**3GPP TSG-SA3 Meeting #102-Bis-e *S3-210979-r3***

**e-meeting, 1st - 5th March 2021** Revision of S3-20xxxx

**Source: Intel**

**Title: Updates to solution 4**

**Document for: Approval**

**Agenda Item: 2.8**

# 1 Decision/action requested

***It is proposed to approve the updates to the Solution in EDGE TR 33.839.***

# 2 References

*(Reference - in list form - should be made to previous related SA5/3GPP/etc. documents.)*

*(For changes against a draft TS/TR, a pseudo CR - a.k.a. pCR - will be provided using this Tdoc template. In this case, the number, name and version of the draft TS/TR used as base must be provided and the version must be the latest available version of the draft TS/TR.)*

<Examples of references, please delete when you have inserted your actual references:

[1] 3GPP TS 32.500 SON Concepts and Requirements

[2] 3GPP TS 99.999 This example has a very long name, because then we can see how thi References paragraph will handle paragraphs spanning more than one line.

[3] 3GPP TS 99.999 Title of the document

[4] S5-991234, CR 32.999 v10.1.1, Inverting architecture of SON

[5] [S5-100001](http://www.3gpp.com/ftp/TSG_SA/WG5_TM/TSGS5_69/Docs/S5-100001.zip), Agenda, 3GPP SA5#69 Comment>

# 3 Rationale

pCR Proposes an editor note related to interface security for edge-1 and 4 interfaces.

For ECS authorization, it may be possible to have authorization service by ECS, but it is not in this solution's scope.

Also, it proposes to add evaluation for solution.

# 4 Detailed proposal

**\*\*\*\*START OF CHANGES \*\*\***

6.4 Solution #4: Authentication/Authorization framework for Edge Enabler Client and Servers

6.4.1 Introduction

This solution addresses the security requirement for the Authentication and Authorization of EEC in key issue #1 and key issue #2, Key issue #6(for EDGE-1, EDGE-4 interfaces). The solution should work for all the scenarios described in 23.558[2]. e.g., MNO Owned ECSP and non-MNO owned ECSP. Another scenario where the solution should be beneficial where UE already has a business relationship (e.g., subscribed to services) with ECSP and MNO has a business relationship ECSP then UE should use existing authentication/authorization methodologies to connect to ECSP to avail services.

Note: Secondary Authentication is performed in this solution.

6.4.2 Solution details



Figure 6.4.2-1: Secondary Authentication Based Authentication/Authorization framework for Edge Enabler Client and Servers

The procedure includes the following steps:

Step 0: UE pre-configuration: If the ECS deployed by MNO is contracted with one or more ECSP(s), the ECS provides EES configuration information of MNO owned, and ECSP owned EESs via MNO ECS as described in clause 8.3.3.2 in 23.558 [2]. If a non-MNO ECSP deploys the ECS, the ECS endpoint address may be configured with the EEC. An EEC that is aware of multiple ECSP's ECS endpoint addresses may perform the service provisioning procedure per ECS ECSP multiple times. As part of provisioning EEC may have installed ECS’s TLS certificates.

Step 1: Primary Authentication: In this step, UE performs primary authentication with the network.

Step 2a, 2b: PDU session: As a result of UE initiating the service provisioning procedure with the ECS (as specified in clause 8.3 in TS 23.558 [2]), UE establishes a PDU session. This PDU Session may be established either to a well-known or pre-configured S-NSSAI or DNN, or the 5GC derives the S-NSSAI by using the registration for UE to network in step 1. Based on this information, the AMF selects an SMF, which in turn selects a PSA that provides a data connection to the Edge Cloud Service Provider's (Edge Data Network's) AAA Server. SMF continues secondary authentication as per clause 11.1.2 in 33.501[7]. ECS may act as DN-AAA Server.

Step 3a, 3b: After successful UE-requested PDU Session Establishment authentication/authorization by an EDN-AAA server, the device discovers and connects, at the application level, to a ECS server address (that was preconfigured in the UE in step 0 or is derived from the application identifier and/or Service Provider Identifier provided by the user in step 1) for provisioning EEC with ECS. The UE performs EEC registration (as specified in clause 8.4.2 in TS 23.558 [2]) and Discovery (as specified in clause 8.5 in TS 23.558 [2]) with the EES.

