|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Proposed spec texts for AID anonymization | | | | |
| Date: 2024-10-25 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Domenico Ficara | Cisco Systems |  |  | dficara@cisco.com |
| Ugo Campiglio | Cisco Systems |  |  | ucampigl@cisco.com |
| Jerome Henry | Cisco Systems |  |  | jerhenry@cisco.com |
| Javier Contreras | Cisco Systems |  |  | jacontre@cisco.com |
| Federico Lovison | Cisco Systems |  |  | flovison@cisco.com |
| Antonio de la Oliva | Interdigital Ltd, UC3M |  |  | [aoliva@it.uc3m.es](mailto:aoliva@it.uc3m.es) |

Abstract

This submission proposes spec text to address the need for AID anonymization, as per proposal in 1105r1

Revision History:

* Rev 0: Initial version of the document
* Rev 1: Address comments from first discussion
* Rev 2: Removed conflicting clause
* Rev 3: Address comments from presentation in Vancouver Nov’24
* Rev 4: Rewording of clause 10.71.6
* Rev 5: Address comments from presentation in telecon of Dec 4, 2024
* Rev 6: Address comments from presentation in Kobe, Jan ‘25

***Discussion:***

|  |  |  |  |
| --- | --- | --- | --- |
| **CID** | **Comment** | **Proposed Change** | **Proposed Resolution** |
| 1515 | The AID anonymization may be possible only if the AP assigns new AID value for the STA. AID assignment may repeat many times and cause high signalling overhead. Please allow AP to fast assign AID value in Broadcasted control frames to associated STAs. | Define a mechanism to assign AID value to associated STAs. The AID assignment should use broadcast control frames and STAs' addresses when assigning the AID value. One control frame should be able to assign multiple AID values. | Revised.  Submission 1714r5 proposes individual management frames to assign new AID value for the STAs.  Editor please implement the changes in document 1715r5. |
| 1516 | The AID seems to be the most complicated parameter to anonymize. STAs should be allowed to operate without anonymizing AID value. | Define operation mechanism that allows STAs to operate without AID anonymization. For instance, the devices may only use UL EDCA access and DL MU PPDU may contain AID value for these STAs. The operation without AID anonymization may be relevant principle for IoT-devices or to operation with mobile hot spot. | Rejected.  The AID value is used in Beacons and most PPDU types. The AID is needed to ensure private use of these PPDU types and Beacon frames. |

***Editing instructions formatted like this are intended to be copied into the TGbi Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGbi editor: Please add following row to Table 9-130 (Element IDs) as follows:***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Element | Element ID | Element ID Extension | Extensible | Fragmentable |
| ...... |  |  |  |  |
| AID List element | 255 | <ANA> | Yes | Yes |
| ... |  |  |  |  |
| NOTE—See 10.28.6 (Element parsing) on the parsing of elements. | | | | |

* Element IDs

***TGbi editor: Please modify the Status Code field in clause 9.4.1.9 as follows***

**9.4.1.9 Status Code field**

***-- Editor please add the following rows to Table 9-80 as follows --***

|  |  |  |
| --- | --- | --- |
| Status Code | Name | Meaning |
| <ANA> | SUCCESS\_AID\_LIST\_PARTIALLY\_STORED | The AID List is too large and the CPE non-AP MLD has stored it only partially. |
| <ANA> | FAILURE\_AID\_LIST\_NOT\_STORED | No AID value has been stored. |
| <ANA> | FAILURE\_AID\_STORAGE\_TOO\_SMALL | The request to join or create a group epoch has failed, because the AID storage of the non-AP MLD is too small |
| <ANA> | NO\_ASSIGNED\_AID | The non-AP MLD has no AID value for the current epoch. |

***TGbi editor: Please insert the following new subclause at the end of 9.4.1***

**9.4.1.XX Number of Stored AIDs field**

The Number of Stored AIDs field indicates the number of AIDs from the AID List Value field that the non-AP MLD has stored.

