**3GPP TSG-SA WG6 Meeting #49-bis-e S6-222234**

**e-meeting,** **22nd August 2022 – 31st August 2022 (revision of S6-22xxxxx)**

**Source: Convida Wireless LLC**

**Title: AC Association-aware solution update**

**Spec: 3GPP TR 23.700-98 v.1.0.1**

**Agenda item: 9.8**

**Document for: Approval**

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**1. Introduction**

This proposal is a merge of S6-221699\_rev1 and S6-221700\_rev1, as discussed at SA6 #49bis conference calls. It uses the text provided in each document to provide in the same clause 7.27 the two options introduced by these tdocs, since they are both technically viable.

This update provides updates post July 18 offline conf call as follows :

* All new changes captured with trackmarks as ‘post-cc’, changes on changes removed, most formatting changes accepted
* Previous hilighing removed. New hilighting used only for the couple of AI addressed during the conf call, namely :
	+ A NOTE in 7.27.0 calling to specify the usecases and underlying asumptions made for option (i)
	+ That the scenario previously termed ‘without CAAR’ is very similar to the one ‘with CAAR’, therefore they should be merged. Note that the hiligigting here shows only the couple of places where the merged option is described – most of the merging consisted of text removals or moves, so not all are hilighted

After the changes above, updates have been made for the following purposes:

* Ensuring logic and accuracy after the removal of one of the options
* Clarifying the ‘dynamic grouping’ which was supported by the AC association profile, but not fully detailed (at the time for simplicity of addressing the pre-grouped case first). For this purpose the AAP table 7.27.2.2.1.1-1 has further clarifications and simplifications. Clause 7.27.2.2.1.2 was introduced with additional description of AC grouping.
* Claryfing the scope of the results provided by the service provisioning response. Given the divergent opinions on what service provisioning response should provide (e.g. a common EES selection, common EES candidates, all EES candidates, etc) a new IE is introduced in AAP (AC association requirement). A new clause 7.27.2.2.1.3 provides corresponding description and clause 7.27.2.4.2 has been updated accordingly.
* Updating clause 7.27.2.5 (EAS discovery) to show that it is not a new procedure, but an enhancement to the existing 23.558 procedure. It is also aligned with the newly introduced text, to reference 7.27.2.2.1.3.

Notes/responses on previous discussions :

1. Addition of AC Association (AA) ID list to the EDN configuration IE in 7.27.2.3 should be removed.

Response : without providing AA ID info in the EDN configuration, common EES selection is very difficult. Currently this addition applies only to option (ii) anyway. If the idea is to have the ECS determine a single EES to be provided to the EEC in the response, this is problematic on many fronts :

* + An EEC service provisioning request should be able to serve more than one AC at a time. Without understanding which EES is suitable as common EES for which AC association, the procedure needs to be repeated to serve multiple ACs if at least one is in an association. Alternatively when the provisioning request includes more than one AC that has AAP (AA Profile), the response is ambiguous.
	+ The restriction of having only one suitable EES acting as common EES per EDN or deployment is unnecesary and so far unfounded.
	+ ACs and EECs have additional info that can be used to determine best EES from a list – therefore they should be provided a list if available.
1. Why is the List of common EAS characteristics needed in AAP – can’t the discovery filters be used for common EAS determination?

Response : AAP is pre-provisioned at the AC, therefore it is the only way to ensure that the members of the association use common criteria. In addition, the filter crieria should be used to determine regular EASs for the AC. In many cases connecting to common EAS is optional.

1. How are the “common UE characteristics” and “common AC characteristics” IEs used?

Response: The two lists have been clarified with more text added in the AAP table and in clause 7.27.2.2.1.2.

In general, “common AC characteristics” is used for dynamic grouping. When the ACs have been pre-grouped, the grouping relies on a common “UE group ID” which is pre-provisioned to all the members.

1. Why is “AC association ID” made optional?

Response: AC association ID is being used as a key in the global database of AC associations, therefore it needs to be unique in the system. I think only if it is assigned by EEL we can ensure this

I have added the idea that we might want to provide (in stage 3) the option to encode a type along with the Association ID. This way, an initial temp AC Association ID can be provided by EEC. We might want to have a ‘type’ that is defined as ‘unique global ID’ which indicates to EES if the type has been ensured to be globally unique. If not, I think we need to allow EEL to assign a globally unique Association ID. There is a NOTE clarifying that it can be discussed in normative phase how the EELcan assign this AC Association ID.

