IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 11bi D1.0 CRs for 3.2 | | | | |
| Date: 2025-06-02 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Jerome Henry | Cisco Systems |  |  | jerhenry@cisco.com |
| Domenico Ficara | Cisco Systems |  |  | dficara@cisco.com |
| Ugo Campiglio | Cisco Systems |  |  | ucampigl@cisco.com |
| Javier Contreras | Cisco Systems |  |  | jacontre@cisco.com |

Abstract

This submission proposes resolutions for the following CIDs:

982, 9, 146, 781, 983, 780, 879, 769, 782, 148, 783, 976, 149, 321, 372, 920, 911, 985, 373, 374, 770, 785, 921, 299, 151, 375, 158, 786, 923, 987, 323, 184, 300, 988, 183, 386, 301, 152, 986, .

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Improved resolution to CID

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGbi D1.0 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGbi D1.0 Draft. (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents). TGbi Editor: Editing instructions preceded by “TGbi Editor” are instructions to the TGbi editor to modify existing material in the TGbi draft. As a result of adopting the changes, the TGbi editor will execute the instructions rather than copy them to the TGbi Draft.***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Clause** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 982 | 3.2 | 21.01 | In many cases, whether a STA, AP, non-AP MLD or AP MLD supports CPE, BPE or EDP can be implied from the context. | Delete "EDP", "CPE" and "BPE" prefixes before "STA", "AP", "non-AP MLD" or "AP MLD" when this can be implied from the context. | Rejected  While this proposed change makes sense in the body of the specification, the goal of clause 3.2 is to provide specific definitions, thus clarity is more important than conciseness (with the risk of ambiguity). |
| 9 | 3.2 | 21.09 | Do we really need the AP and non-AP MLD versions of CPE and EDP? I would opine that simply adding CPE and EDP to the definitions should suffice. | Add definitions for CPE and EDP and delete the CPE AP MLD, CPE non\_AP MLD, EDP AP, EDP non-AP STA | Revised –  In general, the amendment does not define project title in 3.2. For example, no VHT definition in 3.2. However, normally, there are descriptions in 4.5 Overview of the services, and 11bi already has 4.5.4.10a Enhanced Data Privacy (EDP) enhancements to further describe EDP. CPE needs definition, TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 9 |
| 146 | 3.2 | 21.09 | The definition of CPE is self-referential. A definition of CPE needs to be provided separately. | Add a new definition in clause 3.2: "client privacy enhancements: [CPE] enhancements to a client for privacy purposes" | Revised  TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 146 |
| 781 | 3.2 | 21.09 | The definitions do not include CPE as a stannd-alone entry. The terms "CPE AP MLD" and "CPE non-AP MLD" are included, but these use CPE in the definition and thus provide no explanation of what CPE is. While the expansion for the abbreviation CPE is spelled out in the abbreviations list, this does not explain the concept. | Add a definition of "client privacy enhancements". One possibility: "A set of features by which a STA or MLD alters or reduces content transmitted in unsecured preassociation and association messages to reduce the opportunity for fingerprinting." | Revised  TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 781 |
| 983 | 3.2 | 21.10 | Definition refers to CPE features, but there is no definition of CPE or CPE features. See also line 14 | Add a definition for CPE or CPE features | Revised  TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 983 |
| 780 | 3.2 | 21.09 | Defintions do not include BPE, BPE AP MLD and BPE non-AP MLD | Add definitions for these three terms | Revised  TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 780 |
| 879 | 3.2 | 21.09 | This type of definition is not very useful. Also, the definitions in 3.2 are not comprehesive; why is CPE AP MLD and CPE non-AP MLD defined (both with the same definition BTW), but not CPE STA, CPE AP, CPE non-AP STA. | Remove this definition and the one at 21.13. Provide a better overview in 4.5.4.10a, that 1) defines CPE and 2) explains the relationship of CPE to EDP and to the various STA and MLD flavors. | Rejected  Although the definitions are indeed not very useful, they follow the baseline structure where many other terms are merely expanded with a definition that looks… not very useful. More text is indeed needed in clause 4. CPE applies to MLDs, not to indvidiual STAs. |
