**3GPP TSG-SA WG6 Meeting #49-e meeting S6-221093r2**

**16th – 25th May 2022, Online**

**Source: ETRI, Uangel**

**Title: New Solution for KI#9: Dynamic EAS instantiation triggering and notification**

**Spec: 3GPP TR 23.700-98**

**Agenda item: 9.8**

**Document for: Approval**

**Contact: Seung-Ik Lee <seungiklee@etri.re.kr>**

# 1 Introduction

This paper proposes a new solution to address the KI#9: Enhancement of dynamic EAS instantiation triggering. This paper provides the detailed procedures for dynamic EAS instantiation/termination triggering including the triggering conditions, EES determination steps, interactions with the ECSP management system, and further notifications to EECs.

# 2 Discussion

As specified in TS 23.558 (Rel-17), EES may trigger the EAS instantiation dynamically if there is no instantiated EAS that matches the requesting service characteristics during EEC registration, EAS discovery, T-EAS discovery at ACR as follows:

**[TS 23.558 v17.3.0]**

|  |
| --- |
| *8.12 Dynamic EAS instantiation triggering**8.12.1 General* *The EES may trigger the EAS instantiation dynamically due to e.g., EAS discovery request, UE mobility, upon receiving EEC Registration request containing AC profile.*  *Upon receiving the EAS discovery request with EAS discovery filter from the EEC or the S-EES during the procedures for EAS discovery or ACR, the EES may fail to discover and select the EAS that matches the UE location and the requesting application characteristics specified in table 8.5.3.2-2 due to no EAS is available or instantiated. The EES may trigger the EAS management system to instantiate the EAS serving the AC in the EDN before returning the EAS information to the EEC or S-EES, based on the pre-configured dynamic EAS instantiation information about which EAS can be dynamically instantiated at the associated EDN.*  *NOTE 1: The EAS management system is responsible for the authorization of the dynamic EAS instantiation.*  *NOTE 2: The EAS management system can provide the pre-configured dynamic EAS instantiation information to the EES. Such a mechanism is out of scope of this release of the present document.*  *Editor's Note: [SA5] How the EAS management system can provide the dynamic EAS instantiation information at the EES is in the scope of SA5 and whether information elements related to the dynamic EAS instantiation information can be provided by EAS is FFS.* |

In FS\_eEDGEAPP, KI#9 of TR 23.700-98 provides the open issues for dynamic EAS instantiation triggering as follows:

**[TR 23.700-98 v0.6.0]**

|  |
| --- |
| *4.9 Key issue #9: Enhancement of dynamic EAS instantiation triggering* *In order to ensure efficient utilization of EDN resources for EAS deployment, it should be possible to have the proper number of EAS instances in the EDN to accommodate the load for applications. The dynamic EAS instantiation triggered by the EES is supported in release 17, but further details are not addressed. The EES may invoke EAS dynamic instantiation triggering to the EAS management system, e.g,, for considering the service load/capacity of EAS (e.g., number of service session); and for considering the EEC's requesting service characteristics (e.g., location, latency). In this regard, the followings need to be studied further.*  *Open issues:*  *1. What kind of information can be acquired by edge enabling layer and utilized by an EES to decide to trigger dynamic EAS instantiation and which entities can provide such information to an EES*  *2. Whether and how to support dynamic EAS termination triggering in order to enable dynamic scaling of EAS (i.e., scale in as needed).*  *Editor's note: The aspects of the interaction between EES and EAS management system should be consulted with SA5.* |

For the dynamic EAS instantiation triggering, EES may interact with the ECSP management system by invoking EAS instantiation/termination request in the similar way as specified in TS 28.538:

**[TS 28.538 v17.0.0]**

|  |
| --- |
| *7.1.2.1 EAS VNF instantiation* *Figure 7.1.2.1-1 depicts a procedure that describes how an ASP can consume provisioning MnS to instantiate the EAS. It is assumed that both ASP and ECSP consumers have subscribed to the producer of provisioning MnS to receive notifications.*    *Figure 7.1.2.1-1: EAS instantiation* *7.1.2.2 EAS VNF termination* *Figure 7.1.2.2-1 depicts a procedure that describes how an ASP can consume provisioning MnS to terminate the EAS VNF. It is assumed that both ASP and ECSP consumers have subscribed to the producer of provisioning MnS to receive notifications.*    *Figure 7.1.2.2-1: EAS VNF termination* |

While there have been several solutions proposed in the previous SA6 meetings, the following issues can be raised:

* EES needs to collect one or more EEC request (i.e., EEC Registration or EAS discovery) rather than a single EEC request before triggering the EAS instantiation for efficient resource utilization.
* EES needs to provide only its indication for demanding instantiation of the target EAS to the ECSP management system. Any decision or further actions to the requests are up to the ECSP management system (scope of SA5).
* The EAS instantiation triggering procedure needs to be asynchronous to the EEC requests (i.e., EES needs to prevent EEC from waiting for instantiation triggering) because the EES's instantiation triggering determination may need to collect more of the other EEC requests; and the EAS instantiation process may not be completed instantly in the ECSP management system.
* EEC needs to get notified the EAS instantiation result by EES for further considerations on the discovery of the new EAS instance.