**2. Reason for Change**

Provide further details for solution #27.

**3. Proposal**

It is proposed to agree to this solution #27 update to 3GPP TR 23.700-98.

\* \* \* First Change \* \* \* \*

7.27 Solution #27: Enabling AC Association Aware services by selecting common EASs

7.27.0 General

This solution is based on two options for achieving a common EES (termed “assumed common EAS” and “with CAAR”). Achieving a common EES is necessary before determining a common EAS. CAAR functionality and deployment options are described as part of this solution.

The alternatives can be summarized as follows:

1. Determine common EAS based on the assumption that common EES has been achieved/ pre-provisioned (termed “assumed common EES”).

NOTE: The usecases and underlying assumptions for this option are to be detailed for solution consideration in the normative phase.

1. Determine common EAS using CAAR functionality for maintaining information on AC Association serviced per EES (i.e.,” with CAAR”)

The following descriptions apply to all alternatives, unless sub-clause titles or clarifying NOTEs specify otherwise.

7.27.1 Architecture enhancements

As described in clause 7.27.0, multiple options for the implementation of this solution are provided. Option (ii) relies on the introduction of new functionality termed Central AC Association Repository (CAAR). CAAR functionality can be implemented by ECS or as an independent CAAR server.

This clause introduces architectural enhancements based on the assumption that the SP deploys an independent server which hosts the CAAR functionality, and which communicates with multiple ECSs and each of the EESs serving Common EAS groups.

NOTE 1: The architectural enhancement introduced in this clause is optional. It can be used for the option “with CAAR” (ii) (as described in clause 7.27.0), as an alternative to CAAR functionality being implemented by ECS.

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**Figure 7.27.1-1: EDGEAPP architecture enhanced with Central AC Association Repository**

The EDGE-X reference point is introduced to support EES interaction with a Central AC Association Repository (CAAR). The EES can store, update, and remove information about the AC associations it provides services to via EDGE-X reference point.

The EDGE-Y reference point is introduced to support ECS interaction with CAAR. The ECS can query the AC association information via EDGE-Y reference point.

NOTE 2: It is to be determined in the normative phase whether CAAR and Binding Server from solution 30 can be merged.

7.27.2 Solution description

7.27.2.1 General

This solution addresses key issue #17 on discovery of a common EAS in clause 4.17.

The solution describes enhancements to several edge procedures that enable ACs/EECs of different UEs to share AC association information with the EEL. This AC association is formed such that the services for the associated ACs are optimized by selecting a common EAS.

NOTE: In the following descriptions within this solution, the term "Associated ACs" is used to denote a set of ACs on different UEs for which the association described above has been configured via an AC association Profile. How the AC association Profile is determined is out of scope of the current specification.

#### 7.27.2.2 New Information Elements

##### 7.27.2.2.1 AC Association Profile

###### 7.27.2.2.1.1 Description

The AC association Profile (AAP) is proposed as a new IE in TS 23.558:

**Table 7.27.2.2.1.1-1: AC association Profile**

|  |  |  |
| --- | --- | --- |
| **Information element** | **Status** | **Description** |
| Association ID (NOTE 1) | O | Identifier of the Association |
| AC association type | M | Choice of dynamic grouping (multi-user, multi-session, etc.) or pre-grouped |
| AC association requirement | `M | Choice of mandatory, prioritized or optional. A mandatory requirement indicates that the AC connects with an EAS only if determined to be a common EAS. A prioritized requirement indicates that the AC prioritizes connecting to EAS determined to be common EAS but connects to other EAS if a common EAS is not available. Optional requirement indicates that if both a common and a regular EAS are available, the EEC decides which EAS to connect to. |
| List of UE filter criteria  | O | Information for filtering the UEs with associated ACs.  |
| > UE group ID | O | If present, it indicates a 3GPP Group ID pre-provisioned (e.g. as External Group ID) to the UEs with ACs in the associated group/ association.  |
| > UEs service area | O | If provided, it indicates the Service area for determining other UEs in the association.The UE location is described in clause 7.3.2. The optional additional EAS selection criteria describe criteria for the EAS selection (e.g., "same latency for all" or "lowest latency for the own UE location"). |
| List of associated ACs characteristics  | M | Information for determining the associated ACs , provided as a triple (ACID, AC type, AC schedule) with wildcards as necessary. |
|  |  |  |
|  |  |  |
|  |  |  |
| List of common EAS characteristics  | O | Information for determining the common EAS |
| >Common EAS discovery filter (NOTE 2) | O | Describes the characteristics of a common EASs using the EAS discovery filter described in Table 8.5.3.2-2.  |
| > Common EAS aggregate Service KPIs | O | Service characteristics provided by the common EAS, detailed in Table 8.2.5-1. The characteristics are described to meet the requirements for the AC association. |
| NOTE 1: It is to be determined in the normative phase whether and how this IE can also include an Association ID type, format or numbering (e.g. system-wide unique numbering, etc.) |

