15 of page 79 is part of a figure, so not sure what is the contradiction. Third, the epoch duration is clearly defined and we should not allow arbitrary length epochs. |
| 233 | 10.71.2.2 | 79 | 45 | The following operaiton is poorly specified:A CPE non-AP MLD operates in a epoch group1 and the CPE non-AP MLD joins to epoch group2.The MLD has group1 specific anonymization ongoing. After join to group2, the MLD should have group2 specific anonymization ongoing.The join operation should clarify how the address, SN and PN anonymization is handled during join or the first epoch after the join operation. At the moment it is not clear when the STA changes the anonymization values to Group epoch2. | Please clarify how the new group epoch parameters are taken into use and what happens to the existing anonymization parameters when STA joins to a different group epoch. | REVISEEditor please implement changes tagged as 233 in doc 25/1122r2. |
| 234 | 10.71.2.2 | 80 | 1 | Please clarify which address, SN and PN are in use, when STA has left group epoch. There are at least two alternatives:1) STA uses the address, SN and PN values without anonymization2) STA continues to use the anonymized values as used in the last epoch. | Please clarify which address, SN and PN are in use, when STA has left group epoch. There are at least two alternatives:1) STA uses the values without anonymization2) STA continues to use the anonymized values. | REVISEEditor please implement changes tagged as [234] in document 25/1122r2 |
| 340 | 10.71.2.2 | 76 | 59 | Clarify if the non-AP MLD includes parameters it prefers or if it includes parameters of a specific group it wants to join. | Revise the wording to be more clear about how much information a non-AP STA is expected to provide | REVISEEditor please implement changes tagged as [111] in document 25/1122r2 |
| 341 | 10.71.2.2 | 76 | 63 | Clarify if the non-AP MLD includes parameters it prefers or if it includes parameters of a specific group it wants to join. | Revise the wording to be more clear about how much information a non-AP STA is expected to provide if it doesn't want to join the default group | REVISEEditor please implement changes tagged as [111] in document 25/1122r2 |
| 343 | 10.71.2.2 | 78 | 1 | If a non-AP MLD leaves or is directed to leave an Epoch group, what happens? Does the MLD stick with its current MAC and AID? Does it go back to its DS AMC address? Does it need a new AID from the AP MLD? | Add text describing what happens when a non-AP MLD ceases FA operation. | REVISEEditor please implement changes tagged as [234] in document 25/1122r2 |
| 522 | 10.71.2.2 | 76 | 58 | "The non-AP MLD may include in an encrypted (Re)Association Request frame an EDP element indicating the parameters for the EDP group it requests to join. " not clear as to whether it is prohibited from including it in an non-encrypted frame | Delete "encrypted". Also in next para | REJECTEDEDP element is only included if encrypted association frames are used. |
| 861 | 10.71.2.2 | 77 | 44 | Please refer the related subclause for the description of the EDP Group Parameter frame. | Please add : as defined in the subclause 9.6.42.4 | ACCEPT |
| 865 | 10.71.2.2 | 77 | 13 | It is written: "The CPE AP MLD, upon reception of the EDP element in an encrypted (Re)Association Request frame mayassign the CPE non-AP MLD to the EDP group with parameters that best match the parameters requested." What is the threshold to conclude that an EDP group does not match with another EDP Group ? Only the case of EDP Epoch length interval is described. And it is notified that several parameters are concerned. | Please clarify | REJECTThe only parameter that shall be provided by a CPE non-AP MLD is the Epoch Interval. The rest are optional/reserved and should not be considered for similarity. |
| 868 | 10.71.2.2 | 78 | 1 | A CPE non-AP MLD shall be a member of one EDP Epoch group. Please clarify what is the behavior of an CPE non-AP MLD between the time when it leaves an EDP Epoch group and the time when it joins another EDP Epoch group. | Please clarify | REVISEEditor please implement changes tagged as [233] in document 25/1122r2 |
| 878 | 10.71.2.2 | 77 |   | What is a default Epoch group ? The settings associated to the default Epoch group shall be included in the association response frame | Please clarify | REVISEThe EDP parameters for any epoch including the default epoch are already provided in the (Re) Association Response frameSaid so, comment [111] addresses changes to clarify this.Editor please implement changes tagged as [111] in document 25/1122r2. |
| 883 | 10.71.2.2 | 49 | 12 | It is necessary to indicate some rules on the setting of the Time Range field defined in clause 9.4.1.83 to avoid situation where the effective start time of a Epoch n is after the start time of the Epoch n+1, or other impossible situations | indicate in clause 10.71.2.2 some constraints on the Time Range field value setting. The commenter will bring acontribution on he subject. | REVISEDAgree in principle with the commenter. Field name has been renamed “Epoch Start Time Variation Range”. A sentence indicated a litmit of 20% of the Epoch Interval Length has been added.Editor please make the changes as shown under CID 201 in doc 11-25/1112r0 |
| 908 | 10.71.2.2 | 77 | 13 | Please claritfy the parameters of the assigned EDP group can be also returned through an EDP Epoch Response Action frame, not only an association response frame. | refers to comment | REJECTEDThis is already clear in the text. The EDP Epoch Response frame may include an EDP Epoch Setting field with the parameters for the epoch. |
| 968 | 10.71.2.2 | 77 | 49 | "If the CPE AP MLD can fulfill the request, it will include the CPE non-AP MLD in the new EDP group and remove it from the previous EDP group." What is mandatory here, and what is descriptive? What if the CPE AP MLD "can" fulfill the request, but chooses not to? "Can" is vague" and "will" sounds descriptive. Contrast the last sentence in the section ("Upon reception of this message, the CPE AP MLD shall remove the CPE non-AP MLD from the EDP group."). | Change the (first) cited sentence to "Upon reception of the request, the CPE AP MLD may include the CPE non-AP MLD in the new EDP group and remove it from the previous MLD group." | ACCEPT |
|  |  |  |  |  |  |  |
| 1047 | 10.71.2.2 | 76 | 65 | It is unclear if the sentence "The first EDP epoch... 0" is needed or true. | Delete the sentence | REJECTEDStating all Epoch Sequences start with Epoch number 0 is useful |
| 1048 | 10.71.2.2 | 77 | 15 | "EDP epoch interval length". Is this the "Epoch Interval" field of the "EDP Epoch Settings" field? | Provide clear description of this field | REVISEThe text is not refering to a field but to the actual time duration of the epoch.Editor please implement change tagged as [1048] in document 25/1122r2 |
| 1049 | 10.71.2.2 | 77 | 36 | Is "epoch duration" the "Epoch Interval" field of the "EDP Epoch Settings" field? | Provide clear description of this field | REJECTThis is not a fiel, is the actual duration of the epoch |
| 1050 | 10.71.2.2 | 77 | 60 | It is unclear what the sentence "Following this reorganization.." is trying to say. "Level of restrictiveness" is vague. | Either improve the clarity of the sentence, or delete the sentence. | REJECTThe phrase is clear, stating clearly what is the meaning od restrictive in the phrase. Following this reorganization addresses the fact that the organization of epochs and stations belonging to them has been changed. |
| 519 | 10.71.2.1 | 76 | 36 | "At any given time, an AP MLD shall not assign an associated non-AP MLD to more than one EDP group. A non-AP MLD belongs to at most one EDP group at a time. " is duplication | Delete the second sentence | ACCEPT |
| 802 | 10.71.2.2 | 77 | 24 | The text indicates "The CPE non-AP MLD may request creation of a new EDP group...".  This does not make clear whether the non-AP MLD must be associated to request creation. | Clarify whether CPE non-AP MLD must be associated to make this request. | **Revised**Editor please implement changes tagged as [802] in 25/1122r2" |

