**3GPP TSG-WG SA2 Meeting #162 *S2-2404411***

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**Source: Huawei, HiSilicon, Intel**

**Title: KI#1: Update on solution#3 to remove the ENs and additional clarification**

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*Abstract: This paper addresses open Editor’s notes and provides updates for Solution#3 in TR 23.700-49.*

# 1. Discussion

## 1.1 Overview

The following sections discuss open EN in Sol#3 in TR 23.700-49 and propose a way forward to address those EN. To merge sol#4 some additional part are also added.

## 1.2 Target UE information included in the BaselineDNSPattern

The BaselineDNSPattern is not dedicated to specific PDU session, i.e. it can be applied to multiple PDU sessions. Following EN is related to whether the BaselineDNSPattern can include the target UE information.

Editor’s Note: It need be further clarified whether it is suitable to include the target UE information in the BaselineDNSPattern.

When the SMF builds DNS handing rules for a dedicated PDU session at EASDF, it can refer to BaselineDNSPattern to avoid replicating same information in different rule. To support this the Template ID is included in the DNS handling rule and BaselineDNSPattern. By doing this way, the template ID is used to associate the DNS handling rule (for a specific PDU session) with DNS detection temple (not dedicated to a specific PDU session).

Target UE information is used for same purpose. The EDI (EAS Deployment Information) may be applied to all PDU Sessions with a certain DNN, S-NSSAI and/or specific Internal Group Identifier(s), i.e. Any UE or specific Group UE. Hence the related derived Baseline DNS pattern can also be concluded that it is either applied to Any UE or specific Group UE. If the DNS handling rule include the related UE information, i.e. whether the UE is Any UE, and additional specific GROUP UE. Then it can also link the DNS handling rule with the related Baseline DNS pattern. To support this Target UE information is introduced. So the proposed target UE information, i.e. "Any UE" or "Internal Group ID" is not used to point to a specific PDU session but help to associate the DNS handling rule with Baseline DNS pattern, i.e. the Baseline DNS pattern even with this information is still not dedicated to a specific PDU session.

As show in Figure 1.2-1, by the DNS rule associated information, the DNS rule is linked with the BaselineDNSPattern information. Hence per the concreted FQDN, IP address included in the DNS template within the BaselinePattern, the EASDF can populate the related DNS query/response MDT (Message Detection Template) at the DNS handling rule. By doing this way, the SMF only indicate the related category of UE and not need be aware the concrete EDI information beforehand. The management of EDI information and related Baseline DNS pattern can be offloaded from SMF.



Figure 1.2-1: Linkage the DNS rules with Baseline DNS Patterns via the associated information

To avoid any misunderstanding, the target UE information can be renamed as target UE group information.

**Proposal 1: Rename the target UE as target UE group information, e.g. "Any UE" or "Internal Group ID". It is proposed to remove this EN.**

## 1.3 BD MDT ID or BD AIT ID needed to be unique or not

Following EN is about whether BD MDT(Message Detection Template) ID or BD AIT(Action Information Template) ID need to be unique,

Editor’s Note: Whether the Baseline DNS message detection template ID and the Baseline DNS handling actions ID for the given proposal above need to be unique is FFS.

Original the ID is used to associate the DNS handling rule with BaselineDNSPattern. In this proposal the ID is still needed for the BaselineDNSPattern update/delete. Hence the uniqueness of the ID can be same as existing design, i.e. unique per L-SMF set when a L-SMF set controls an EASDF and per L-SMF otherwise.

**Proposal 2: Clarify that the Baseline DNS message detection template ID and the Baseline DNS handling actions ID are unique per L-SMF set when a SMF set controls an EASDF and per L-SMF otherwise.**

## 1.4 How EASDF combines DNS MDT in DNS rule with BD MDT in Baseline DNS patten

Following EN is about how EASDF combine the BaselineDNSPattern with the DNS handing rule.

Editor’s Note: How EASDF combines the two pieces of information and generates the DNS template information need to be further clarified.

As discussed in clause 1.2, the two pieces information is linked together via the associated Target UE group information.

**Proposal 3: Remove this EN because it can be solved together with EN in clause 1.2.**

## 1.5 About the interface between the SMF and L-SMF

Following EN is related to the interface between SMF and L-SMF.

Editor’s Note: Details on interface between the SMF and L-SMF for this solution are FFS.

For the interface between SMF and L-SMF we have already renamed it as N16b interface as shown in the Figure6.3.2-1. As usual the detail of this interface is part of the study and not need be concluded right now.

**Proposal 4: change the EN to Note and clarify this interface is FFS.**

## 1.6 Merger proposal of Sol#4

There are two solution suggesting using the L-SMF, i.e. sol#3, sol#4. The main difference between these two solutions is that sol#4 select the L-SMF before the DNS query and the additional L-SMF removal procedure. We see the possibilities to merge these two proposals into one.