NOTE: The list of IEs in Table 7.27.2.2-1 and whether AC association information should be provided in a new Profile IE, or via existing ones, is to be determined in the normative phase..

###### 7.27.2.2.1.2 Determining grouping based on AC Association type

AC Association Profiles (AAPs) are assumed to be provisioned to the ACs using procedures out of scope of the current document.

* **AC associations of type *pre-grouped*** are those for which the determination of the individual ACs within the association is done out-of-band (i.e. via an external group ID). Each of the association members is provided with an AAP which includes AC Association type (i.e. pre-grouped), UE group ID (same for all the ACs and equal to the external group ID) and List of associated ACs characteristics. This allows pre-grouped associations to be used for a variety of usecases, including multi-user, multi-session or hybrid.
* **AC associations of type *dynamic grouping*** are those for which the AAP provides only characteristics of the individual ACs within the association, with the grouping being determined by EEL for providing common EAS services. Each of the association members is provided with AAP which includes at least the following IEs: AC Association type (i.e. dynamic grouping) and "List of associated AC characteristics".

If the “UE filter criteria” IEs is present in the AAP of a dynamic grouping AC association, it is used as an additional characteristic for filtering the ACs in the dynamic association. If

For all AC association types, if the “List of common EAS characteristics” IEs is present in the AAP, it is used to determine the EAS(s) suitable to act as common EAS for the association, in addition to the EAS discovery filters. If the IE is not present in the AAP, common EAS determination relies upon other parameters provided, e.g. EAS discovery filters.

AC Association ID is a unique identifier of an association within the EEL deployment or the system, and as such it can be assigned by an EEL entity. The ID is necessary for uniquely identifying AC associations in the absence of the full AAP information. For a pre-grouped association type, the UE group ID can be used as AC Association ID.

 NOTE: Whether and how Association ID can be assigned and/or updated in EEL is to be determined in the normative phase.

###### 7.27.2.2.1.3 Determining service provisioning and discovery scope

The AC association requirement IE can have a value of *mandatory*, *prioritized* or *optional*. This IE is used to determine the service provisioning and discovery scope and responses, as follows:

* For a *mandatory* AC association requirement, successful service provisioning and discovery responses contain in scope only information about already acting common EES(s) or EAS(s), respectively.
* For a *prioritized* AC association requirement, successful service provisioning and discovery responses can contain information about candidate common EES(s) or EAS(s), in addition to servers already acting as common EES(s) or EAS(s).
* For an *optional* AC association requirement, successful service provisioning response and discovery responses always contain in scope information about both acting and candidate common EES(s) or EAS(s), respectively. In addition, information about EES(s) or EAS(s) which meet other request criteria (termed “regular EES/EAS”) is in scope within this solution. The regular EES/EAS(s) match the discovery request criteria (e.g., AC Profiles), so although they do not match the AAP criteria (i.e. List of common EAS characteristics) they can provide regular services to the AC.
* For all AC association requirements, if servers in scope of the provisioning and discovery responses cannot be determined, the procedure is considered unsuccessful, and an appropriate error status is included in the response.

