**3GPP TSG-SA WG6 Meeting #44 S6-211666**

**e-meeting, 12nd July – 20th July 2021 (revision of S6-21xxxx)**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **23.558** | **CR** | **0021** | **rev** | - | **Current version:** | **17.0.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

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| ***Title:***  | Resolving the failure of ACR |
|  |  |
| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | S6 |
|  |  |
| ***Work item code:*** | EDGEAPP |  | ***Date:*** | 2021-07-06 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | In 8.8.2.6, upon ACR launching (step 4) by EEC, the T-EES sends ACR notification to T-EAS. But the notification is not defined.The EEC driven scenarios specified in clause 8.8.2.2 and clause 8.8.2.3 should be aligned where T-EES sends notification to T-EAS. |
|  |  |
| ***Summary of change:*** | This contribution is introduced to provide a mechanism: EES to notify the T-EAS that the T-EAS has been determined by the EES to perform ACR. |
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| ***Consequences if not approved:*** | Stage 3 cannot implement the notification. |
|  |  |
| ***Clauses affected:*** | 8.6.3.2.2, 8.6.3.2.3, 8.6.3.3.2, 8.8.2.2, 8.8.2.3 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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

##### 8.6.3.2.2 Subscribe

Figure 8.6.3.2.2-1 illustrates the subscribe operation between the EAS and the EES for ACR management event notifications.



Figure 8.6.3.2.2-1: ACR management event API: Subscribe operation

1. The EAS sends ACR management event subscribe request (e.g. tracking the UE's user plane path change continuously). The EAS shall include UE Identifier or UE group Identifier.

a. The EAS may include the "user plane path change" event to indicate the EES to notify the EAS when the EES detects there is a user plane path change for the application traffic and the EAS may include Subscription Type (Early and/or Late notification defined in clause 5.6.7 of 3GPP TS 23.501 [2]) and/or Indication of EAS Acknowledgement in the event subscription.

b. The EAS may include the "ACR monitoring" event to indicate the EES to notify the EAS when the EES detects there is a need for the ACR (e.g. when T-EAS is available at the target DNAI or ACR is initiated by EEC). The EAS may also include the Event Filters to specify the conditions to match for notifying the event, e.g., inter-EDN mobility, intra-EDN mobility.

c. The EAS may include the "ACR notification" event to indicate the EES to notify the EAS when the EES determines that the EAS is selected as the T-EAS to serve the AC.

d. The EAS may include the "ACR facilitation" event to indicate the EES to notify the S-EAS of the selected T-EAS after the EES detects and determines the need for ACR.

2. The EES checks if the EAS is authorized for this operation. If authorized, EES checks if there exists a subscription with the 3GPP core network for the user plane path management event notifications corresponding to the UE information obtained in step 1 as described in 3GPP TS 23.501 [2] and 3GPP TS 23.502 [3], which may be triggered by other EAS for the same UE. The EES checks the availability of the user plane path management event service for the UE.

a. if a subscription with 3GPP core network does not exist, then the EES subscribes with the 3GPP core network (PCF, NEF or SCEF+NEF) for the user plane path management event notifications of the UE as described in 3GPP TS 23.501 [2] and 3GPP TS 23.502 [3] If the EAS provides Subscription Type and/or Indication of EAS Acknowledgement, the EES include the type of subscription and/or the indication of "AF acknowledgement to be expected" as information on AF subscription to corresponding SMF events within the AF Request;

b. if a subscription with 3GPP core network exists, then the EES uses the locally cached user plane path management event notification information of the UE to respond to the EAS.

The EES stores the subscription related to the EAS.

3. If the event is "user plane path change", the EES may subscribe to UE expected behaviour analytics (UE mobility and UE communication) for the group of UEs as described in 3GPP TS 23.288 [18].

4. If EAS is authorized, the EES responds with ACR management event subscribe response. If EAS is not authorized, the EES provides a rejection response with cause information.

 If the target UE and the 3GPP network support mobility between 5GC and EPC, the EES monitors the availability of the user plane path management event notification from the 3GPP network by utilizing Nnef\_APISupportCapability or Availability of service APIs event notifications provided by the CAPIF core function.