The format of the Number of Stored AIDs field is shown in Figure 9-X

|  |  |
| --- | --- |
|  | Number  of Stored AIDs |
| Bits: | 16 |

**Figure 9-X – Number of Stored AIDs field format**

***TGbi editor: Please modify the subclause 9.4.1.83 as follows:***

* EDP Epoch Settings field (#1070, #Ed)

The EDP Epoch Settings field includes the information regarding the parameters of an Epoch.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | EDP Epoch Settings Control | Group ID | Epoch Interval | First Epoch Start Time | Time Range | Epochs Remaining | Minimum Epoch Pacing Parameters | Number Of Participating Affiliated STAs | AID Storage Size |
| Bits: | 16 | 0 or 8 | 16 | 0 or 64 | 0 or 16 | 0 or 16 | 0 or 16 | 0 or 8 or 16 or 24 | 0 or 16 |

* EDP Epoch Settings field format(#Ed)

The EDP Epoch Settings field contains the EDP epoch parameters of an EDP epoch sequence for the non-AP MLD.

The Group ID field signals an identifier of the EDP group. Value 0 indicates the default group. Value 255 is reserved.

The EDP Epoch Settings Control is defined as follows:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Group ID Present | First Epoch Start Time  Present | Time Range  Present | Epochs Remaining  Present | Participating Affiliated STAs Count Present(#Ed) | Participating Affiliated STAs Percentage Present(#Ed) | Minimum Epoch Pacing Parameters  Present | AID Storage Size Present | Reserved |
| Bits: | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 |

* EDP Epoch Settings Control field format(#Ed)

***…Rest of clause 9.4.1.83 is unchanged.***

***TGbi editor: Please add the following sentences at the end of the subclause 9.4.1.83:***

When transmitted by a CPE AP, the AID Storage Size field indicates the minimum number of AID values required by a CPE non-AP MLD to be allowed to join in the EDP group.

When transmitted by a CPE non-AP MLD, the AID Storage Size field indicates the number of AID values that the non-AP MLD can store.

***TGbi editor: Please insert the following new subclause at the end of 9.4.2:***

**9.4.2.350 AID List element**

The AID List element contains a sequence of AID values for the receiving EDP non-AP MLD to use in a sequence of contiguous EDP epochs.

The format of the AID List Element is shown in figure 9-Y(AID List Element).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Element ID extension | Group ID | Start Epoch (SE) | AID List Value |
| Octets: | 1 | 1 | 1 | 1 | 2 | variable |

**Figure 9-Y AID List Element**

The Element ID, Length and Element ID Extension fields are defined in 9.4.2.1 (General).

The Group ID field signals an identifier of the EDP group.

The Start Epoch (SE) field is the 2 least significant octets of the EDP epoch iteration in which the first AID of the AID List Value field is used. Such EDP epoch iteration is relative to the EDP group identified by the Group ID field.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Number of Epochs (NE) | AID for SE | AID for SE +1 | … | AID for SE+NE-1 | Padding |
| Bits: | 16 | 12 | 12 |  | 12 | 0 or 4 |

**Figure 9-Z AID List Value Field**

The format of the AID List Value Field is shown in figure 9-Z(AID List Value Field**)**.

The Number of Epochs (NE) field indicates the number of consecutive epochs for which AID fields are provided.

The AID field is present for the Number of Epochs (NE).

A Padding field is optionally present to align the field to octet limits.

***TGbi editor: Append the AID Assignment frame to the end of the Table 9-658s as shown below.***

**9.6.42.1 EDP Action field**

**Table 9-658s – EDP Action field values**

|  |  |
| --- | --- |
| **Value** | **Meaning** |
| 6 | AID Assignment |
| 5 - 255 | Reserved |

***TGbi editor: Add the new clauses and renumber accordingly.***

**9.6.42.X AID Assignment frame format**

The AID Assignment frame is transmitted as a protected management frame by a CPE AP. The frame assigns AID values to the receiving CPE STA for the coming epochs.

**Table 9-658XX – AID Assignment frame format**

|  |  |
| --- | --- |
| **Order** | **Information** |
| 0 | Category |
| 1 | EDP Action |
| 2 | Dialog Token |
| 3 | AID List |

The Category field is defined in 9.4.1.11 (Action field).

The EDP Action field is defined in 9.6.42.1.

The Dialog Token field is defined in 9.4.1.12 (Dialog Token field) and is set to a nonzero value to identify the request/response transaction.

The AID List element is defined in 9.4.2.350 (AID List element).

**9.6.42.Y AID Assignment Response frame format**

The format of the AID Assignment response frame is shown in Table **9-658YY**

**Table 9-658YY – AID Assignment response frame format**

|  |  |
| --- | --- |
| **Order** | **Information** |
| 0 | Category |
| 1 | EDP Action |
| 2 | Dialog Token |
| 3 | Status Code |
| 4 | Number of Stored AIDs |

The Category field is defined in 9.4.1.11 (Action field).

