**3GPP TSG-WG SA2 Meeting #153e *S2-220xxxx***

**E-meeting, October 10-17, 2022 (revision of S2-220xxxx)**

**Source: Samsung**

**Title: KI #1, Conclusion and Evaluation Update for HR Scenarios**

**Document for: Approval**

**Agenda Item: 9.11**

**Work Item / Release:** **FS\_EDGE\_Ph2 / Rel-18**

**Abstract:** *This contribution updates the HR part of the Key Issue #1 Evaluation and Conclusion.*

# 1. Discussion

At SA2 #152e, an interim Key Issue #1 conclusion was agreed for the HR scenario.

In the conclusion, the following editor’s notes are captured:

Editor's note: These conclusions are interim and options need to be removed in the finally approved conclusions.

Editor's note: It is FFS whether both scenarios 2.1 and 2.2 will be addressed by normative specifications.

Editor's note: It is FFS how the indication is sent to the V-SMF either via AMF during UE registration procedure or via H-SMF during the PDU Session Establishment procedure or both.

Editor's note: Procedure for scenario 2.1 is FFS.

Editor's note: Whether the Options A/B/C/D in HR roaming case are exactly same as non-roaming is FFS.

In addition, during e-mail discussion in SA2#152, the following editor’s note was identified, but not captured in the contribution, therefore it should be resolved in this meeting.

Editor’s Note: It is FFS whether both mechanisms (UDM information / PCF information) listed in bullet 1 and 2 are needed.

Also, the technical issues to be resolved regarding following editor’s notes are not extensively discussed, but should be revolved in this meeting.

Editor’s Note: It is FFS whether V-PCF can be involved in the PCC control of the PDU Session.

Editor’s note: It is FFS of the procedure when AF in roaming PLMN triggers the traffic influence and EAS relocation

This contribution proposes a set of conclusions, but will end up with agreeable version after the discussion.

The following changes are proposed for TR 23.700-48 v0.4.0.

\* \* \* \* 1st change \* \* \* \*

### 7.1.2 Evaluation for scenario 2 (via HR PDU Session)

In this clause, we evaluate the solutions addressing KI#1 scenario 2: #1, #2, #3, #4, #5, #24, #25, #26.

1. Regarding the technical aspect on how to authorize the PDU Session to support local traffic routing to access an EHE in the VPLMN, there are three categories of solutions as follows:

1) With #2 and #25, the authorization information is stored in UDM. During the UE registration procedure, the UDM sends the allowed indication to the AMF in VPLMN.

2) With #1 and #3, the authorization information is stored in UDM or is configured in H-SMF locally according to roaming agreement. During the PDU Session Establishment procedure, the H-SMF sends the indication to allow local traffic routing to the V-SMF.

3) With #4 and #5, H-PCF provides the policy to V-SMF via H-SMF.

 UDM-based approaches can be used where no dynamic PCC is deployed. The allowed indication sent to the AMF can be used to assist the AMF to select the V-SMF.

2. Regarding the technical aspect on whether and how to support charging for the local traffic of a PDU Session that supports local traffic routing to access an EHE in the VPLMN, there are four solutions (#1, #2, #3, #5 and #25) addressing VPLMN charging.

- With #1, V-UPF reports the usage and charging records to the V-SMF. V-SMF sends the charging information to V-CHF and also sends the usage records to the H-SMF.

- With #2 and #3, V-PSA collects and reports it.

- With #5, V-SMF configures the traffic routing rule and Usage Report Rule to assist traffic offload to V-EAS and usage information report from UL-CL V-UPF or BP V-UPF to H-SMF via V-SMF for offline and online charging.

- Solution #25 proposes that the V-SMF provides Usage Reporting Rules to the UL-CL/BP and local PSA to collect Usage Reports for charging in VPLMN that it conveys to H-SMF.

 Both VPLMN and HPLMN need to store charging records, it is reasonable that V-SMF sends the records to H-SMF.

3. Regarding the technical aspect on how to support Rel-17 edge computing related procedures, such as EAS (re-) discovery, as specified in clause 6 of TS 23.548 [3], there are seven solutions (#1, #2, #3, #4, #5, #24, and #25).