| 769 | 3.2 | 21.10 | The statement that an CPE AP MLD is an AP MLD that implementing CPE features, is not very clear or useful. It would be better to define the CPE AP MLD as an AP MLD that transmits Privacy Beacons. As this is how an MLD can determine if the AP MLD is a CPE AP. | Change: An AP MLD implementing CPE features. To: An AP MLD that transmits privacy beacons. | Rejected  Although the definitions are indeed not very useful, they follow the baseline structure where many other terms are merely expanded with a definition that looks… not very useful. The proposal is to replace the definition by one behavior of the AP. However, the AP does more than send privacy beacons, therefore focusing the definition on this single behavior may be misleading to the readers. |
| 782 | 3.2 | 21.16 | The definitions include DS MAC address, but do not include OTA MAC address which is similarly used in the text. | Add definition of OTA MAC address | Revised  The OTA MAC is in fact a regular MAC in the MAC header. TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 782 |
| 148 | 3.2 | 21.28 | The definition of EDP is self-referential. A definition of EDP needs to be provided separately. | Add a new definition in clause 3.2: "enhanced data privacy: [EDP] enhancements for the privacy of data" | Rejected –  In general, the amendment does not define project title in 3.2. For example, no VHT definition in 3.2. However, normally, there are descriptions in 4.5 Overview of the services, and 11bi already has 4.5.4.10a Enhanced Data Privacy (EDP) enhancements to further describe EDP. |
| 783 | 3.2 | 21.28 | The definitions do not include EDP as a stand-alone entry. There are multiple terms that include EDP, but these use EDP in the defintion, so provide little clarrity on what EDP is. While the expansion of the abbreviation EDP is spelled out in the abbreviations list, this does not explain the concept. | Add a definition of "enhanced data privacy". One possibility: "A set of features by which a STA or MLD reduces the disclosure of information that might allow a third party observing the wireless medium to track the actions or locations of devices." | Rejected –  In general, the amendment does not define project title in 3.2. For example, no VHT definition in 3.2. However, normally, there are descriptions in 4.5 Overview of the services, and 11bi already has 4.5.4.10a Enhanced Data Privacy (EDP) enhancements to further describe EDP. |
| 976 | 3.2 | 21.29 | The statement that an CPE AP is an AP that supports at least one of the EDP features, is not very clear or useful. It would be better to define the CPE AP as an AP that transmits Privacy Beacons. As this is how a STA can determine if the AP is a CPE AP. | Replace: An AP with support for at least one of the EDP features. With: An AP that transmits privacy beacons. | Rejected  Although the definitions are indeed not very useful, they follow the baseline structure where many other terms are merely expanded with a definition that looks… not very useful. The proposal is to replace the definition by one behavior of the AP. However, the AP does more than send privacy beacons, therefore focusing the definition on this single behavior may be misleading to the readers. |
| 149 | 3.2 | 21.43 | The definition of EDP epoch does not need to mention EDP. Epoch is not used in the baseline, so why not just use "epoch". | Replace all occurences of "EDP epoch" with "epoch". There are 180 occurences. | Rejected  The TG discussed this point in the past. Although epoch is used solely in the context of EDP for now, it also has a specific meaning, that is not the general meaning of an epoch. Confusion will arise if other amendments use the term epoch in its general meaning, thus being specific seems safer. |
| 321 | 3.2 | 21.44 | Incorrect tense - "set ... remain constant" | Change to "set ... remains constant." | Accepted  TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 321 |
| 372 | 3.2 | 21.46 | "A fixed duration between the reference start times of two consecutive EDP epochs in an EDP epoch sequence." -- it is not clear what a "reference start time" is | Delete "reference " | Revised  We used to call the epoch interval “reference interval” in early drafts, then removed the term from the text, removing it from the matching definition makes sense. However, we want to keep alive the idea that this is a target value, that may not be always what both sides see, changing ‘reference’ to ‘target’. TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 372 |