Thus, this paper proposes a new solution to address KI#9 which provides asynchronous operations of dynamic EAS instantiation triggering and notifications with minimizing impact to TS 23.558 Rel-17. The proposed solution can be summarized as follows:

* **Dynamic EAS instantiation triggering and notification**
  + Triggering inputs events:
    - No available EAS instances matched during EEC registration, EAS discovery, and T-EAS discovery
  + Triggering determination:
    - Up to EES implementation
    - Based on the triggering input events and pre-configured information about instantiable EASs
    - Further considerations:
      * EEC's requesting service characteristics (e.g., location, latency) as specified in AC profile or EAS discovery filters
      * EAS's service load/capacity (e.g., number of service sessions) maintained by EES
  + Triggering actions
    - Invoking an MnS API of the ECSP management system for requesting instantiation of a target EAS
  + Post-triggering actions
    - Receiving a notification for instantiation result from the ECSP management system by EAS registration or provisioning update
    - Notifying the EAS instantiation to the corresponding EECs which have initiated the triggering input events for the target EAS instance
* **Dynamic EAS termination triggering**
  + Triggering inputs events:
    - EEC de-registration, ACR status update
  + Triggering determination:
    - Up to EES implementation
    - Based on the triggering input events
    - Further considerations:
      * EAS's current service status (e.g., number of service sessions) maintained by EES
  + Triggering actions
    - Invoking an MnS API of the ECSP management system for requesting termination of a target EAS
  + Post-triggering actions
    - Receiving a notification for instantiation result from the ECSP management system by EAS de-registration or provisioning update

# 3 Proposal

It is proposed to modify the text of TR 23.700-98 as follows.

*1st CHANGE*

7.x Solution #x: Dynamic EAS instantiation triggering and notification

7.x.1 Architecture enhancements

None.

7.x.2 Solution description

7.x.2.1 General

This solution addresses the Key issue #9: Enhancement of dynamic EAS instantiation triggering for efficient utilization of EDN resources for EAS deployment.

As specified in TS 23.558 (Rel-17), EES may trigger the EAS instantiation dynamically if there is no instantiated EAS that matches the requesting service characteristics during EEC registration, EAS discovery, T-EAS discovery at ACR.

By collecting one or more of these triggering input events, EES may determine if and which EAS needs to be instantiated based on the pre-configured information about instantiable EASs with further considering the requesting service characteristics (e.g., location, latency) by EEC or service load/capacity (e.g., number of service sessions) of EAS. If determined, EES may request the ECSP management system (which is specified in TS 28.538 [x]) to instantiate the target EAS that is determined to instantiate by invoking an MnS API of the ECSP management system.

When the target EAS has been instantiated, the EES may get notified by EAS Registration. Then EES may further notify the instantiation result of the target EAS to the corresponding EECs in order to inform the EECs of the availability of the EAS instance. When the EES gets informed of the EAS instantiation, the EES notifies the EECs whose AC profile or EAS discovery filters match with the EAS instance.

NOTE 1: How and when a triggering is determined by EES is upon implementation and out the scope of this solution.

NOTE 2: The pre-configured information about instantiable EASs may be provided by the ECSP management system but such a mechanism is out of the SA6 scope.

NOTE 3: With the EAS instantiation request, EES just provides its indication for demanding instantiation of the target EAS to the ECSP management system. Any decision or further actions to the requests are up to the ECSP management system.

NOTE 4: The MnS APIs for EAS instantiation request/notification should be provided by the ECSP management system and should be consult with SA5.

The solution can be summarized as follows:

* Dynamic EAS instantiation triggering and notification
  + Triggering inputs events:
    - No available EAS instances matched during EEC registration, EAS discovery, and T-EAS discovery
  + Triggering determination:
    - Up to EES implementation
    - Based on the triggering input events and pre-configured information about instantiable EASs
    - Further considerations:
      * EEC's requesting service characteristics (e.g., location, latency) as specified in AC profile or EAS discovery filters
      * EAS's service load/capacity (e.g., number of service sessions) maintained by EES
  + Triggering actions
    - Invoking an MnS API of the ECSP management system for requesting instantiation of a target EAS
  + Post-triggering actions
    - Receiving a notification for instantiation result from the ECSP management system by EAS registration
    - Notifying the EAS instantiation to the corresponding EECs which have initiated the triggering input events for EAS availability change

*Editor's note: Further considerations for the other EAS discovery events (e.g., T-EAS discovery by S-EES and S-EAS; or EAS Service API discovery as studied in KI#2) are FFS.*

7.x.2.2 Dynamic EAS instantiation triggering and notification procedures

The Figure 7.x.2.2-1 depicts the essential operational steps for dynamic EAS instantiation triggering and notification procedures.