7.27.2.3 Enhancements to existing Information Elements

The enhancements captured (highlighted with bold text) in tables within this clause are proposed to Information Element tables in 3GPP TS 23.558 [2]. Enhancements to requests, responses and notifications are described in following clauses via procedural descriptions

**Table 7.27.2.3-1: EAS discovery filters**

|  |  |  |
| --- | --- | --- |
| **Information element** | **Status** | **Description** |
| List of AC characteristics (NOTE 1) | O | Describes the ACs for which a matching EAS is needed. |
| > AC profile (NOTE 2) | M | AC profile containing parameters used to determine matching EAS. AC profiles are further described in Table 8.2.2-1. |
| List of EAS characteristics (NOTE 1, NOTE 3) | O | Describes the characteristic of required EASs. |
| > EASID | O | Identifier of the required EAS. |
| > EAS provider identifier | O | Identifier of the required EAS provider |
| > EAS type | O | The category or type of required EAS (e.g. V2X) |
| > EAS schedule | O | Required availability schedule of the EAS (e.g. time windows) |
| > EAS Geographical Service Area | O | Location(s) (e.g. geographical area, route) where the EAS service should be available. |
| > EAS Topological Service Area  | O | Topological area (e.g. cell ID, TAI) for which the EAS service should be available. See possible formats in Table 8.2.7-1. |
| > Service continuity support | O | Indicates if the service continuity support is required or not. |
| > Service permission level | O | Required level of service permissions e.g. trial, gold-class |
| > Service feature(s) | O | Required service features e.g. single vs. multi-player gaming service |
| **AC association profile** | **O** | **Describes an association between ACs and an association between ACs and a common EAS.** |
| NOTE 1: Either "List of AC characteristics", "List of EAS characteristics" **or AC association profile** shall be present.NOTE 2: "Preferred ECSP list" IE shall not be present.NOTE 3: The "List of EAS characteristics" IE must include at least one optional IE, if used as an EAS discovery filter. |

**NOTE 1: The enhancement to EEC Context shown in table 7.27.2.3-2 is necessary for the option “with CAAR” (ii) as described in clause 7.27.0. It is to be determined in the normative phase whether this functionality is necessary for the** “**assumed common EES” (i**) **as described in clause 7.27.0.**

**Table 7.27.2.3-2: EEC Context**

|  |  |  |
| --- | --- | --- |
| **Information element** | **Status** | **Description** |
| EEC ID | M | Unique identifier of the EEC. |
| EEC Context ID | M | Identifier assigned to the EEC Context  |
| Source EES Endpoint | M | The endpoint address (e.g., URI, IP address) of the EES that provided EEC context ID. |
| UE Identifier | O | The identifier of the hosting UE (i.e., GPSI or identity token)  |
| List of EDGE-1 subscriptions | O | List of subscriptions IDs for capability exposure to the EEC ID (NOTE 1). |
| UE location  | O | Latest UE location of the UE hosting the EEC which was available at the EES. |
| List of AC Profiles | O  | Information about the ACs as described in Table 8.2.2-1. |
| **List of AC association profiles** | **O** | **List of all AC associations applicable to the EEC** |
| List of Service Session Contexts | O | List of associated Service Session Context IEs. Each Service Session Context includes information maintained by the EES for the services (involving UE related resources) received from an EAS registered to the EES. |
| > Service Session Context | M | Service Session Context is described in Table 8.2.8-2 (NOTE 2) |
| NOTE 1: The corresponding EDGE-1 subscription information may include 3GPP CN subscription information such as subscription correlation ID**NOTE 2: Whether the Service Session Context IE needs to contain AC Association ID as optional element, is to be determined in the normative phase.** |

NOTE 2: The enhancement to EDN configuration information shown in table 7.27.2.3-3 is necessary for the option “with CAAR” (ii) as described in clause 7.27.0., only.

The IE enhancement is used to provide EECs in the service provisioning phase with information about which EESs already act as common EESs serving AC associations, and which are candidates. This enables the EEC to determine which EES to choose if common EAS association services are needed. Note that the service provisioning response can also be limited by ECS policies to include only the EDNs/EESs which provide such services. The information about served AC Associations per EES is provided by EESs to ECS using CAAR functionality.