| 920 | 3.2 | 21.47 | The concept could be more clearly defined. Presumably "reference" because while the duration is fixed the actual start times vary. Maybe use "target" as an adjective (as in TBTT) instead of "reference". | Change definition to "A fixed duration representing the time between the target start of consecutive EDP epochs. The actual EDP epoch start times might vary." | Revised  3.2 may not describe behavior, buttarget is a better choice than reference. TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 920 |
| 911 | 3.2 | 21.47 | "time window" implies a smaller part of a whole (think of a window in a building). In this context I believe we are talking about long periods of time that follow each other consecutively (without gaps). | Change "time window" to "period of time". Ditto for 22.5 and 22.10. | Accepted  Note: other comments also remove the distinction between group and individual epochs. TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 911 |
| 985 | 3.2 | 21.50 | This term is used only in also p47, line 34. Could we rename to "EDP epoch settings" wh.ich is used more frequently in the specification. | Update term here and replace occurrence on p47, line 34 with "EDP epoch settings" | Revised  TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 985 |
| 373 | 3.2 | 21.54 | I think we normally spell out "0" in these situations | Change to "zero" | Accepted  TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 373 |
| 374 | 3.2 | 21.54 | It is not clear to me why something that has no MLDs should still be called a group | Change "0" to "one" | Rejected  The AP sets the groups, when the group is set the group may exist without any STA, thus it has 0 member. Similarly, a STA can leave a group. When the last STA leaves the group, the group has 0 members. The AP may delete the empty group at some point, but there is no mandate for a group to have at least one member. |
| 770 | 3.2 | 21.54 | "enhanced data privacy (EDP) group" definition seems to be restricted to MLD case only. Any reason in particular? | If this definition only applies to MLD, make it explicitely clear, e.g. replace "enhanced data privacy (EDP) group" with "enhanced data privacy (EDP) multi-link device (MLD) group". | Rejected  The TG indeed concluded that EDP would only apply to MLDs. Yet renaming the group to EDP MLD group would imply that there are non-MLD groups, which would be misleading to the reader. |
| 785 | 3.2 | 21.54 | The definition of EDP group suggests that a group can include 0 items, which seems contradictory. In addition, it says that members of the group apply the same epoch parameters, but which seems even more of a problem for a group with zero or even just one member. (Same as what?) | Revise definition. Suggestion: "A construct for representing a collection of non-access point (non-AP) multi-link devices (MLDs) associated with the same AP MLD that apply the same EDP epoch parameters." | Revised  The definition still needs to convey that the group may be empty. TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 785 |
| 921 | 3.2 | 21.54 | Use numbers for values but words for small counts | 0 => zero | Accepted  Note: TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 921 |
| 299 | 3.2 | 21.55 | multi-link device should be multi-link devices | change to multi-link devices | Accepted (also fixed with #785).  Note: TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 299 |
| 151 | 3.2 | 21.57 | The term "EDP parameter" is not used in the draft, only "EDP parameters". | Either change the definition to "EDP parameters" or change it to "privacy parameters". | Revised  Changed to EDP settings (plural) as per #985. TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 151 |
| 375 | 3.2 | 21.57 | "Client privacy enhancements (CPE) or basic service set (BSS) privacy enhancements (BPE) parameter." is missing an article | Change to "A client [...]" | Accepted  Note: TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 375 |
| 158 | 3.2 | 21.58 | Neither "CPE parameter" nor "BPE parameter" is used in the draft. EDP parameter is only used once (P78L11). Therefore this definition of EDP parameter is at best meaningless and should be removed. | Remove the definition of EDP parameter and any use of it within the draft. A more suitable generic term would be "privacy parameter". | Revised  Changed to EDP settings, which is used in the draft (also with CID 985). TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 158 |
| 786 | 3.2 | 21.58 | The definition of EDP parameter includes "BPE", but this term is not defined on its own. It is used later in the document in multiple ways, such as "BPE EDP features", "BPE AP MLD", and "BPE non-AP MLD" | Add a defintion of "basic service set (BSS) privacy enhancements". Suggestion: "A set of features by which an access point (AP) multi-link device (MLD) reduces the amount of information about itself it makes available to third party observers." | Revised  Also implemented as part of CID 780. The definition was aligned with that of CPE for parity. TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 786 |
