**3GPP TSG-SA/WG2 Meeting #143e *S2-200xxxx***

**Elbonia, Feb. 24 – Mar.9 , 2020 (revision of S2-200xxxx)**

**Source: Intel, Tencent?, China Telecom?, Lenovo?**

**Title: EAS IP Replacement in 5GC**

**Document for: Agreement**

**Agenda Item: 8.3**

**Work Item / Release: enh\_EC / Rel-17**

***Abstract of the contribution:*** *This contribution* *captures the solution concluded in TR 23.748, clause 9.2.5.*

# 1 Proposal

It is proposed to agree the changes based on the conclusion in TR 23.748 clause 9.2.5:

**/\*\*\*\*\*\*\*\*\*\*\*\*Start of Change (all new text) \*\*\*\*\*\*\*\*\*\*\*\*\*\*/**

### 6.3.3 Edge relocation using EAS IP replacement

EAS IP replacement enables the local PSA UPF to replace the source EAS IP address and port number with the target EAS IP address and port number for the uplink traffic and replace the target EAS IP address and port number with the source EAS IP address and port number for the downlink traffic based on the enhanced AF Influence information for EAS IP replacement (i.e. Support of EAS IP Replacement Capability, source EAS IP address and port number, target EAS IP address and port number). The source EAS IP address and port number are the destination IP address and port number of the uplink traffic, generated by UE, for a service subject to Edge Computing. The source EAS IP address is the one discovered by UE for an EC service.

#### 6.3.3.1 EAS IP replacement procedures for different scenarios

##### 6.3.3.1.1 EAS IP replacement enabling in the middle of EC Session



Figure 6.3.3.1.1-1: EAS IP replacement enabling in the middle of EC Session

NOTE 1: This procedure covers the scenarios that the UE moves from non-EC to EC or the AF decides to enable the EAS IP replacement in the middle of an EC session.

1. UE requests to establish a PDU Session.

2. UE is preconfigured with the Source EAS IP address or discovers the IP address of the application server for the EC service, and the Source EAS IP address is returned to the UE via EAS Discovery procedure.

3. UE communicates with the Source EAS.

4. AF detects that the EAS is capable of runtime context minoring and an optimal EAS is found, then AF decides to influence the traffic routing in 5GC. The EAS IP replacement information (i.e. Support of EAS IP Replacement Capability, source EAS IP address and port number, target EAS IP address and port number) is sent to the SMF within the AF Influence information and the SMF reconfigures the UL CL UPF and Local PSA with EAS IP replacement information. Or when UE moves to an area where the Local PSA has been configured to enforce EAS IP address replacement.

 UL CL is configured by SMF to forward the destination IP address in the UL packet equals to the Source EAS IP address to Local PSA.

 Local PSA is configured by SMF to enforce the "Outer Header Creation" and " Outer Header Removal" as described in step 6. FARs "Outer Header Creation" and " Outer Header Removal" are reused for such an instruction from SMF to UPF.

 Detailed enhancement to the AF Influence procedure is described in clause 6.3.3.2.2.

5. Early Notification procedure with enhancement described in clause 6.3.3.2 is triggered, SMF notifies AF about the current serving EAS IP information (i.e. Source EAS IP address and port number), AF triggers to mirror the runtime context between Source EAS and Target EAS. Once the Target EAS is ready, AF responds to SMF about the Target EAS IP information (i.e. Target EAS IP address and port number). SMF reconfigures Local PSA for EAS IP address replacement between Source EAS and Target EAS.

6. Local PSA starts to perform "Outer Header Creation" and " Outer Header Removal" FARs as instructed by SMF, which results in EAS IP address replacement:

- For UL traffic, the destination IP address and port number are replaced with the Target EAS IP address and port number at Local PSA;

- For DL traffic, the source IP address and port number are replaced back with the Source EAS IP address and port number at Local PSA.

NOTE 2: In this solution, the PSA UPF need not to understand the logic of EAS IP replacement.

7. Late Notification procedure with enhancement described in clause 6.3.3.2 is triggered, SMF notifies AF about the start of the EAS IP replacement.

 Then all subsequent uplink traffic of this EC service for this UE is forwarded to the target EAS.

NOTE 3: AF decides when and how to stop the Source EAS from serving the UE based on its local configuration.

##### 6.3.3.1.2 UE moves among EC Environments with DNAI and EAS IP Change



Figure 6.3.3.1.2-1: EAS IP replacement procedure after DNAI and Local EAS IP change

1. For UL traffic, the destination IP address is replaced with the old Target EAS IP address at Local PSA; for DL traffic, the source IP address is replaced back with the Source EAS IP address at Local PSA.

2. When Early Notification happens, the SMF notifies AF about the Source EAS IP address and port number, old Target EAS IP address and port number, source and target DNAI, then AF initiates runtime session context migration from the old Target EAS to the new Target EAS. When the resource in the new Target EAS is ready, the AF responds with the new Target EAS IP address and port number to SMF. SMF decides whether to relocate UL CL and Local PSA and configures the EAS IP address replacement using "Outer Header Creation" and " Outer Header Removal" in Local PSA2 if PSA relocation happens.