Pre-conditions:

1. EES is pre-configured with the information about instantiable EASs which may be provided by the ECSP management system.



**Figure 7.x.2.2-1: Dynamic EAS instantiation triggering and notification procedures**

1a-1b. EECs proceed EEC registration, EAS discovery, or T-EAS discovery with EES, which are triggering input events for dynamic EAS instantiations.

2. Based on the triggering input events, the EES determines if and which EAS needs to be instantiated considering the requesting service characteristics provided by AC profile or EAS discovery filters; or service load/capacity (e.g., number of service sessions) of EAS maintained by the EES.

3. If determined to instantiate an EAS, EES requests the ECSP management system to instantiate the target EAS by invoking an MnS API of the ECSP management system.

4. The MnS of the ECSP management system responds the EES with indicating that the requesting EAS instantiation will be considered.

5. The ECSP management system determines if the requested EAS instantiation is acceptable by analyzing the deployment requirements and available resources; and proceeds the corresponding actions. (out the scope of this specification)

6. If the target EAS is instantiated successfully, the EES gets informed by an EAS registration procedure of the instantiated EAS.

7a-7b. The EES further notifies the EAS instantiation result to the relevant EECs which have already initiated the triggered input events for the target EAS instance.

7.x.3 Solution evaluation

*This clause provides an evaluation of the solution.*

*2nd CHANGE*

## 7.0 Mapping of solutions to key issues

Table 7.0-1 Mapping of solutions to key issues

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | KI # 1 | KI # 2 | KI # 3 | KI # 4 | KI # 5 | KI # 6 | KI # 7 | KI # 8 | KI # 9 | KI # 10 | KI # 11 | KI # 12 | KI # 13 | KI # 14 | KI # 15 | KI # 16 | KI # 17 | KI # 18 | KI # 19 | KI # 20 | KI # 21 | KI # 22 |
| Sol #1 | **X** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Sol #2 |  |  |  |  |  |  | **X** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Sol #4 |  |  |  |  |  | **X** |  |  |  | **X** |  |  |  |  |  |  |  |  |  |  |  |  |
| Sol #5 |  |  |  |  |  | **X** |  |  |  | **X** |  |  |  |  |  |  |  |  |  |  |  |  |
| Sol #6 |  |  | **X** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Sol #7 |  |  | **X** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Sol #8 |  | **X** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Sol #9 |  |  |  |  |  |  |  |  |  |  |  |  |  | **X** |  |  |  |  |  |  |  |  |
| Sol #10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **X** |  |  |  |  |  |  |  |
| Sol #11 |  | **X** |  |  | **X** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Sol #12 |  |  | **X** |  |  |  |  |  |  |  |  | **X** |  |  |  |  |  |  |  |  |  |  |
| Sol #13 |  |  |  |  |  | **X** |  |  |  | **X** |  |  |  |  |  |  |  |  |  |  |  |  |
| Sol #14 |  |  |  |  |  |  |  |  |  | **X** |  |  |  |  |  |  |  |  |  |  |  |  |
| Sol #15 |  |  |  |  |  |  |  | **X** |  |  |  |  |  | **X** |  |  |  |  |  |  |  |  |
| Sol #16 |  |  |  |  |  |  |  |  |  |  |  | **X** |  |  |  |  |  |  |  |  |  |  |
| Sol #17 |  |  |  |  |  |  |  |  |  |  |  |  |  | **X** |  |  |  |  |  |  |  |  |
| Sol #18 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **X** |  |  |  |  |  |  |  |
| Sol #19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **X** |  |  |  |
| Sol #20 | **X** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Sol #21 |  |  | **X** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Sol #22 |  |  |  | **X** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **X** |  |
| Sol #23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **X** |  |  |  |  |  |  |
| Sol #24 |  |  |  |  |  |  |  |  |  |  | **X** |  |  |  |  |  |  |  |  |  |  |  |
| Sol #25 |  |  |  |  |  |  |  |  |  |  | **X** |  |  |  |  |  |  |  |  |  |  |  |
| Sol #26 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **X** |  |  |  |  |
| Sol #27 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **X** |  |  |  |  |  |
| Sol #28 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **X** |  |  |  |  |  |
| Sol #29 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **X** |  |  |  |  |  |
| Sol #x |  |  |  |  |  |  |  |  | **X** |  |  |  |  |  |  |  |  |  |  |  |  |  |

*END OF CHANGES*