| 923 | 3.2 | 22.05 | Recursive definition; if I read it my brain will enter an infinite loop. Surely, group EDP epoch and individual EDP epoch are EDP epochs applied to different sets of STAs? Define them that way. | Define as "An EPD epoch that applies to a specific group of non-AP MLDs." and, for 22.10: "An EDP epoch that applies to single non-AP MLD." | Revised  The epoch is not the parameters, each epoch has parameters, but the definition is indeed recursive and needs fixing. Other comments also remove the distinction between group and individual epochs. TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 923 |
| 987 | 3.2 | 22.05 | Since indiividual EDP epochs are no longer used, reduce "group EDP epoch" to "EDP Epoch". Update is needed in other locations in the specification. | Update occurrences of "group EDP epoch" (and expanded term) with "EDP epoch" (or expanded term respectively) | Revised  Individual epochs indeed do not exist anymore. TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 987 |
| 323 | 3.2 | 22.06 | Definitions for EDP Epoch and Group EDP Epoch and Individual EDP Group Epoch are needlessly repetitive | Remove one or the other definition. Prefer to remove Group and Individual EDP Epochs. | Accepted  Note: TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 323 |
| 184 | 3.2 | 22.08 | The group EDP Epoch parameters are applied by AP and non-AP MLDs. The AP MLD is not mentioned in the definition. | Change the definition to read:" A time window in which each non-access point (non-AP) multi-link device (MLD) of a set of non-AP MLDs and the associated APs of the AP MLD apply a set of EDP parameters that isvalid for the duration of that group EDP epoch." | Revised  Agree in principle, the definition was improved with CID 987, and also includes the AP MLD. TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 184 |
| 300 | 3.2 | 22.10 | I think we do not have individual EDP epochs, we should remove the definition | remove the definition individual EDP eopch | Accepted  Note: TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 300 |
| 988 | 3.2 | 22.11 | indiividual EDP epochs are no longer used | delete this definition | Accepted  TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 988 |
| 183 | 3.2 | 22.12 | The individual EDP Epoch parameters are applied by AP and non-AP MLDs. The AP MLD is not mentioned in the definition. | Change the definition to read:" A time window in which AP and a single associated non-AP MLD apply a set of EDP parameters to anonymize individually addressed frames to and from the non-AP MLD. The parameters set is valid for the duration of that individual EDP epoch." | Revised  Agree in principle, the definition was removed with CID 987, as individual epochs no longer exist in the draft. TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 183 |
| 386 | 3.2 | 0.00 | There are definitions of CPE AP MLD and CPE non-AP MLD but not BPE equivalents | Add definitions of BPE AP MLD and BPE non-AP MLD | Revised  The definitions were added. TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 386 |
| 301 | 3.2 | 0.00 | I think we should have a definition of CPE and BPE in definitions clause | add a definition of both terms so a reader can undersstand the difference | Revised  The definitions were added. TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 301 |
| 152 | 3.4 | 22.53 | Why is there no definition of BPE in clause 3.2? There are definitions for CPE and EDP. | Add a new definition in clause 3.2: "BSS privacy enhancements: [BPE] enhancements to a BSS for privacy purposes" | Revised  The definitions were added. TGbi editor to make the changes shown in the latest version of 11-25/1008 under all headings that include CID 152 |
| 986 | 3.2 | 21.47 | "EDP parameters" is another term for "frame anonymization parameter set". The spec should not use two terms for the same definition. Also used on p21 line 47, p22 line 6, p22 line 12, p78 line 11 | Delete defintion, and replace other occurences of "EDP parameters" with "frame anonymization parameter set" or "FA parameter set" | Rejected  In the current draft, EDP parameters apply to CPE and BPE, while FA parameters only applies to CPE in 10.71.1. Allying this unification would require first changing 10.71.1, which is more than just a definition change. |