1) Scenario 2.1: #1, #4, #5, and #25

- #1. H-AF requests influence traffic routing and H-SMF sends local routing indication to the V-SMF.

- #4. H-EASDF is used. The V-SMF performs selection and insertion of UL-CL/BP and local PSA based on DNAIs received from H-SMF. The DNAIs are determined by H-SMF based on EAS IP report from H-EASDF.

- #5. The V-SMF determines the HR PDU Session for V-EHE should be activated based on the EAS information and roaming offload policy received from H-PCF via H-SMF, and configures the traffic routing rule to assist traffic offload to V-EAS.

- #25. H-SMF and Home DNS/H-EASDF may monitor, assist and validate the L-PSA selected by the V-SMF, based on H-EASDF trigger.

 #4 supports the dynamic EAS (re-)discovery by H-SMF based on interaction with EASDF.

 In #1, #5 and #25, HPLMN sends an offload policy/configuration to the V-SMF, and V-SMF performs the UL-CL and local PSA selection at EAS (re-)discovery.

2) Scenario 2.2: #1, #2, #3, #4, #5, #24, #25

- #1. V-SMF retrieves the EAS deployment information of the VPLMN from the V-NEF and performs EAS discovery according to the EAS discovery procedure.

- #2. Based on V-EASDF trigger, the V-SMF decides the Session Breakout using EAS Deployment Information provisioned from the AF and V-SBO information provided by the H-SMF.

- #3. V-SMF uses a pre-configured list of FQDNs subject to EC services to derive a traffic routing rule and configures it to the V-UPF so that the V-UPF can route DNS queries (corresponding to FQDNs) to V-EASDF. Based on EAS information received from the V-EASDF and UE location, V-SMF may perform V-ULCL and V-PSA selection and insertion. This configuration refers to option D.

- #4. H-SMF determines candidate DNAIs of VPLMN corresponding the FQDN based on the EAS deployment information in the VPLMN. The H-SMF obtains ECS option/local DNS server from V-SMF during PDU Session Establishment and send it to H-EASDF. The H-EASDF handles all DNS queries of the UE based on this ECS option/local DNS server. This solution implies interaction between H-SMF and V-SMF in every DNS resolution to trigger V-SMF actions related to local UL-CL/PSA selection and configuration and unnecessary involvement of HPLMN for scenario 2.2.

- #5. Based on the received EAS information (e.g. EAS IP address) and the roaming offload policy, the V-SMF decides to insert or relocate UL-CL/BP V-UPF and PSA V-UPF for traffic offload to the V-EAS. According to the roaming offload policy and the EAS Deployment Information, the V-SMF configures DNS message handling rules to V-EASDF.

- #24. During the PDU Session establishment procedure, the V-SMF instructs the UL-CL the traffic routing rule to route the DNS Query for an FQDN (range) to a local DNS Server/Local DNS Resolver (Re-use Option D).

- #25. Dynamic EAS discovery and insertion of UL-CL and local PSA happens in the V-PLMN based on available EC application information and related policies and trigger from V-EASDF.

 V-SMF decides UL-CL and local UPF insertion based on V-EASDF notification (#1, #2, #3, #5, #25) while in #4, H-SMF determines the DNAI of VPLMN.

 V-SMF configures V-EASDF based on roaming offload policy from H-SMF and EAS deployment Information (#1, #2, #3, #5, #25).

Solutions address how to forward DNS query:

- use V-EASDF handling rule by the V-SMF (#2, #5, #25 opt A);

- use Option C (#1);

- V-UPF to forward the DNS queries to local DNS server/V-EASDF or home DNS server/H-EASDF (i.e Option D) (#3, #24, #25 Opt B);

- always use H-EASDF (#4).

4. Regarding the technical aspect on how to ensure proper policy control and QoS enforcement, there are three solutions (#1, #5, #26)

 With #1 and #5, regarding HPLMN policy, V-SMF receives the roaming offload policy/rules from H-PCF via H-SMF, while regarding VPLMN policy, with #26, V-SMF receives its VPLMN policy from V-PCF.