**10.71 Frame anonymization**

**10.71.1 Introduction**

Frame anonymization (FA) is an EDP CPE feature available when MLO is supported and DS MAC address is supported.

Frame anonymization addresses unencrypted fields and elements in Beacon frames and individually addressed frames containing values that facilitate presence monitoring of a non-AP MLD, i.e., determining the continued presence of a non-AP MLD even if the long-term identity of the non-AP MLD cannot be determined. Presence monitoring can be a threat to privacy of the user of the non-AP MLD. User privacy can be improved by shortening the presence monitoring time windows. It is possible to limit presence moni-toring time windows by doing (re)association as defined in 11.3 (Authentication and association). However, (re)association results in leaving State 4 and introduces a loss in connectivity that could create a negative user experience.

The unencrypted fields and elements that facilitate presence monitoring of a non-AP MLD are:

— AID and fields and elements derived from the AID.

— Address 1 (on the downlink) and Address 2 (on the uplink).

— Sequence Number (SN).

— Packet Number (PN).

FA enables restricting presence monitoring time windows to portions of a single association (that is, without leaving State 4). These time windows are the EDP epochs described in 10.71.2 (EDP epoch operation). A new frame anonymization parameter set (FA parameter set) is established between the AP MLD and non-AP MLD for each new EDP epoch of the non-AP MLD as described in 10.71.3 (Establishing frame anonymization parameter sets).

The transmitting MLD applies the processing in 10.71.5 (MAC header anonymization and transmitting functions) to the identified MAC header fields.

— The sequence number and packet number (assigned by the transmitting MLD) are transformed into over the air values that can be safely transmitted in the clear while maintaining anonymity.