**Discussion**

Clause 3.2 before changes:

**client privacy enhancements (CPE) access point (AP) multi-link device (MLD):** [CPE AP MLD]An AP MLD implementing CPE features.

**client privacy enhancements (CPE) non-access point (non-AP) multi-link device (MLD):** [CPE non-AP MLD] A non-AP MLD implementing CPE features.

**distribution system (DS) medium access control (MAC) address:** [DS MAC address] A MAC address used by an enhanced data privacy (EDP) access point (AP) or an EDP AP multi-link device (MLD) as the address to notify the DS and establish the destination mapping for an EDP non-AP STA or an EDP non-AP MLD after (re)association.(#984)

**enhanced data privacy (EDP) access point (AP):** [EDP AP] An AP with support for at least one of the EDP features.

**enhanced data privacy (EDP) non-access point (AP) station (STA):** [EDP non-AP STA] A non-AP STA with support for at least one of the EDP features.

**enhanced data privacy (EDP) access point (AP) multi-link device (MLD):** [EDP AP MLD] An AP MLD with support for at least one of the EDP features.

**enhanced data privacy (EDP) non-access point (AP) multi-link device (MLD):** [EDP non-AP MLD] A non-AP MLD with support for at least one of the EDP features.

**enhanced data privacy (EDP) epoch:** [EDP epoch] A time window during which a set of EDP parameters remain constant.

**enhanced data privacy (EDP) epoch reference interval:** [EDP epoch reference interval] A fixed duration between the reference start times of two consecutive EDP epochs in an EDP epoch sequence.

**enhanced data privacy (EDP) epoch parameters:** [EDP epoch parameters] A set of parameters characterizing an EDP epoch.

**enhanced data privacy (EDP) group:** [EDP group] A group of 0 or more non-access point (non-AP) multi-link device (MLD) associated to the same AP MLD and that apply the same EDP epoch parameters.

**enhanced data privacy (EDP) parameter:** [EDP parameter] Client privacy enhancements (CPE) or basic service set (BSS) privacy enhancements (BPE) parameter.

**frame anonymization:** [FA] A multi-link operation (MLO) enhanced data privacy (EDP) mechanism for frames transmitted by or intended for reception by an associated non-AP multi-link device (MLD), mitigating against the use of unencrypted fields for presence monitoring.

**frame anonymization parameter set:** [FA parameter set] A set of parameters used in frame anonymization.

**group enhanced data privacy (EDP) epoch:** [group EDP epoch] A time window in which each non-access point (non-AP) multi-link device (MLD) of a set of non-AP MLDs applies a set of EDP parameters that is valid for the duration of that group EDP epoch.

**individual enhanced data privacy (EDP) epoch:** [individual EDP epoch] A time window in which a single non-AP MLD applies a set of EDP parameters that is valid for the duration of that individual EDP epoch.

**over-the-air packet number:** [OPN] The value transmitted in an individually addressed Counter Mode (CTR) with cipher-block chaining message authentication code (CBC-MAC) protocol (CCMP) header or Galois/Counter Mode (GCM) protocol (GCMP) header in the place of the packet number as part of frame anonymization.

**over-the-air sequence number:** [OSN] The value transmitted in an individually addressed medium access control (MAC) protocol data unit (MPDU) header in the place of the sequence number as part of frame anonymization.

**presence monitoring:** Determining the ongoing presence of non-access point (non-AP) multi-link devices (MLDs) associated to an AP MLD.

**privacy group temporal key (PGTK):** [PGTK] A random value, assigned by the access point (AP) multi-link device (MLD), that is used to anonymize fields.

**Discussion on CPE, BPE, EDP and FA relationship**

On EDP and CPE:

* **In 4.5.10a, EDP seems to include CPE and BPE**
* **Using EDP features, a STA or MLD can modify the amount of information disclosed in several ways.** 
  + Using EDP client privacy enhancements (CPE), a non-AP STA or non-AP MLD can…
  + An AP MLD supporting BPE EDP features can…

Therefore, EDP is the overarching set of features, that include CPE and BPE features

A diagram of a diagram

AI-generated content may be incorrect.

On BPE vs CPE:

* **4.5.4.10a, second paragraph, talks about BPE:**
  + *A BPE EDP AP MLD and its associated non-AP MLDs can change their OTA MAC addresses and other trackable fields for both unicast and group transmissions.*
    - -> it seems that BPE supposes that non-AP MLDs also obfuscate OTA parameters
* **10.71.4 confirms:**
  + *All associated BPE non-AP MLDs and the BPE AP MLD shall generate EDP BPE frame anonymization parameters for a given EDP epoch by computing a single pseudorandom EDP BPE FA block which is partitioned into a set of EDP BP frame anonymization parameters according to the following tables.*
    - -> but the table only talks about the AP MAC addresses on the various links. The same limitation is brought forward in 10.71.6.1 (lines 8-10)
* **10.71.8:**
  + *BSS Privacy Enhancement (BPE) operations protect privacy of BPE AP MLDs and associated BPE non-AP MLDs. The BPE AP MLD privacy is protected by not sending BPE AP MLD discovery information, e.g., SSID, capability or operation elements, clear over the air.*
  + *The associated non-AP BPE MLDs and BPE AP MLD operate in a single EDP group named as a BPE group. The BPE group has a single schedule. At the beginning of each epoch, the BPE non-AP STA addresses and SN spaces and PNs of the individual frames are anonymized in all links according to CPE anonymization, see10.71.3*

Therefore, BPE includes CPE, with a specific mode of a single epoch structure.