EEC establish the TLS session with the ECS, to secure the communication. TLS is used to provide integrity protection, replay protection and confidentiality protection for EDGE-4 interface. Certificate-based Mutual authentication is performed between the EEC and the ECS using TLS, following RFC 5246 [25] for TLS 1.2 and RFC 8446 [19] for TLS 1.3.After successfully establishing the secure session over EDGE-4 as in step 2, the Edge Enabling Client should send an Initial Provisioning request with Access Token Request message to the Edge Configuration Server as per the OAuth 2.0 specification. The Edge Configuration Server should verify the Access Token Request message per OAuth 2.0 specification. If the Edge Configuration Server successfully verifies the Access Token Request message, the Edge Configuration Server should generate an access token specific to the Edge Enabling Client and return it in an Initial Provisioning Response (Access Token Response) message.

Step 4.a: On EDGE-1, the Edge Enabling Client authenticates to the Edge Enabling Server by establishing a TLS session with the Edge Enabling Server based on the Server (Edge Enabling Server) side certificate authentication or certificate-based mutual authentication) as indicated by Edge Configuration Server. Edge Configuration Server may provide Edge Enabling Client's root CA certificate during the registration response (as specified in clause 8.4 in TS 23.558[2]) to the Edge Enabling Server to validate the Edge Enabling Client's certificate. TLS provides integrity protection, replay protection, and confidentiality protection over the EDGE-1 interface. It is required to protect and to provide the access token to an authentic EES.

Step 4.b: The UE initiates the EEC registration procedure with the EES, including the access token obtained from the ECS in Step 3.b. The authorization check for the EEC registration request is performed by verifying the access token issued by the ECS to the UE. The EES obtains the access token validation service from the ECS. In another option, the access token validation service by the ECS could be replaced by an authorization service by the ECS that does not require a token to be issued by the ECS to the UE but details are not in scope of this solution.

Step 5: EEC requests a service (e.g., Discovery) with access token obtained in step 4. The Edge Enabling Server should validate the access token. The Edge Enabling Server verifies the integrity of the access token by verifying the Edge Configuration Server signature. If validation of the access token is successful, the Edge Enabling Server should verify the Edge Enabling Client's Service request against the authorization claims in the access token, ensuring that the Edge Enabling Client has access permission for the requested service.

e.g., When the UE initiates the EAS discovery procedure with the EES by including the same access token obtained from the ECS in Step 3.b if it is valid. Again, the EES obtains the access token validation service from the ECS. The EES also requests and obtains the access token(s) from the ECS for the UE to grant access to the EAS(s). In response to the request, the EES includes the EAS access grant token(s), with relevant information like validity time, to the UE.

If the obtained access token from the ECS (in Step 3.b) is not valid, then the EEC requests ECS for a new access token, as shown in figure 6.3.X-1. The access token request message includes the necessary parameters to identify the EEC security context and parameters for authenticity verification. After verifying the authenticity, the ECS provides a new access token to the EEC in response to the request.

Step 6: The UE obtains service from EAS by producing the access token obtained from the EES over the secure TLS connection. The UE also obtains security policy and the relevant access token from the EES in Step 5. Before sending the access token to the EAS, the UE and the EAS establish a secure channel using the EAS server certificate. It is required to protect and to provide the access token to an authentic EAS. The EAS obtains the access token validation service from the ECS via EES. After successful validation of the access token, the UE obtains the Edge Computing service from the EAS.

6.4.3 Solution evaluation

The above solution proposes reusing the authentication and authorization between UE and Edge Data network using existing secondary authentication mechanisms as defined in TS 33.501. There is no impact on network entities and existing procedures.

After establishing the authentication and authorization using secondary authentication with Edge AAA server, EDGE-1, Edge-4 interface is further protected using TLS. TLS provides integrity protection, replay protection, and confidentiality protection over the EDGE-1 and Edge 4 interface.

An access token mechanism provides authorization for Edge-1. The solution can be amended by an authorization service by the ECS instead of an access token mechanism.

Solutions comply with all app-based platforms and the majority of deployed application solutions on the Internet today, which rely on the basic principle where a network server (in the role of Authenticator) authenticates the device (in the role of Supplicant) by communicating with a backend Authentication Server. The key benefit of this Solution with AKMA based solutions proposed in this TR that the additional system impact on enabling AKMA on the ECSP network is avoided. Also, it avoids putting a burden on the ECSP to support AKMA

With the above analysis, the solution meets the security requirements for Key issue 1, Key issue 2, Key issue 6.

Editor’s Note: Why secondary authentication is need before the TLS connection is FFS.

Editor’s Note: How the certificates for the applications (AC and EEC) are provisioned is FFS.

Editor’s Note: Further evaluation is FFS.

**\*\*\*\*END OF CHANGES \*\*\***