— The Address 1 field (on the downlink), or the Address 2 field (on the uplink), is set to a temporary random MAC address for the affiliated STA of the non-AP MLD on the link on which the frame is transmitted.

The intended receiving MLD applies the processing described in 10.71.6 (MAC header anonymization and receiving functions) to the over the air MAC header field values.

— During address filtering, the over the air value in Address 1 (on the downlink) or Address 2 (on the uplink) is matched to the temporary random MAC address for the affiliated STA of the non-AP MLD on the link on which the frame is transmitted.

— The over the air values for the sequence number and packet number are transformed back to the original sequence number and packet number assigned by the transmitting MLD.

NOTE 1—The following list clarifies the scope of attacks that FA mitigates:

— FA mitigates against presence monitoring across multiple FA epochs.

— FA does not mitigate against presence monitoring within a single FA epoch.

— FA does not mitigate identifying frames transmitted from a single MLD within a single FA epoch.

— FA does not mitigate using traffic analysis using known transmission behavior of upper layer protocols for presence monitoring across multiple FA epochs.

The requirements in 10.71 are conditional on the non-AP MLD being associated to the AP MLD (that is, after the non-AP MLD receives a successful (Re)Association Response frame), unless otherwise noted. [802]

All CPE STAs should transmit every MSDU in an A-MSDU.

All BPE STAs shall transmit every MSDU in an A-MSDU.

NOTE 2—Transmission of MSDUs in A-MSDUs provides confidentiality of SA and DA.

**10.71.2 Proposed resolution**

**10.71.2 EDP epoch operation**

**10.71.2.1 General**

Support of EDP epoch operation is a mandatory feature within the MAC Header Anonymization, which is itself an optional feature.[1040]

EDP epoch operation allows the AP MLD to schedule groups of CPE MLD non-AP STAs (EDP groups) during time period sequences (EDP epochs) [799] to anonymize MLDs’ selected OTA fields (e.g., STA address, AID, PN, SN, etc.) in MLD’s [337] individually addressed frames.

At any given time, an AP MLD shall not assign an associated non-AP MLD to more than one EDP group. [519]

A non-AP MLD, [68]that is a member of an EDP group,[68] and its associated AP MLD,[68] shall both [68] anonymize the selected fields of the individually addressed frames according to the group EDP(#1012) epoch settings as defined in 10.71.3 (Establishing frame anonymization parameter sets), 10.71.5 (MAC header anonymization and transmitting functions), 10.71.6 (MAC header anonymization and receiving functions) and 10.71.7 (Frame anonymization and AID).

**10.71.2.2 EDP group operations**

A CPE AP MLD advertises the support for [520] EDP group operations [338] in Beacon and Probe Response frames by setting the Group EDP Epoch Supported field of the Extended RSN Capabilities field of the RSNXE element to 1.A non-AP MLD advertises the support for [520] EDP epoch group operations [339] in (Re)Association Request frames by setting the Group EDP Epoch Supported field of the Extended RSN Capabilities field of the RSNXE element to 1.

The non-AP MLD may include in an encrypted (Re)Association Request frame an EDP element indicating the parameters for the EDP group it requests to join. [69] If no EDP element is included in the encrypted (Re)Association Request frame, [69] the CPE non-AP MLD is assigned to the default EDP(#1012) group.

[523]The first EDP epoch of an EDP epoch sequence is EDP epoch number 0.

Within EDP Epoch Settings fields sent in (Re)Association Request frames, EDP Epoch Request frames and EDP Epoch Response frames, the CPE non-AP MLD shall include i) an Epoch Interval field, indicating the desired duration of the EDP epoch, the CPE non-AP MLD wants to join, and ii) an AID Storage Size field indicating the number of AIDs the CPE non-AP MLD is capable of store. In addition, the CPE non-AP MLD may include: i) an EDP Group ID, and ii) a Minimum Epoch Pacing field. The rest of fields in the EDP Epoch Settings fields shall not be transmitted by a CPE non-AP MLD [111]. The Minimum Epoch Pacing field indicates the minimum epoch interval length supported by the CPE non-AP MLD. If the value resulting of the multiplication of the Epoch Interval Length field by the Epoch Interval Unit field included in the Minimum Epoch Pacing field is greater than the value resulting of the multiplication of the Epoch Interval Length field by the Epoch Interval Unit field for the default EDP group (group 0) or of any other EDP group already created, then the CPE non-AP MLD is not assigned to any EDP group at (re)association.(#1012)

NOTE 1—The CPE non-AP MLD might remain associated without FA and might request the creation of a new EDP group (through the EDP Epoch Request frame, see 9.6.42.5[867]).