On CPE vs FA:

* + *EDP CPE feature available when MLO is supported and DS MAC address is supported (10.71.1)*
  + FA focuses on non-AP MLD, and only beacon and unicast frames, and AID, SN/PN, address 1 (DL), or address 2 (DL)
  + *10.71.1 Note 1 talks of “FA epochs”*
  + *4.5.4.10a: Using EDP client privacy enhancements (CPE), a non-AP STA or non-AP MLD can modify the content of messages sent before and during association to reduce the opportunity to fingerprint the non-AP STA or non-AP MLD through its messages outside of a secured connection. A non-AP MLD supporting CPE frame anonymization can change the MAC address(es) and other fields used in communications by its affiliated STAs during an association*
  + *10.71.2.1 Support of EDP epoch operation is optional for a CPE AP MLD and a CPE non-AP MLD.*
  + *10.71.2.2 A CPE AP MLD advertises the support of EDP groups …*
  + *the CPE non-AP MLD is assigned to the default EDP group…*
  + *(without an assigned group), 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)*

Therefore, CPE is a set of features that includes FA (changing OTA visible parameters like MAC, AID, SN/PN) and epoch management (groups, min pacing element, collision warning etc.)

CID 9, 146, 781, 983:

**client privacy enhancements (CPE):** enhancements for client privacy purposes

CID 780, 386, 152, 301, 786:

**BSS privacy enhancements (BPE):** enhancements for BSS privacy in an MLD context extending CPE features

**BSS privacy enhancements (BPE) access point (AP) multi-link device (MLD):** [BPE AP MLD]An AP MLD implementing BPE features.

**BSS privacy enhancements (BPE) non-access point (non-AP) multi-link device (MLD):** [BPE non-AP MLD] A non-AP MLD implementing BPE features.

CID 782:

**Over the air (OTA) medium access control (MAC) address:** [OTA MAC address] A MAC address in the MAC header transmitted over the wireless medium.

CID 321

**enhanced data privacy (EDP) epoch:** [EDP epoch] A time window during which a set of EDP parameters remains constant.

CID 372, 920

**enhanced data privacy (EDP) epoch ~~reference~~ interval:** [EDP epoch ~~reference~~ interval] A fixed duration between the target ~~reference~~ start times of two consecutive EDP epochs in an EDP epoch sequence.

CID 911

**enhanced data privacy (EDP) epoch:** [EDP epoch] A period of time ~~window~~ during which a set of EDP parameters remain constant.

**group enhanced data privacy (EDP) epoch:** [group EDP epoch] A period of time ~~window~~ in which each non-access point (non-AP) multi-link device (MLD) of a set of non-AP MLDs applies a set of EDP parameters that is valid for the duration of that group EDP epoch.

**individual enhanced data privacy (EDP) epoch:** [individual EDP epoch] A period of time ~~window~~ in which a single non-AP MLD applies a set of EDP parameters that is valid for the duration of that individual EDP epoch.

CID 985, 151, 158

**enhanced data privacy (EDP) epoch settings ~~parameters~~:** [EDP epoch settings ~~parameters~~] A set of parameters characterizing an EDP epoch.

**9.4.1.9 Status code field**

Table 9-80 – **Status codes**

|  |  |  |
| --- | --- | --- |
| **Status code** | **Name** | **Meaning** |
| … |  |  |
| 145 | SUCCESS\_SIMILAR\_EPOCH | The request to join or create a group epoch is successful but the epoch settings parameters are not exactly the requested |

Annex C

C.3 MIB Detail

dot11EDPEpochStartTimeMargin OBJECT-TYPE

SYNTAX Unsigned32 (1..100)

UNITS "0.1 milliseconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a control variable.