Similar as today the insertion of the UL-CL/L-PSA before DNS query per AF influence information, SMF can also select a Local SMF per AF influence information. This can also be only applied to some dedicated UE, i.e. the AF influence information only apply to some dedicated UE.

Due to the UE mobility the L-SMF can be relocated or removed. However only L-SMF relocation is mentioned at clause 6.3.3.4. It is also possible that L-SMF is only removed but not relocated. This is described in sol#4. It is proposed to clarify this.

**Proposal 5: Add the possibilities that the L-SMF selection can happen before DNS Query. Also, the removal of L-SMF is clarified.**

# 2. Text Proposal

It is proposed to capture the following changes vs. TR 23.700-49.

\* \* \* \* First change \* \* \* \*

### 6.3.3 Procedures

#### 6.3.3.1 EAS Deployment Information and BaselineDNSPattern Management in the EASDF by L-SMF

The EAS deployment information provisioned from AF to 5GC, i.e. UDR, is same as the procedure defined in clause 6.2.3.4.2 of TS 23.548 [5].

The L-SMF subscribes to EAS Deployment Information Change Notification from the NEF using the procedure same as one defined in clause 6.2.3.4.3 of TS 23.548 [5].

The L-SMF manages the BaselineDNSPattern at the EASDF as following.



**Figure 6.3.3.1-1: BaselineDNSPattern Management in the EASDF procedure**

The procedure defined in clause 6.2.3.4.4 of TS23.548[5] is reused with the following difference:

1. The BaselineDNSPattern is enhanced with two additional information, i.e. Associated L-SMF information and Target UE, as following,

**- DNS handling rule associated information:**

- Target UE **Group**, this DNS pattern is applied to which target UE group, e.g. "Any UE" or "Internal Group ID".

NOTE 1: The Target UE group information is used to associate the BaselineDNSPattern with the DNS handling rule. For the DNS handling rule it is dedicated to specific PDU session.

*- Baseline DNS message detection template*

*- Baseline DNS handling actions information*

NOTE 2: For the Baseline DNS message detection template or Baseline DNS handling actions temple, the Baseline DNS message detection template ID and the Baseline DNS handling actions ID is used for BaselineDNSPattern update and deletion. The uniqueness of the ID is per L-SMF set when a L-SMF set controls an EASDF and per L-SMF otherwise.

- **Association between L-SMF/DNAI/IP address range information:** For each DNAI derived from the EAS deployment Information, one supported L-SMF is included. Then this DNAI/(EAS) IP address range is associated with one L-SMF NF ID.

2. The L-SMF discover the related EASDF(s) for the indicated DNN/S-NSSAI, which are to be selected by the central SMF for DNS message handling. When the EASDF receive the BaselineDNSPattern from L-SMF, EASDF categorize the DNS pattern per which target UE group it is applied.

#### 6.3.3.2 EAS discovery procedure with EASDF



**Figure 6.3.3.2-1: EAS discovery procedure with EASDF**

The EAS Discovery with EASDF, i.e. option A/B type discovery, is executed as following:

1. L-SMF has created BaselineDNSPattern at the EASDF using the procedure as defined in clause 6.3.3.1.

2. Except the enhancement of DNS context, DNS context creation Procedure is same as defined in step 1~4 in Figure 6.2.3.2.2-1 of TS 23.548 [5].

 The SMF creates the DNS context at EASDF. The DNS detection template includes the DNS message detection associated information, e.g. the associated target UE group. Per the DNS message detection associated information, i.e. same target UE group information as indicated in the DNS handling rule associated information within the BaselineDNSPattern, the DNS detection template is linked to the DNS message detection template included in the DNS pattern. Hence the EASDF can combine two information to generate related dedicated DNS template information, e.g. FQDN or IP address range, to be detected. For the DNS handling action, it includes the action to report the DNS message content to SMF, no other action is configured. For these DNS handling rule, it can be called as default handling rule, e.g. default handling rule for Any UE, at the DNS context of UE.

3. If the existing DNS context configured at EASDF does not applied, e.g. due to the condition same as defined step 5 in clause 6.2.3.2.2 of TS 23.548 [5], the SMF may update the DNS context, e.g. removing one dedicated DNS handling rule which is configured at the EASDF in step 10 or 20.

4. Same as step 7 in clause 6.2.3.2.2 of TS 23.548 [5].

5/6, The EASDF notifies the matched DNS query message and include the candidate L-SMF NF ID(s) per the provisioned BaselineDNSPattern information. The SMF responds back to EASDF.

7. The SMF select a L-SMF per the UE location and the candidate L-SMF(s) information.

8/9. The SMF query the L-SMF by N16b interface to determine how to populate the EDNS Client Subnet option or get the local DNS server information. The Query parameter include the UE location information and FQDN information reported from EASDF. The L-SMF select a suitable EDNS Client Subnet option or Local DNS server and responds it to SMF.