\* \* \* Next Change \* \* \* \*

##### 8.6.3.2.3 Notify

Figure 8.6.3.2.3-1 illustrates the notify operation between the EES and the EAS for continuous ACR management event notifications.



Figure 8.6.3.2.3-1: ACR management event API: Notify operation

1. The EES detects the ACR management event of the UE (e.g. receiving User plane path management event notification for the UE from the 3GPP core network).

a. If "user plane path change" Event is subscribed, the EES may cache the detected User plane path management event notification locally with timestamp as the latest information of the UE(s) and start the notification aggregation for a group of UEs. The EES decides whether to aggregate and the aggregation period based on the analytics result received from the 3GPP Core Network, local policy and User Plane path management subscription information received from the EAS. The EES determines to notify the user plane path management event notification information (e.g., DNAI) to the EASs which has subscribed for the "user plane path management" event.

b. If "ACR monitoring" Event is subscribed, based on the detected user plane path change report sent from the 3GPP core network, the EES checks whether the target DNAI is in the EAS profile of the subscribing EAS, if not it further checks whether a T-EAS is available at the target DNAI as described in steps 2-4 of clause 8.8.3.2. If a T-EAS is available, the EES notifies the EAS with T-EAS endpoint; otherwise this event notification will not be sent. Also, when the EES receives the ACR request from the EEC, the EES decides to send the notification to the EAS.

c. If "ACR notification" event is subscribed, the EES notifies that the subscribed EAS is determined as the T-EAS to serve the AC.

NOTE: It is up to T-EAS implementation to decide the further actions, and the EES does not need to wait for any response from T-EAS to continue the ACR operations.

d. If "ACR facilitation" Event is subscribed, based on the detected user plane path change report sent from the 3GPP core network, the EES checks whether the target DNAI is in the EAS profile of the subscribing EAS, if not it further checks whether a T-EAS is available at the target DNAI as described in steps 2-4 of clause 8.8.3.2. If a T-EAS is available, the EES selects the T-EAS from the discovered EAS list and applies the AF traffic influence with the N6 routing information of the selected T-EAS in the 3GPP Core Network. The EES also notifies the S-EAS with the selected T-EAS endpoint.

2. The EES sends ACR management event notification to the EAS. The EES includes the ACR management event notification information of the UE(s) and optionally the timestamp. If the event triggering the notification is DNAI change, the timestamp can be included to indicate the age of the user plane path management event notification information. The EES may only provide part of information included in the user plane path management event notification from 3GPP network (e.g. target DNAI). If the EAS had provided "Indication of EAS acknowledgement", the EES waits for acknowledgement from the EAS before it sends AF acknowledgement to the 3GPP core network.

3. If the EAS had included Indication of EAS Acknowledgement within ACR path management event subscribe request described in clause 8.6.3.2.1, the EAS sends EAS Acknowledgement as a response to ACR management event notification to the EES either immediately or after the required ACT is completed. The EAS may reply in negative, e.g., the EAS may determine not to perform ACR. Then, the EES sends the AF acknowledgement to the 3GPP core network.

\* \* \* Next Change \* \* \* \*

##### 8.6.3.3.2 ACR management event subscribe request

Table 8.6.3.3.2-1 describes the information elements for an ACR management event subscribe request from the EAS to the EES.

Table 8.6.3.3.2-1: ACR management event subscribe request

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| EASID  | M | The identifier of the EAS |
| Security credentials | M | Security credentials of the EAS |
| UE ID (NOTE) | O | The identifier of the UE (i.e. GPSI or identity token) |
| UE Group ID (NOTE) | O | Identifies a group of UEs (i.e. internal group ID or external group ID) |
| Event ID(s) | M | Event ID:- user plane path change- ACR monitoring - ACR notification- ACR facilitation |
| Event Report | M | Event Reporting Information as specified in 3GPP TS 23.502 [3] |
| Notification Target Address | M | Notification Target Address of the EAS where the notification is to be sent by the EES |
| Type of subscription | O | Indicates Early and/or Late notification to inform if the notification needs to be received before and/or after UP path configuration. Applicable for the "user plane path change" event. |
| Indication of EAS acknowledgement | O | This IE indicates the EES to include indication of "AF acknowledgement to be expected" within the AF request for subscribing UP path management events to 3GPP network and that the EAS will provide an acknowledgement as a response for the notifications of UP path management events to the EES. Applicable for the "user plane path change" event. |
| Event Filter | O | Event filter as specified in 3GPP TS 23.501 [2] |
| EAS characteristics for ACR | O | Set of characteristics to determine required EAS as detailed in Table 8.5.3.2-2.Applicable for the "ACR monitoring" event and "ACR facilitation" event. |
| NOTE: Either UE ID or UE Group ID shall be provided. |