It is written by an external management entity or the SME. Changes take effect as soon as practical in the implementation.

This attribute indicates the duration, before an epoch boundary, during which a STA receiving individually addressed frames does not filter out frames that use the current nor the next epoch settings ~~parameters~~."

DEFVAL { 100 }

::= { dot11EDPStationConfigEntry 3 }

dot11EDPEpochTransitionTime OBJECT-TYPE

SYNTAX Unsigned32 (1..1000)

UNITS "TUs"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a control variable.

It is written by an external management entity or the SME. Changes take effect as soon as practical in the implementation.

This attribute indicates the duration, after an epoch boundary, during which a STA receiving individually addressed frames does not filter out frames that use the previous nor the current epoch settings ~~parameters~~."

DEFVAL { 300 }

::= { dot11EDPStationConfigEntry 4 }

CID 373

**enhanced data privacy (EDP) group:** [EDP group] A group of zero ~~0~~ or more non-access point (non-AP) multi-link device (MLD) associated to the same AP MLD and that apply the same EDP epoch settings (#985).

CID 785, 299

**enhanced data privacy (EDP) group:** [EDP group] A construct for representing a collection of non-access point (non-AP) multi-link devices (MLDs) associated with a single AP MLD that apply identical EDP epoch settings. An EDP group includes zero or more members.

CID 375

**enhanced data privacy (EDP) settings:** [EDP settings] A c~~C~~lient privacy enhancements (CPE) or basic service set (BSS) privacy enhancements (BPE) parameter.

CID 923

**group enhanced data privacy (EDP) epoch:** [group EDP epoch] A period of time in which each non-access point (non-AP) multi-link device (MLD) of a set of non-AP MLDs applies a set of EDP settings ~~that is valid for the duration of that group EDP epoch~~.

**individual enhanced data privacy (EDP) epoch:** [individual EDP epoch] A period of time in which a single non-AP MLD applies a set of EDP settings ~~that is valid for the duration of that individual EDP epoch~~.

CID 987, 184, 300, 988, 183, 923, 323

**enhanced data privacy (EDP) epoch:** [EDP epoch] A period of time ~~window~~ which each non-access point (non-AP) multi-link device (MLD) of a set of non-AP MLDs applies a set of EDP settings ~~during which a set of EDP parameters remain constant.~~

**~~group enhanced data privacy (EDP) epoch:~~** ~~[group EDP epoch] A period of time in which each non-access point (non-AP) multi-link device (MLD) of a set of non-AP MLDs applies a set of EDP parameters that is valid for the duration of that group EDP epoch.~~

**~~individual enhanced data privacy (EDP) epoch:~~** ~~[individual EDP epoch] A period of time in which a single non-AP MLD applies a set of EDP.~~

*Also replace group EDP epoch with EDP epoch in the draft (13 other occurences)*

*TGbi editor: Modify clause 3.2 as follows (track change on):*

**BSS privacy enhancements (BPE):** enhancements for BSS privacy purposes (#780, 386, 152, 301)

**BSS privacy enhancements (BPE) access point (AP) multi-link device (MLD):** [BPE AP MLD]An AP MLD implementing BPE features. (#780, 386, 152)

**BSS privacy enhancements (BPE) non-access point (non-AP) multi-link device (MLD):** [BPE non-AP MLD] A non-AP MLD implementing BPE features. (#780, 386, 152)

**client privacy enhancements (CPE):** enhancements for client privacy purposes (#9, 146, 781, 983)

**client privacy enhancements (CPE) access point (AP) multi-link device (MLD):** [CPE AP MLD]An AP MLD implementing CPE features.

**client privacy enhancements (CPE) non-access point (non-AP) multi-link device (MLD):** [CPE non-AP MLD] A non-AP MLD implementing CPE features.

**distribution system (DS) medium access control (MAC) address:** [DS MAC address] A MAC address indicated by an enhanced data privacy (EDP) non-access point (non-AP) station (STA) to an EDP AP or an EDP non-AP multi-link device (MLD) to an EDP AP MLD and used by the EDP AP or the EDP AP MLD as the address to notify the DS and establish the destination mapping for the EDP non-AP STA or the EDP non-AP MLD after (re)association.

