**3GPP TSG-WG SA2 Meeting #144E e-meeting *S2-2102491 r03***

**Elbonia, 12 – 16 April, 2021 (revision of S2-210xxxx)**

**Source: Huawei, HiSilicon, Nokia, Nokia Shanghai Bell**

**Title: Updating Option C of EAS Discovery Procedure with Local DNS server**

**Document for: Approval**

**Agenda Item: 8.3**

**Work Item / Release: eEDGE\_5GC/Rel-17**

*Abstract: This contribution proposes to update Option C of EAS Discovery Procedure with Local DNS Server.*

# 1. Discussion

This contribution proposes the following details to Option C of EAS discovery procedure:

1. Clarification on how UE gets the local DNS server address in case of UL CL/BP pre-establishment.

For Option C, the SMF may pre-establish the UL CL/BP and Local PSA during the PDU Session Establishment, then the IP address of the local DNS server should be provided to UE via PDU Session Establishment Accept message.

1. Updating DNS server address to be sent UE in case of removal or simultaneous change of UL CL/BP and local PSA

After the UE is configured with the Local DNS Server as DNS server for the PDU Session, the following scenarios may happen:

* 1. The SMF decides to remove the UL CL/BP and local PSA, e.g. due to UE mobility, the DNS server address configured on UE should be updated because the local DNS server is not valid. Therefore the address of EASDF should be provided to UE as DNS server address for that PDU Session.
	2. The SMF decides to change the UL CL/BP and local PSA, e.g. due to UE mobility, then if there is a new local DNS server serving the target DNAI, the local DNS server address configured on UE should be updated.
1. Descriptions for IPv6 multi-homing are updated in the call flow.

In the case of IPv6 multi-homing, the SMF notifies the UE of the availability of the new IP prefix @ Local PSA using an IPv6 Router Advertisement message. Also, the SMF sends IPv6 multi-homed routing rule along with the IPv6 prefix to the UE to influence the selection of the source Prefix for the subsequent DNS queries as described in TS 23.501 [2] clause 5.8.2.2.2.

In addition, the SMF also configures traffic routing rule on the UL CL (including e.g. Local DNS server address) or the BP (e.g. the new IP prefix @ Local PSA) to route traffic destined to the local DN including the DNS Query messages to the L-PSA.

1. Merging the updates of option C proposed in S2-2102160.

# 2. Text Proposal

It is proposed to capture the following changes into TS 23.548.

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

##### 6.2.3.2.3 EAS Discovery Procedure with Local DNS Server/Resolver

For the case that the DNS message is to be handled by local DNS resolver/server, the DNS Query is routed to the local DNS resolver/server corresponding to the DNAI where the L-PSA connects. The SMF is provisioned with the local DNS server address per DNAI based on configuration or per AF request (via Nnef\_TrafficInfluence as specified in TS 23.502 [2]). Based on the operator’s configuration, one of the following options may apply when UL CL/BP and Local PSA have been inserted (during or after PDU Session Establishment):

- Option C: The SMF chooses a local DNS server based on the DNAI corresponding to UE location and Local DNS server deployment, and configures it to the UE as new DNS server. SMF may obtain the IP address of the local DNS server via local configuration or per AF request (via Nnef\_TrafficInfluence as specified in TS 23.502 [2]). In addition, the SMF also configures traffic routing rule on the UL CL (including e.g. Local DNS server address) or the BP (e.g. the new IP prefix @ Local PSA) to route traffic destined to the local DN including the DNS Query messages to the L-PSA. The local DNS server resolves the DNS Query either locally or recursively by communicating with other DNS servers.

 Editor's note: Whether the local DNS server address is configured in SMF per DNAI or per other granularity is FFS.

- Option D: If the SMF has configured that DNS Queries for an FQDN query can be locally routed on the UL CL, then the subsequent DNS queries for the FQDN will be locally routed to a local DNS proxy. The local DNS proxy receives and handles the DNS Query that is addressing EASDF by replacing the source/target IP addresses of the DNS Query and Response messages as described in step 5 in clause 6.2.3.2.3.