**Table****7.27.2.3-3: EDN configuration information**

|  |  |  |
| --- | --- | --- |
| **Information element** | **Status** | **Description** |
| EDN connection information (NOTE 1) | M  | Information required by the UE to establish connection with the EDN. |
| > DNN/APN | M | Data Network Name/Access Point Name |
| > S-NSSAI | O | Network Slice information |
| > EDN Topological Service Area | O  | The EDN serves UEs that are connected to the Core Network from one of the cells included in this service area. See possible formats in Table 8.2.7-1. |
| List of EESs | M | List of EESs of the EDN. |
| > EESID  | M | The identifier of the EES |
| > EES Endpoint  | M | The endpoint address (e.g. URI, IP address) of the EES |
| > EASIDs (NOTE 2) | O | List of EASIDs registered with the EES. |
| > EES Provider identifier | O | The identifier of the EES Provider (such as ECSP)  |
| > EES Topological Service Area | O | The EES serves UEs that are connected to the Core Network from one of the cells included in this service area. EECs in UEs that are located outside this area shall not be served. See possible formats in Table 8.2.7-1.  |
| > EES Geographical Service Area | O | The area being served by the EES in Geographical values (as specified in clause 7.3.3.3) |
| > List of EES DNAI(s) | O | DNAI(s) associated with the EES/EAS. This IE is used as Potential Locations of Applications in clause 5.6.7 of 3GPP TS 23.501 [2]. |
| > EES Service continuity support | O | Indicates if the EES supports service continuity or not. This IE also indicates which ACR scenarios are supported by the EES. |
| > EEC registration configuration | M | Indicates whether the EEC is required to register on the EES to use edge services or not. |
| **>List of association IDs (NOTE 3)** | **O** | **List of association IDs of the AC associations the EES is serving** |
| Lifetime | O | Time duration for which the EDN configuration information is valid and supposed to be cached in the EEC. |
| NOTE 1: If the UE is provisioned or pre-configured with URSP rules by the HPLMN, the UE handles the precedence between EDN connection info and URSP rules as defined in 3GPP TS 23.503 [12] clause 6.1.2.2.1. EDN connection info is considered to be part of UE Local Configurations. NOTE 2: EAS information is limited to the EEC requested applications. If no AC profiles were present in the service provisioning request, the EAS information is subject to the ECSP policy (e.g. no EAS information or a subset of EAS information related to the EES).**NOTE 3: Whether the list needs to contain the entire AC association Profile, or the IDs are sufficient, is to be determined in the normative phase.** |

7.27.2.4 Enhancements to Service Provisioning for determining common EES

##### 7.27.2.4.1 Using the “assumed common EES” option (option i)

If the “assumed common EES” option is used, procedures for determining common EES are not necessary.

##### 7.27.2.4.2 Determining common EES with CAAR (option ii)

During the service provisioning procedure defined in 3GPP TS 23.558 [2], the presence of an AC association Profile in the request triggers the use of the following enhancements. The service provisioning response is used to provide information about which EESs already act as Common EESs, i.e. providing services to AC associations, as well as candidates. In this option, this information is provided to EECs via the EDN Configuration Information in the service provisioning response, and it can be derived by ECS using CAAR queries.

Compared to the procedures specified in 3GPP TS 23.558 [2] clause 8.3.3, the proposed differences are captured below.

**Enhancements to 3GPP TS 23.558 clause 8.3.3 Service Provisioning**

1. The service provisioning request (3GPP TS 23.558 [2] Table 8.3.3.3.2-1) from EEC to ECS is enhanced to include an AC association Profile.
2. Upon receiving the request, the ECS uses the AC association Profile information (e.g., association IDs) to query the (EES ID, AC association ID list) tuples stored by CAAR to determine whether an EES is already serving the AC association(s). The ECS uses the AC association ID(s) to query the CARR using the procedure in 7.27.2.Z .
3. If the processing of the request with AC association Profile information was successful, the ECS responds to the EEC with a service provisioning response. The ECS uses the EES(s) obtained from the step 2 CAAR query to update the enhanced EDN configuration information (Table 7.27.2.3-4) with EES(s) already serving the AC association and sends it in the provisioning response.

Clause 7.27.2.2.1.3 describes the service provisioning functionality and the scope of the of the service provisioning response as a function of the AC association requirement IE of the AC association Profile in the service provisioning request.

For *prioritized* or *optional* AC association requirement, if the ECS determines to include candidate common EESs or regular EESs in the response, it uses the profiles of its registered EESs, the AAP and/or other request criteria to determine the corresponding EESs.