\* \* \* Next Change \* \* \* \*

#### 8.8.2.2 Initiation by EEC using regular EAS Discovery

This procedure handles ACR as a result of the UE moving to, or the UE expecting to move to, a new location which is outside the service area of the serving EAS. It further relies on the EEC being triggered as a result of the UE's movement.

This procedure is based on Service Provisioning (as specified in clause 8.3) and EAS Discovery (as specified in clause 8.5) procedures to discover the T-EESs and EASs that shall serve the ACs as a result of the UE's new location, and that shall receive the Application Context from the serving EASs.

The procedure in the following clause describes the relocation of a single application context to a new EAS. It should be repeated for each active AC in the UE.

This procedure relies on an interface between the EEC and ACs over EDGE-5, which is out of the scope of this specification.

Pre-conditions:

1. The AC in the UE already has a connection to a corresponding S-EAS;

2. The preconditions listed in clause 8.3.3.2.2 with regards to the EEC are fulfilled; and

3. The EEC is triggered when it obtains the UE's new location, or is triggered by another entity such as an ECS notification.

NOTE 1: This procedure is applicable only for Edge-aware ACs and EASs.



Figure 8.8.2.2-1: ACR initiated by the EEC and ACs

Phase I: ACR Detection

1. The EEC detects the UE location update as a result of a UE mobility event, and is provided with the UE's new location as described in clause 8.8.1. The EEC can also detect an expected or predicted UE location in the future as described in clause 8.8.1.

NOTE 2: If the EEC is triggered by an external entity such as by a notification from the ECS, a list of new EESs (to be used as T-EESs) is provided by that notification and step 3 below is skipped.

Phase II: ACR Decision

2. Either the AC or the EEC makes the decision to perform the ACR.

NOTE 3: Which applications require ACR can be decided based on the application profile, e.g. requirement of service continuity of the application.

Phase III: ACR Execution

3. The EEC performs Service Provisioning (as specified in clause 8.3) for all active applications that require ACR. Since the location of the UE has changed, this procedure results in a list of T-EESs that are relevant to the supplied applications and the new location of the UE. When in step 1 the ACR for service continuity planning is triggered, then the Connectivity information and UE Location in the Service Provisioning (as specified in clause 8.3) procedure contains the expected Connectivity information and expected UE Location.

NOTE 4: If the change in UE's location does not trigger a need to change the serving EAS, the subsequent steps will not take place. The EEC remains connected to the serving EESs and the ACs remain connected to their corresponding serving EASs.

4. Using the provisioned T-EESs, the EEC performs EAS discovery (as specified in clause 8.5) for the desired T-EASs by querying the T-EESs that were established in step 2 (or provided in the notification from the ECS – if it was the trigger). The T-EES sends ACR notify to the T-EAS.

5. The AC and EEC select the T-EAS to be used for the application traffic, as described in clause 8.5.1 EAS discovery. Step 5 is skipped if EEC selects only one T-EAS.

6. The EEC performs ACR launching procedure (as described in clause 8.8.3.4) to the S-EES with the ACR action indicating ACR initiation and the corresponding ACR initiation data (without the need to notify the EAS). The S-EES may apply the AF traffic influence with the N6 routing information of the T-EAS in the 3GPP Core Network (if applicable), as described in clause 8.8.3.4.

7. The AC is triggered by the EEC to start ACT. The AC decides to initiate the transfer of application context from the S-EAS to the T-EAS. There may be different ways of transferring context and they are all outside the scope of this specification.

 When in step 1 the ACR for service continuity planning has been triggered, the AC connects to the T-EAS when the UE moves to the predicted location. Otherwise, the rest of this step is skipped.