NOTE: Option D assumes that either ULCL steering is based on L4 information (i.e. DNS port number) or ULCL has visibility of the DNS traffic (i.e. FQDN in the DNS Query message). The UPF may be instructed by the SMF to apply different forwarding of non-ciphered UL DNS traffic based on the target domain of the DNS Query. Option D requests modification of destination IP address of DNS messages. Whether this is allowed or not is subject to local regulations. Option D does not apply to DoH or DoT messages.



Figure 6.2.3.2.3-1: EAS discovery with local DNS server/resolver

1. The SMF inserts UL CL/BP and Local PSA.

 UL CL/BP/Local PSA insertion can be triggered by DNS messages as described in clause 6.2.3.2.2. Or, the SMF may pre-establish the UL CL/BP and Local PSA before the UE sends out any DNS Query message (e.g. upon UE mobility). In this case, the SMF includes the IP address of Local DNS Server in PDU Session Establishment Accept message as in step 11 of clause 4.3.2.2.1 of TS 23.502[3] or in a network initiated PDU Session Modification procedure. The UE configures the Local DNS Server as DNS server for that PDU Session.

The UL CL/BP and Local PSA are inserted or changed as described in TS 23.502 [3]. In the case of IPv6 multi-homing, the SMF may also send an IPv6 multi-homed routing rule along with the IPv6 prefix to the UE to influence the selection of the source Prefix for the subsequent DNS queries as described in TS 23.501 [2] clause 5.8.2.2.2.

 When the UL CL/BP and Local PSA are inserted or simultaneously changed, the SMF configure the UL CL/BP for DNS Query handling:

- For Option C, the SMF configures traffic routing rule on the UL CL (including e.g. Local DNS server address) or the BP (e.g. the new IP prefix @ Local PSA) to forward UE packets destined to the local DN to the Local PSA. The packets destined to local DN includes DNS Query messages destined to local DNS Server.

Steps 2 and 3 are performed for option C:

2. If the UL CL/BP and Local PSA are inserted after PDU Session Establishment, the SMF sends PDU Session Modification Command (Local DNS Server Address) to UE.

 If, based on operator’s policy or UE’s mobility, the Local DNS Server IP Address in the local Data Network needs to be notified or updated to UE, the SMF sends PDU Session Modification Command (Local DNS Server Address) to UE.

3. The UE responds with PDU Session Modification Complete.

 The UE configures the Local DNS Server as the DNS server for the PDU Session. The UE sends the following DNS Queries to the indicated Local DNS Server.

NOTE 1: The UE does not need to know that the new DNS server is “local”.

4. UE sends a DNS Query message. In the case of IPv6 multi-homing the UE selects the source IP prefix based on the IPv6 multi-homed routing rule provided by SMF.

5. The DNS Query message is forwarded to the local DNS Server and handled as described in following:

- For Option C, the target address of the DNS Query is the IP address of the Local DNS Server. The DNS Query is forwarded to the Local DNS Server by UL CL/BP and Local PSA. The Local DNS Server resolves the FQDN of the DNS query by itself or communicates with other DNS server to recursively resolve the EAS IP address.

- For Option D:

a. The local DNS proxy modifies the packet's destination IP address (corresponding to EASDF) to that of the L-DNS and stores the original IP address (EASDF-IP) and the packet's source IP address (corresponding to UE's IP address) to its own (i.e. the local DNS resolver's) IP address and stores the original source IP address (UE-IP) for later processing.

b. The local DNS proxy then forwards the modified DNS Query to the L-DNS and processes as follows:

- If the L-DNS can resolve the IP address for the requested FQDN of EAS, it responds to the local DNS proxy with the desired IP address of the local EAS.

- If the L-DNS cannot resolve the IP address for the requested FQDN of EAS but it is connected to a C-DNS, it communicates with the C-DNS to recursively resolve the EAS IP address.

6. The Local PSA receives DNS Response message from local DNS server, it forwards it to the UL CL/BP, and the UL CL/BP forwards the DNS Response message to UE.

If SMF decides to remove the UL CL/BP and Local PSA as defined in TS 23.502[3] clause 4.3.5.5, e.g. due to UE mobility, the SMF sends a PDU Session Modification Command to configure the new address of the DNS server on UE (e.g. to set it to the address of EASDF).

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