7.27.2.5 Enhancements to EAS Discovery for determining Common EAS

During the EAS discovery procedure defined in 3GPP TS 23.558 [2], if the EEC sends an EAS discovery request to an EES including AC association Profile it triggers the use of the following enhancements. Based on the AC association Profile, the EES determines an EAS discovery result that includes a common EAS for the AC association.

Compared to the procedurs specified in 3GPP TS 23.558 [2] clause 8.5.2.2, the proposed differences are captured below.

**Enhancements to 3GPP TS 23.558 clause 8.5.2.2 EAS Discovery (request-response model)**

Pre-conditions:

1. An AC association Profile has been provided to the EEC.

**Steps:**

1. The EEC sends an EAS discovery request to the EES. The EAS discovery request includes an AC association Profile. Included in the AC association Profile is information regarding an association between AC(s) on this UE and other ACs indicating that the use of a common EAS is required.

2. Upon receiving the request, the EES determines whether a common EAS is available to provide services to the associated ACs that meet the criteria specified in the AC association Profile (i.e., list of common EAS characteristics).3. If the processing of the request was successful, the EES responds to the EEC with an EAS discovery response which includes information about the discovered common EAS able to provide services to the associated ACs.

Clause 7.27.2.2.1.3 describes the EAS discovery functionality and the scope of the of the EAS discovery response as a function of the AC association requirement IE of the AC association Profile in the EAS discovery request.

For *prioritized* or *optional* AC association requirement, if the EES determines to include candidate common EASs or regular EASs in the response, it uses the profiles of its registered EASs, the AAP and/or other request criteria to determine the corresponding EESs.

7.27.2.6 Enhancements to ACR

During the detection, decision-making and execution phases of the ACR procedures defined in 3GPP TS 23.558 [2], an AC association Profile can be used to identify ACs requiring a common EAS. This information can be used in the ACR procedures to coordinate the transitioning of an AC to a common T-EAS or transitioning a group of already associated ACs from a common S-EAS to a common T-EAS.

NOTE 1: Coordination of the ACRs for AC association members is to be addressed in the normative phase.

Compared to the procedures specified in 3GPP TS 23.558 clause 8.8, the proposed differences are captured below.

**Enhancements to 3GPP TS 23.558 clause** **8.8.3.2 Discover T-EAS procedure**

Compared to the procedures specified in 3GPP TS 23.558 [2] clause 8.8.3.2, the proposed differences are captured below:

1. The enhanced EAS discovery filter (Table 7.27.2.3-1) within the EAS discovery request from the S-EAS includes AC association Profile information (e.g., common EAS characteristics).
2. The S-EES checks if the T-EAS satisfies the AC association Profile (e.g., common EAS characteristics) and can serve as a common EAS for the associated ACs.
3. The EAS discovery filter (Table 7.27.2.3-1) within the EAS discovery request issued from the S-EES to the T-EES includes AC association Profile information (e.g., common EAS characteristics).
4. The T-EES discovers the T-EAS(s) utilizing the common EAS characteristics of the AC association profit, such that a common EAS able to serve the associated ACs is provided in the response.

**Enhancements to 3GPP TS 23.558 clause 8.8.3.3 Retrieve T-EES procedure**

NOTE 2: In the “assumed common EES” (i) option, T-EES equals S-EES, so no enhancements are required for 3GPP TS 23.558 clause 8.8.3.3.

Compared to the procedures specified in 3GPP TS 23.558 clause 8.8.3.3, the proposed differences are captured below:

1. The T-EES retrieve request (3GPP TS 23.558 [2] Table 8.8.4.6-1) from the S-EES to the ECS is enhanced to optionally include AC association Profile.

2. The ECS interacts with the 3GPP core network to retrieve the UE locations.

The ECS determines a common T-EES for the AC association.

NOTE 3: The ECS uses AC association Profile, UE location, as well as CAAR query as detailed in clause 7.27.2.Z to make this determination.