The EDP Action field is defined in 9.6.42.1.

The Dialog Token field is defined in 9.4.1.12 (Dialog Token field) and is set to a nonzero value to identify the request/response transaction.

The Status Code field indicates the result of the AID assignment request and is defined in 9.4.1.9(Status Code field).

The Number of Stored AIDs field is defined in 9.4.1.X(Number of Stored AIDs field**)** and is present if the Status Code field is equal to SUCCESS\_AID\_LIST\_PARTIALLY\_STORED, to indicate the number of AIDs that the CPE non-AP MLD has stored.

***TGbi editor: Please replace clause 10.71.7 as follows:***

**10.71.7 Frame anonymization and AID operations**

Upon advertisement of EDP groups (as defined in 10.71.2.2(EDP Group Operations)), the CPE AP MLD shall include an AID Storage Size field in the EDP element it transmits. The AID Storage Size field indicates the minimum number of stored AID values for the AID list for any non-AP MLD shall be capable to store to be allowed to join in the EDP group.

A CPE non-AP MLD shall include an AID Storage Size field in the EDP element of (Re)Association Request frame and EDP Request frame it transmits. The AID Storage Size field indicates the maximum number of AIDs that the CPE non-AP MLD can store.

If the AID Storage Size value indicated by the CPE non-AP MLD is lower than the value indicated by the CPE AP MLD, then the CPE AP signals that the non-AP MLD is not allowed to join in the EDP group with an EDP Response frame indicating FAILURE\_AID\_STORAGE\_TOO\_SMALL in the Status field.

A CPE AP MLD generates a list of AIDs that an associated CPE non-AP MLD shall use in the subsequent epochs.

The AID list size (indicated by the Number of Epochs field in fig. 9-Z(AID List Value Field)) shall be smaller or equal to the value of AID Storage Size provided by the CPE non-AP MLD.

The CPE AP MLD sends a protected AID Assignment action frame to the non-AP MLD with the AID List element that encodes the AID values.

If the AID assignment operation has been successful, the CPE non-AP MLD and the CPE AP shall use the AIDs in the AID List element for any communications, starting from the Starting Epoch (SE), within as many epochs as defined in the Number of Epochs (NE) field.

The receiving CPE non-AP MLD, that has not been able to store every AID of the AID list, shall respond with an AID Assignment Response action frame. The Status Code field in the AID Assignment Response frame shall be set according to the result of the AID assignment operation as follows:

* Status Code SUCCESS\_AID\_LIST\_PARTIALLY\_STORED indicates that the AID assignment operation has been successful but only the initial part of the AID list has been stored by the CPE non-AP MLD. In this case, the CPE non-AP MLD shall include the Number Of Stored AIDs field and set it to the number of the stored AID values.
* Status Code FAILURE\_AID\_LIST\_NOT\_STORED indicates that the AID assignment operation has failed. The non-AP MLD has not stored any AID in the AID list.

NOTE 1— A CPE non-AP MLD that successfully stores the AID list is not required to respond with an AID Assignment Response frame.

A CPE AP MLD shall generate and send new AID values periodically. Before the end of the NE epochs, the CPE AP MLD shall generate a new list of AID values and send a new AID Assignment frame with the new AID List element to the non-AP CPE MLD.

The CPE AP MLD may, at any point in time, generate a new AID List and send a new AID Assignment frame with the new AID List element to the non-AP CPE MLD. At latest the CPE AP MLD shall send a new AID List before the end of the NE epochs.

If the SE field of the AID List indicates an epoch for which an AID has been already assigned, the AIDs in the AID List shall override the previously assigned AIDs beginning from the epoch number value indicated by the received SE field of the AID List element.

Upon AID assignment failures, the CPE AP MLD may repeat the AID assignment operation. Upon subsequent failures, the CPE AP MLD may request the CPE non-AP MLD to join a different EDP group.

If a CPE non-AP MLD has no available AID during next epoch, the CPE non-AP MLD should continue to operate with other epoch specific FA and send an AID Assignment Response frame with Status Code set to NO\_ASSIGNED\_AID to request AP to new AID value assignment. If the CPE AP MLD receives such a frame, the AP MLD shall send an AID Assignment frame to the non-AP MLD and assign AIDs for the coming epochs.

If a CPE non-AP MLD has no available AID during an epoch, due to failures in AID assignment operations, the AP MLD shall disassociate the CPE non-AP MLD.