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**Source: Samsung, Huawei**

**Title: KI#1, evaluation and interim conclusion on scenario 2**

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*Abstract: This contribution proposes the interim conclusions on KI#1 solutions on scenario 2*

# Summary

This contribution proposes the evaluation and the interim conclusions on solutions addressing KI#1 scenario 2.

On key issue #1: Accessing EHE in a VPLMN when roaming, there are two scenarios

* UE accessing EHE in VPLMN via an LBO PDU Session
* UE accessing EHE in VPLMN via a PDU Session established as HR

This contribution evaluates the solutions addressing the second scenario with the following aspects.

1. how to authorize the PDU Session to support local traffic routing to access an EHE in the VPLMN;
2. 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;
3. how to support Rel-17 edge computing related procedures, such as EAS (re-)discovery, as specified in clause 6 of TS 23.548 [3];
4. how to ensure proper policy control and QoS enforcement;
5. potential impact on Policy and QoS control;
6. how to configure the VPLMN ECS address to UE in roaming scenarios;
7. how to support the edge relocation in roaming scenarios.

Target solutions for evaluation are #1, #2, #3, #4, #5, #24, #25, #26.

# Proposal

It is proposed to update the following changes in TR 23.700-48.

\* \* \* Start of changes (all new text) \* \* \* \*

### 7.X.Y KI#1 Evaluation on scenario 2.

In this clause, we evaluate the solution 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:
2. 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.
3. 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.
4. 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.

1. 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 three solutions (#1, #2, #3 and #5) addresses 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.

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

1. 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, there are seven solutions (#1, #2, #3, #4, #5, #24, and #25).
2. 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 opt2. H-SMF and Home DNS/H-EASDF validates the selected L-PSA based on H-EASDF trigger.

#4 and #25 Opt2 supports the dynamic EAS (re-)discovery based on DNS Query.

#1 and #5 is semi-dynamic mechanism, HPLMN sends an offload policy/configuration to the V-SMF, and V-SMF performs the ULCL decision based on EAS (re-)discovery.

1. 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.
* #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 V-EASDF.

SMF decides ULCL 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).

Solutions address how to forward DNS query:

* + Use V-EASDF handling rule by the V-SMF (#2, #5, #25 opt1)
  + 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)
  + Always use H-EASDF (#4)

1. 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.

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

1. Regarding the technical aspect on potential impact on Policy and QoS control,

The technical aspect 2 and 4 addressed.

1. 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.

Regarding the technical aspect on how to support the edge relocation in roaming scenarios, #39 (clause 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.

\* \* \* Next changes (all new text) \* \* \* \*

### 8.X. Conclusion for Key Issue #1: HR case (interim)

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

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

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.

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.

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

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

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.

1. For scenario 2.1 (H-PLMN knows the EDI of the V-PLMN), to support Rel-17 edge computing related procedures, such as EAS (re-) discovery, H-SMF and H-EASDF supports dynamic (re-)discovery based on DNS queries . The H-EASDF address is sent to the UE in the PCO during PDU Session Establishment/Modification procedure.

NOTE: Scenario 2.1 requires the tight cooperation between the VPLMN and HPLMN.

For scenario 2.2, V-SMF decides ULCL and local UPF insertion based on V-EASDF notification and UE location and 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 . The V-SMF sends the V-EASDF/Local DNS address to the H-SMF for the H-SMF to create PCO for the UE during PDU Session Establishment/Modification procedure, or. H-SMF sends H-DNS server IP address included in PCO to UE via V-SMF during PDU Session Establishment/modification procedure.

Editor’s note: It is FFS if the H-SMF can send both the IP addresses of the V-EASDF/Local DNS in the VPLMN and of the H-EASDF/H-DNS in the ePCO.

1. .

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

1. H-SMF sends VPLMN ECS address stored in UDM to UE via V-SMF in ePCO during the PDU Session Establishment/Modification procedure for the scenario that VPLMN ECS address is configured in HPLMN.
2. 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 the EAS relocation is between HPLMN and VPLMN.
3. Option 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 both HR and LBO roaming scenarios.