The CPE AP MLD, upon reception of the EDP element in an encrypted (Re)Association Request frame shall assign the CPE non-AP MLD to the EDP group with parameters that best match the parameters requested by including an EDP element in the encrypted (Re) Association Response frame [227], creating a new EDP group or assigning the CPE non-AP MLD to an already existing EDP group [228]. [342] The assigned EDP epoch duration [1048] shall not be shorter than indicated in the Minimum Epoch Pacing Parameters field.

The parameters of the assigned EDP group are returned to the CPE non-AP MLD through an EDP element in the (Re)Association Response frame. If no EDP element is included in the (Re)Association Response frame, the CPE non-AP MLD is not assigned to any EDP group.

A CPE AP MLD transmitting EDP Epoch Settings fields in (Re)Association Response frame, EDP Epoch Response frames, EDP Epoch Assignment frames or EDP Groups Parameters frames shall include the fields EDP Group ID, Epoch Interval, First Epoch TSF Start Time, Epoch Number Offset, Time Range, Epochs Remaining, and may also include the Number Of Participating Affiliated STAs in the EDP Epoch Settings field within the EDP element.[111] The CPE AP MLD shall not include an AID Storage Size field on transmitted EDP Epoch Settings fields.

The associated [802] CPE non-AP MLD may request creation of a new EDP group by sending an EDP Epoch(#859) Request frame (see 9.6.42.5) [867] with Epoch Request field indicating "Create" and indicating the parameters for the EDP group to be created in the EDP Epoch Settings field. [70] The CPE AP MLD may create the new EDP group with the received parameters. Alternatively, the CPE AP MLD may allocate the CPE non-AP MLD to an already existing EDP group with *similar* [530] parameters. This may be signalled to the CPE non-AP MLD in an EDP Epoch(#859) Response frame indicating in the Status field, SUCCESS\_SIMILAR\_EPOCH, and providing the EDP Epoch Settings field with the parameters of the EDP group. [530] In this context, an EDP group with "similar parameters" refers to an existing EDP group whose epoch duration is equal or smaller than the one requested by the CPE non-AP MLD (i.e., most privacy-preserving). This choice is made while ensuring adherence to any pacing limits indicated in the Minimum Epoch Pacing Parameters field that the CPE non-AP MLD has specified in (Re)Association Request frame.

Once the CPE non-AP MLD is associated and has been assigned an EDP group, it may request to join a different EDP group. Information on the available EDP group(s) may be distributed periodically by the CPE AP MLD transmitting EDP Groups(#1011, #Ed) Parameter frames (see 9.6.42.4). To join a different EDP group, the CPE non-AP MLD shall send [533] an EDP Epoch Request frame (see 9.6.42.5)[867], indicating "Join" in the Epoch Request field and providing the EDP Epoch Settings field indicating the parameters of the EDP group it requests to join. [71] Upon reception of the request, the CPE AP MLD may include the CPE non-AP MLD in the new EDP group and remove it from the previous MLD group. [968] The result of the operation is indicated to the CPE non-AP MLD through an EDP Epoch(#859) Response frame. This frame includes a Status field, "SUCCESS", indicating the operation result and an optional EDP Epoch Settings field to indicate the parameters of the newly joined EDP(#1012) group.

[72] The CPE AP MLD may request the associated CPE non-AP MLD to transition to a different EDP group, by sending an EDP Epoch Assignment(#859) frame to the associated CPE non-AP MLD(#859) including the EDP Epoch Settings field with the parameters of the suggested EDP group. The CPE non-AP MLD shall [534] report the status of the operation by responding with an EDP Epoch(#859) Response frame. This operation allows the CPE AP MLD to reorganize the EDP groups in use. Following this reorganization, the resulting EDP groups should maintain the same level of restrictiveness or be even more restrictive, i.e., shorter epoch durations, while also respecting any pacing limits indicated in the Minimum Epoch Pacing Parameters field that the CPE non-AP MLD has specified in (Re)Association (see 9.6.42.5)[867].

Once the CPE non-AP MLD receives an EDP Epoch Response frame or transmits an EDP Epoch Response frame in response to an EDP Epoch Assignment frame, signaling successful (Status code field set to SUCCESS, SUCCESS\_SIMILAR\_EPOCH, SUCCESS\_ALREADY\_EXISTING\_EPOCH or SUCCESS\_AID\_LIST\_PARTIALLY\_STORED) reception of new EDP group parameters, the CPE non-AP MLD shall compute the new MAC Header Anonymization parameters as per 10.71.3 and apply them immediately. [233]

A CPE non-AP MLD may leave an EDP group at any time by sending an EDP Epoch(#859) Request frame (see 9.6.42.5)[867] indicating "Leave" in the Epoch Request field. Upon reception of this message, the CPE AP MLD shall remove the CPE non-AP MLD from the EDP group. The CPE non-AP MLD shall continue using the current MAC Header Anonymization parameters’ values currently in use at the time of leaving the group.[234]