**EAPOL-Start Authentication frame:** An Authentication frame that carries all or part of an IEEE 802.1X Extensible Authentication Protocol (EAP) over local area network (LAN) (EAPOL) protocol data unit (PDU) of type EAPOL-Start.

**enhanced data privacy (EDP) access point (AP):** [EDP AP] An AP with support for at least one of the EDP features.

**enhanced data privacy (EDP) non-access point (AP) station (STA):** [EDP non-AP STA] A non-AP STA with support for at least one of the EDP features.

**enhanced data privacy (EDP) access point (AP) multi-link device (MLD):** [EDP AP MLD] An AP MLD with support for at least one of the EDP features.

**enhanced data privacy (EDP) non-access point (AP) multi-link device (MLD):** [EDP non-AP MLD] A non-AP MLD with support for at least one of the EDP features.

**enhanced data privacy (EDP) epoch:** [EDP epoch] A period of time (#911) during which a set of EDP parameters remains (#321) constant.

**enhanced data privacy (EDP) epoch (#372, 920) interval:** [EDP epoch interval] A period of time (#911) between the target (#372, 920) start times of two consecutive EDP epochs in an EDP epoch sequence.

**enhanced data privacy (EDP) epoch settings (#985, 151, 158):** [EDP epoch settings] A set of parameters characterizing an EDP epoch.

**enhanced data privacy (EDP) group:** [EDP group] A construct for representing a collection of non-access point (non-AP) multi-link devices (#299) (MLDs) associated with the same AP MLD that apply the same EDP epoch settings. An EDP group may include zero (#373, 921) or more members (#785).

**enhanced data privacy (EDP) parameter:** [EDP parameter] A (#375) client privacy enhancements (CPE) or basic service set (BSS) privacy enhancements (BPE) parameter.

**frame anonymization:** [FA] A multi-link operation (MLO) enhanced data privacy (EDP) mechanism for frames transmitted by or intended for reception by an associated non-AP multi-link device (MLD), mitigating against the use of unencrypted fields for presence monitoring.

**frame anonymization parameter set:** [FA parameter set] A set of parameters used in frame anonymization.

**(#987, 184, 300, 988, 183, 923, 323)**

**Over the air (OTA) medium access control (MAC) address:** [OTA MAC address] A TA or RA MAC address. (#782)

**over-the-air packet number:** [OPN] The value transmitted in an individually addressed Counter Mode (CTR) with cipher-block chaining message authentication code (CBC-MAC) protocol (CCMP) header or Galois/Counter Mode (GCM) protocol (GCMP) header in the place of the packet number as part of frame anonymization.

**over-the-air sequence number:** [OSN] The value transmitted in an individually addressed medium access control (MAC) protocol data unit (MPDU) header in the place of the sequence number as part of frame anonymization.

**9.4.1.9 Status code field**

Table 9-80 – **Status codes**

|  |  |  |
| --- | --- | --- |
| **Status code** | **Name** | **Meaning** |
| … |  |  |
| 145 | SUCCESS\_SIMILAR\_EPOCH | The request to join or create a group epoch is successful but the epoch settings parameters (#985, 151, 158) are not exactly the requested |

Annex C

C.3 MIB Detail

dot11EDPEpochStartTimeMargin OBJECT-TYPE

SYNTAX Unsigned32 (1..100)

UNITS "0.1 milliseconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a control variable.

It is written by an external management entity or the SME. Changes take effect as soon as practical in the implementation.

This attribute indicates the duration, before an epoch boundary, during which a STA receiving individually addressed frames does not filter out frames that use the current nor the next epoch settings ~~parameters~~." (#985, 151, 158)

DEFVAL { 100 }

::= { dot11EDPStationConfigEntry 3 }

dot11EDPEpochTransitionTime OBJECT-TYPE

SYNTAX Unsigned32 (1..1000)

UNITS "TUs"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a control variable.

It is written by an external management entity or the SME. Changes take effect as soon as practical in the implementation.

This attribute indicates the duration, after an epoch boundary, during which a STA receiving individually addressed frames does not filter out frames that use the previous nor the current epoch settings ~~parameters~~." (#985, 151, 158)

DEFVAL { 300 }

::= { dot11EDPStationConfigEntry 4 }