 Solution #25 proposes that in scenario 2.1, HPLMN may provide QoS policies for specific applications in the SLA, and then this will be configured in V-SMF with limitation to roamers. Alternatively, QoS rules can be conveyed to V-SMF by H-SMF during PDU Session establishment or update as specific information or as an indication to V-SMF to store the information sent to the UE in the NAS message and the QoS profile sent to gNB. In scenario 2.2, V-PCF provides local policies for V-SMF.

 It is reasonable to support both HPLMN and VPLMN policy respectively and both can co-exist.

5. Regarding the technical aspect on potential impact on Policy and QoS control:

 The technical aspects 2 and 4 address this aspect.

6. Regarding the technical aspect on how to configure the VPLMN ECS address to UE in roaming scenarios, one solution (#1) addresses this issue.

 With #1, H-SMF sends VPLMN ECS address stored in UDM to UE via V-SMF.

7. Regarding the technical aspect on how to support the edge relocation in roaming scenarios, #39 (clauses 6.39.2.1 and 6.39.2.2) addresses this issue.

 It supports the AF triggered EAS relocation between different PLMNs. The AF sends PLMN ID corresponding to target EAS to the network, which assists to select SMF and UPF, and indicates SMF to configure traffic rule on UPF to access target PLMN. It is reasonable to support this scenario.

\* \* \* \* 2nd change \* \* \* \*

### 8.1.2 Conclusion for scenario 2 (via HR PDU Session)

Regarding KI#1 scenario 2, it is concluded with the following principles:

1. An indication to authorize the PDU Session to support local traffic routing to access an EHE in the VPLMN, is stored in the UDM. The indication is sent to the V-SMF to decide to apply the session breakout for the Home Routed PDU Session. This indication is sent to the V-SMF via AMF during UE registration procedure and validated via H-SMF during the PDU Session Establishment procedure.

2. H-PCF may send traffic description information, e.g. FQDN(s), EAS IP(s), to indicate traffic which is authorized to perform local traffic routing in VPLMN.

3.

NOTE: It will be described how V-SMF supports charging for the local traffic of a PDU Session that supports local traffic routing to access an EHE in the VPLMN and whether it reports to V-CHF as well as to H-SMF in coordination with SA5 during normative phase.

4.

For scenario 2.1 (H-PLMN knows the EDI of the V-PLMN), V-SMF decides on UL CL/BP and local PSA insertion based on EC Application information that could be part of SLA and be locally configured in VPLMN, or H-SMF provides the information to V-SMF to support V-SMF’s decision on UL CL/BP insertion.

NOTE: The procedures for supporting scenario 2.1 require the tight cooperation between the VPLMN and HPLMN.

 For scenario 2.2, V-SMF decides UL-CL and local UPF insertion based on V-EASDF notification and UE location.

 For Options A and B, V-SMF configures V-EASDF based on roaming offload policy from H-SMF and EAS Deployment Information from AF deployed in VPLMN and/or local configuration in V-SMF and the DNS server address of HPLMN received from HPLMN.

 For Options A and B, the V-SMF sends the V-EASDF address to the H-SMF for the H-SMF to create PCO for the UE during PDU Session Establishment/Modification procedure.

 For Option C, the V-SMF sends the local DNS server address to the H-SMF for the H-SMF to create PCO for the UE during PDU Session Establishment/Modification procedure.

 For Option D, H-SMF sends H-DNS server address included in PCO to UE via V-SMF during PDU Session Establishment/Modification procedure.

Editor's note: Whether the Options A/B/C/D in HR roaming case are exactly same as non-roaming is FFS.

5. For edge relocation in roaming scenarios, the AF sends PLMN ID corresponding to target EAS to the network, and an inter-PLMN relocation indicator is transferred between V-SMF to indicate that the EAS relocation is between HPLMN and VPLMN.

6. Options C/D specified in clause 6.2.3.2.3 of TS 23.548 [3] can be used to route some unencrypted DNS messages locally after the UL-CL is inserted for the PDU Session for HR roaming scenarios.

7. V-SMF supports the use of the HPLMN provided roaming offload policy/rules received from H-PCF via H-SMF, and the use of VPLMN policy received from V-PCF.

\* \* \* \* End of changes \* \* \* \*