10. Per the query result from L-SMF, the SMF update the DNS handling rule. The DNS handling rule update is same as the step 10/11 in clause 6.2.3.2.2 of TS 23.548 [5]. The SMF may determine the DNS handling rule for the FQDN received in the report need to be updated. If yes, the SMF configure the related dedicated handling rule with the EDNS Client Subnet option or local DNS server information.

11. Same as step 12/13 in clause 6.2.3.2.2 of TS 23.548 [5].

12/13. The EASDF notifies the matched DNS response message and include the additional L-SMF information for each candidate EAS addresses per the provisioned BaselineDNSPattern information. The SMF responds back to EASDF.

14. The SMF select a L-SMF per the UE location and the candidate L-SMF(s) information.

15. The SMF invokes a Nsmf\_PDUSession\_CreateSMContext Request (SUPI, DNN, S-NSSAI, SMF ID (SMF Instance ID), SM context ID in SMF, RAT Type, PDU Session Id, UE location information, DNS message) to establish the UE context at the selected L-SMF. The DNS message notified by EASDF are also included and sent to the L-SMF.

16. The L-SMF selects the L-UPF and EAS. For the detail L-UPF and EAS selection refer to solution in KI#2.

17. The L-SMF invokes a Nsmf\_PDUSession\_CreateSMContext Response (Result Indication, PDU Session ID, CN N9 tunnel info) to the SMF. The CN N9 Tunnel Info is the UL Tunnel Info of the new I-UPF.

18. The SMF perform UL CL/BP selection and configure traffic routing rule on the UL CL or the BP to forward UE packets destined to the L-DN to the Local PSA.

19. The SMF communicates with L-SMF to establish the tunnel between ULCL/BP and Local PSA for DL direction, i.e. the SMF send the DL N9 tunnel info of the UL-CL to L-SMF.

20. Same as the step 17/18 in clause 6.2.3.2.2 of TS 23.548 [5], the SMF may determine the DNS handling rule for the FQDN received in the report need to be updated. If yes, the SMF configure the related dedicated handling rule associated with the indicated DNS response message, e.g. not need send further DNS Response message(s) corresponding to FQDN ranges and/or EAS IP address ranges to SMF.

21. Same as step 21 in clause 6.2.3.2.2 of TS 23.548 [5].

Before the DNS query, i.e. step 4, SMF can also selects the L-SMF as described in clause 6.4.3.1. When the SMF receives the PCC rule related to the AF traffic influence and allowed by the subscription data, the SMF may select the L-SMF which serves that DNAI as indicated in the PCC rule even the DNS query has not been triggered. If the L-SMF has been selected, the selection of L-SMF in step 7 and 14 can be skipped.

\* \* \* \* Next change \* \* \* \*

#### 6.3.3.4 EAS rediscovery at Edge Relocation

This procedure is used by the SMF to trigger the EAS rediscovery procedure when a new connection to EAS need to be established. This rediscovery can be triggered in three cases:

- **SMF triggered:** SMF determines that L-PSA relocation/removal may be needed, e.g. UE moves out of the service area of one L-SMF. The SMF queries serving L-SMF to confirm whether the L-PSA relocation is needed or not.

- **L-SMF triggered:** Per the network condition change as described in KI#2, the L-SMF may determine that EAS rediscovery is required.

- **AF triggered:** Due to the serving EAS is not suitable, e.g. it is to be turned off due to maintenance, the AF notifies the SMF to reselect EAS.



Figure 6.3.3.4-1: EAS rediscovery procedure at Edge relocation

1a. The SMF determines that L-PSA relocation/removal may be needed, e.g. UE moves out of L-SMF service area. The SMF queries the serving L-SMF with the UE location information and FQDN information. The L-SMF per the EAS deployment information determines whether the L-PSA need be relocated/removal or not. If the L-PSA need be relocated/removal, the L-SMF confirms to the SMF.

1b. The L-SMF determines to EAS rediscovery is needed as discussed in KI#2. The L-SMF notifies this to the SMF.

1c. The AF triggers EAS relocation e.g. due to EAS load balance or maintenance. The AF notifies the SMF via the PCF.

2. Same as step 2 in clause 6.2.3.3.3 of TS 23.548 [5].

If the L-SMF is reallocated/removal due to EAS rediscovery, after some local configured time, the SMF may release the UE context at the old L-SMF. The old L-SMF in turn release the related L-PSA. After that the SMF update the ULCL/BP to remove the related filter. For the detail procedure it can refer to clause 6.4.3.2.

#### 6.3.3.4 Mobility Handling

The L-SMF is located after the anchor SMF. Hence the mobility handling does not need the L-SMF reallocation. After UE mobility, SMF evaluation whether the L-SMF need reallocated or removed. If it is need, the EAS rediscovery can be triggered.

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