 After the ACT is completed, the AC remains connected to the T-EAS and disconnects from the S-EAS; the EEC is informed of the completion.

NOTE 4: Whether and how the AC initiates the ACT is out of scope of the present document

When in step 1 the ACR has been triggered for service continuity planning, if the UE does not move to the expected/predicted the EEC does not connect to T-EES, the AC does not connect to the T-EAS. Step 8 is skipped.

NOTE 5: The S-EAS or T-EAS can further decide to terminate the ACR, and the T-EAS can discard the application context based on information received from EEL and/or other methods (e.g. monitoring the location of the UE). It is up to the implementation of the S-EAS and T-EAS whether and how to make such a decision.

NOTE 6: It is out of scope of this specification how the AC informs the source and T-EAS that state transfer was part of service continuity planning. When in step 1 the ACR for service continuity planning is triggered, step 8 is performed after the UE moves to the predicted location.

Phase IV: Post-ACR Clean up

8. All required entities perform clean-up.

Editor's note: Evaluate the need of an appropriate step for supporting EEC context transfer from S-EES(s) to T-EES(s)

#### 8.8.2.3 EEC executed ACR via S-EES

Figure 8.8.2.3-1 illustrates the procedure for the EEC to execute the ACR via S-EES.

Pre-condition:

1. The AC at the UE already has a connection to the S-EAS; and

2. The EEC is able to communicate with the S-EES.



Figure 8.8.2.3-1: EEC executed ACR procedure

Phase I: ACR Detection

1. The EEC detects that ACR may be required as described in clause 8.8.1. The EEC may detect that ACR may be required for an expected or predicted UE location in the future as described in clause 8.8.1.

Phase II: ACR Decision

2. The EEC decides to proceed required procedures for triggering ACR.

Phase III: ACR Execution

3. The EEC determines the T-EES by using the provisioned information or performing service provisioning procedure per clause 8.3 of the present document. When in step 1 the ACR for service continuity planning is triggered, then the Connectivity information and UE Location in the Service Provisioning (as specified in clause 8.3) procedure contains the expected Connectivity information and expected UE Location. If the UE is within the service area of the T-EES, upon selecting T-EES the UE may need to establish a new PDU connection to the target EDN. The EEC can then discover and select T-EAS by performing EAS Discovery with the T-EES per clause 8.5.2 of the present document. The T-EES sends ACR notify to the T-EAS.

4. The EEC performs ACR launching procedure (as described in clause 8.8.3.4) to the S-EES with the ACR action indicating ACR initiation and the corresponding ACR initiation data (with the need to notify the EAS). The S-EES authorises the request from the EEC. The S-EES decides to execute ACR based on the information received from the EEC, EEC context and/or EAS profile, The S-EES may apply the AF traffic influence with the N6 routing information of the T-EAS in the 3GPP Core Network (if applicable) and sends the ACR Notify message to the S-EAS to initiate ACT between the S-EAS and the T-EAS. The EEC also subscribes to receive ACR information notifications for ACR complete events from the S-EES, as described in clause 8.8.3.5.2.

5. The S-EAS transfers the application context to the T-EAS at implementation specific time. This process is out of scope of the present specification.

When in step 1 the ACR has been triggered for service continuity planning, if the UE does not move to the predicted location, the EEC does not connect to T-EES, the AC does not connect to the T-EAS. Steps 6 and 7 are skipped.

NOTE 1: The S-EAS or T-EAS can further decide to terminate the ACR, and the T-EAS can discard the application context based on information received from EEL and/or other methods (e.g. monitoring the location of the UE). It is up to the implementation of the S-EAS and T-EAS whether and how to make such a decision.

NOTE 2: When in step 1 the ACR for service continuity planning is triggered, steps 6 and 7 are performed after the UE moves to the predicted location.

Phase IV: Post-ACR Clean up

6. The S-EAS sends the ACR Complete message to the S-EES to confirm that the ACR has completed.

7. The S-EES sends the ACR information notification message to the EEC to confirm that the ACR has completed as specified in clause 8.8.3.5.3.

\* \* \* End of Change \* \* \* \*