In addition, if an “associated UE group ID” is provided in the AC association Profile, the ECS can interact with the 3GPP core network to determine the number of UEs present in candidate EES(s) service area(s). Alternatively, the ECS uses “Associated UEs service area” in the AC association Profile to determine whether the candidate EES service area meets the needs of the AC association. The ECS uses the associated UE group ID and UE locations to determine whether T-EESs are candidates for serving the AC association

**Enhancements to 3GPP TS 23.558 clause 8.8.3.4 ACR launching procedure**

Compared to the procedures specified in 3GPP TS 23.558 [2] clause 8.8.3.4, the proposed differences are captured below:

1. The ACR request message (3GPP TS 23.558 [2] Table 8.8.4.4-1) sent to the EES by EEC is enhanced to optionally include an AC association ID.
2. If the request in step 1 is for ACR initiation and if the EAS notification indication in ACR initiation data is provided in the step 1 request and the EAS has subscribed to receive such notification, the EES includes the association ID of the AC association in the notification.

The notified EAS uses the AC association ID during the ACR status update procedure and stores it with the Application context maintained. The content of the application content maintained by EAS is out of scope of the current document.

**Enhancements to 3GPP TS 23.558 clause 8.8.3.8** **ACR status update procedure**

Compared to the procedure specified in 3GPP TS 23.558 [2] clause 8.8.3.8, the proposed differences are captured below:

1. The EAS sends the ACR status update request message (3GPP TS 23.558 [2] Table 8.8.4.19-1) to the S-EES that is enhanced to include an association ID of the AC association for which the ACR has been performed.

NOTE 4: S-EAS obtains the association ID via pre-provisioning, from an ACR management event notification or directly from the AC and stores it in the Application Context. T-EAS obtains the association ID via pre-provisioning or via ACT.

1. If ACR is successful, the receiving EES uses the association ID information to update the information about the AC associations served.

NOTE 5: In the “assumed common EES” (i) option, no enhancement to step 2 is required.

In the option “with CAAR” (ii) the EES update is to the information available at CAAR. The S-EES removes its corresponding (association ID, EES ID) tuple from CAAR. The T-EES adds its corresponding (association ID, EES ID) tuple to CAAR.

#### 7.27.2.7 Other procedural enhancements

**Enhancements to 3GPP TS 23.558 clause 8.9.1.1 EEC Context handling at EEC registration**

Compared to the procedures specified in 3GPP TS 23.558 [2] clause 8.9.1.1, the following differences are captured below:

If the EEC registration request does not include a previously assigned EEC Context ID value, the receiver EES creates an EEC Context. The receiver EES assigns an EEC context ID and set the source EES Endpoint to its own Endpoint. The EEC ID, UE Identifier and List of AC association profiles are set based on the corresponding registration request parameters.

**Enhancements to 3GPP TS 23.558 clause 8.9.1.5 Other EEC Context handling**

Compared to the procedures specified in 3GPP TS 23.558 clause 8.9.1.5, the following differences are captured below:

When the EES determines that a registered EAS is providing services to an AC which is part of an AC association Profile, the EES updates the corresponding Service Session context with the Association ID. Conversely, when the EES determines that a Service Session is no longer used within an AC association, the EES removes the Association ID from the corresponding Service Session context.

In the option “with CAAR” (ii) the EES also updates the information about served AC Associations available at CAAR accordingly. During ACR, the S-EES removes its corresponding (association ID, EES ID) tuple from CAAR. The T-EES adds its corresponding (association ID, EES ID) tuple to CAAR.

7.27.2.8 New procedures

##### 7.27.2.8.1 EES Update of AC Associations with CAAR (option ii)

The EES procedure for updating AC Associatiation information available at CAAR uses an update request in which the following information is provided to the CAAR: EES ID, list of association IDs of the associations being served, registrar ECS information including list of EDNs. This information is updated by EES when any of this information changes or is about to change (e.g. in advance of EES de-registration).

NOTE: If the CAAR functionality is implemented by ECS, the procedure for updating AC Associatiation information is implemented via the Rel-17 procedure for EES registration update.

##### 7.27.2.8.2 ECS Query of AC Associations with CAAR (option ii)

The ECS procedure for quering the AC Associatiation information at CAAR uses the association IDs recieived (e.g. in a service provisioning request) and its own ECS information. The response provides a list of its registered EESs which serve the AC Association Profiles IDs being queried for.

NOTE: Whether and how CAAR queries are used to direct EECs to a different ECS for the purpose of receiving services consistent with the AC Association is to be addressed in the context of enabling inter-ECSP deployments,

7.27.3 Solution evaluation

Editor's note. Further investigation is required if this solution is feasible.