Detailed enhancement to the User Plane Management procedure is described in clause 6.3.3.2.2.

3. Local PSA2 starts to perform "Outer Header Creation" and " Outer Header Removal" FARs as instructed by SMF, which results in EAS IP address replacement:

- For UL traffic, the destination IP address and port number are replaced with the new Target EAS IP address and port number at Local PSA;

- For DL traffic, the source IP address and port number are replaced back with the Source EAS IP address and port number at Local PSA.

4. Late Notification procedure with enhancement described in clause 6.3.3.2.2 is triggered, SMF notifies AF about the start of the EAS IP address replacement towards the new Target EAS.

NOTE 1: AF decides when and how to stop the old Target EAS from serving the UE based on its local configuration.

##### 6.3.3.1.3 EAS IP Change under same DNAI due to EAS migration



Figure 6.3.3.1.3-1: EAS IP Change under same DNAI due to EAS migration

1. For UL traffic, the destination IP address is replaced with the old Target EAS IP address at Local PSA; for DL traffic, the source IP address is replaced back with the Source EAS IP address at Local PSA.

2. AF triggered EAS migration without DNAI change as described in clause 6.3.3.2.3 with enhancement.

3. Local PSA starts to perform "Outer Header Creation" and " Outer Header Removal" FARs as instructed by SMF, which results in EAS IP address replacement again:

- For UL traffic, the destination IP address and port number are replaced with the new Target EAS IP address and port number;

- For DL traffic, the source IP address and port number are replaced back with the Source EAS IP address and port number.

NOTE 1: AF decides when and how to stop the old Target EAS from serving the UE based on its local configuration.

##### 6.3.3.1.4 From EC to Non-EC Environment due to UE Mobility



Figure 6.3.3.1.4-1: From EC to Non-EC Environment due to UE Mobility

1. Local PSA performs "Outer Header Creation" and " Outer Header Removal" FARs as instructed by SMF, which results in EAS IP address replacement:

- For UL traffic, the destination IP address and port number are replaced with the old Target EAS IP address and port number;

- For DL traffic, the source IP address and port number are replaced back with the Source EAS IP address and port number.

2. Due to UE Mobility to a Non-EC environment, Early Notification is triggered, target DNAI is set to empty value, AF knows the UE moves out of EC environment and mirrors the runtime session context from old Target EAS to Source EAS. Once ready, the AF indicates SMF to disable the local routing at UL CL and the EAS IP replacement at Local PSA for this PDU Session.

3. UL and DL traffic goes through Remote PSA, no EAS IP address replacement happens at Remote PSA.

NOTE 1: AF decides when and how to stop the old Target EAS from serving the UE based on its local configuration.

#### 6.3.3.2 Enhancement to AF Influence

##### 6.3.3.2.1 AF triggered EAS migration in 5GC

For load balancing purpose, the AF may move some UE(s) from the old Target EAS) to the New Target EAS in the same local DN identified by the DNAI.

For the abnormal condition of EAS, the AF may move all the UEs being served by the source EAS to a target EAS in the same local DN.

The AF influence content information defined in clause 5.6.7.1 (table 5.6.7-1) of TS 23.501 [yy] needs to include following additional information:

- List of UE IP address and port number: The IP address and port number of the UE(s) whose traffic should be moved from source EAS to target EAS in the same local DN identified by DNAI.

- The old Target EAS IP address and port number for the impacted DNAI: The IP address and port number of the old Target EAS in local DN identified DNAI which is currently serving the UE(s).

- The new Target EAS IP address and port number for the impacted DNAI: The IP address and port number of the new target EAS in local DN identified DNAI which the EC application traffic is moved to.

##### 6.3.3.2.2 Notification of User Plane Management Events

For the procedure in 23.502[xx] clause 4.3.6.3, following additions are identified:

* The Source EAS IP address and port number, the old Target EAS IP address and port number for an EC service are included in steps 2a, 2b 2c.
* For the target DNAI, the AF selects the new Target EAS and the new Target EAS IP address and port number need to be included in steps 2d, 2e, 2f for Early Notification.
* SMF needs to send the "Outer Header Creation" and " Outer Header Removal" FARs to Local PSA UPF as described in step 6 of clause 6.3.3.2.2, and Local PSA UPF starts the EAS IP address replacement as described in clause 6.3.3.1
* SMF needs to notify the AF about the start of EAS IP address replacement in Late Notification.

##### 6.3.3.2.3 Transferring an AF request targeting an individual UE address to the relevant PCF

For the procedure in 23.502[xx] clause 4.3.6.4, following additions are identified:

* In step 1, AF may include the capability indication for Support of EAS IP Replacement, UE IP address and port number, the Source EAS IP address and port number, the Target EAS IP address and port number.
* In step 5, the SMF may update the Local PSA UPF with "Outer Header Creation" and " Outer Header Removal" FARs to re-enforce the updated replacing EAS IP address(es) per DNAI and replace the source EAS IP address and port number with the target EAS IP address and port number for the specific DNAI for specific UEs identified by list of target UE identifier(s), or the list of UE IP address and port number.

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