**3GPP TSG SA2 Meeting #139E S2-2004128+4068 rev2**

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**Source: Huawei, Hisilicon, Intel**

**Title: KI#2, New solution: UE DNS cache flush**

**Document for: Discussion/Approval**

**Agenda Item: 8.3**

**Work Item / Release: FS\_enh\_EC / Rel-17**

*Abstract of the contribution: This contribution discuss application discovery.*

# Discussion

If UL-CL is used to access the Local network, the UE is not aware of the UL-CL insertion/removal/change. An application server may be deployed in multiple edge networks, and the UE may already have cached the related DNS record locally. When UE moves, the application server located at old edge network may be not optimized for UE access. For example if the same application server located at the new edge network, it is preferred that the application server in the new edge network is selected.

However, if the TTL of DNS record is not expired, the UE will still connect to the Application Server located in old edge network, which may be not optimization. Currently, the OS caches the DNS records based on TTL, in addition, the application layer may also cache DNS records. This may cause unnecessary delay or service interruption. To solve the issue, the following solutions are possible:

Alternative 1: The DNS Server set the TTL of a DNS record to 0.

Since the TTL is 0, the UE will not cache any DNS query result. UE will query DNS every time when the UE needs to connect to application server.

This alternative causes frequent DNS query. In the most cases the UE stays within the same coverage of an edge computing network. This causes too much unnecessary DNS query. In addition, considering delay caused by DNS query, query DNS each time before the UE establishes connection with EAS will lower the user experience.

Alternative 2: ICMP based solution

Another alternative is to send an ICMP back to UE after a new ULCL is inserted, this triggers the UE to re-select a new EAS close to the new location. However it is also not sure how the ICMP triggers the application to invoke a new DNS query. So whether this can force the UE to reselect a new one via this mechanism is questionable?

Alternative 3: CN notifies UE to do rediscovery

In this alternative, when application server needs to be rediscovered, e.g. the UL-CL is changed or removed, the SMF sends a DNS re-resolution indication and area information to UE. The DNS re-resolution indication tells the UE to rediscover application server. After receiving the DNS re-resolution indication, the UE will trigger a new DNS query to the indicated application server. Thus the application server in the new edge network can be selected and the path is optimized.

# Proposal

It is proposed to have the following text in TR 23.748:

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

## 6.0 Mapping of Solutions to Key Issues

Table 6.0-1: Mapping of Solutions to Key Issues

|  |  |
| --- | --- |
| Solutions | Key Issues |
| 1 | 2 | 3 | 5 |
| #1: Provisioning URSP configuration to the UE to establish PDU Sessions for edge applications | X |  |  |  |
| #2: Local DNS based edge server address discovery | X |  |  |  |
| #3: DNS AF | X |  |  |  |
| #4: Providing the DNS authoritative server with IP addressing information about where the UE is located | X |  |  |  |
| #5: Server Discovery using DNS, IP Routing and URSP | X |  |  |  |
| #6: Discovery of EAS based on DNS | X |  |  |  |
| #7: SMF/I-SMF selection based on DNAI | X |  |  |  |
| #x: UE DNS cache flush | X | X |  |  |

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

## 6.X Solution #X: UE DNS cache flush

### 6.X.1 Description

If ULCL is used to access the edge network, the UE is unaware of the ULCL insertion/removal/change. An application may be deployed in multiple edge networks, and the UE may already have connected to an application server in one edge network, and cached the related DNS record locally. When UE moves, the application located at the old edge network may be not optimized for UE to visit. In this case, if the new edge network has the same application server, it is preferred that the new application server in the new edge network is selected by the UE.

However, since the UE has cached the DNS record, the UE will still connect to the application server located in old edge network. To solve the issue, the following solution is proposed:

When DNAI changes, i.e. the ULCL is changed or removed, the SMF sends a DNS re-resolution indication to UE. This DNS resolution indication tells UE to rediscover the application server in the indicated area. After receiving the DNS re-resolution indication, if UE wants to establish a connection to an application server associated with the DNS re-resolution indication, the UE will trigger a new DNS query, and the application server in the new edge network can then be selected and the path is optimized. The new DNS query can also be done immediately if the UE receives the DNS re-resolution indication.

### 6.X.2 Procedures



Figure 6.x.2-1: CN instructed UE DNS cache flush

1. The UE connected to the application server located in an edge computing network accessed via ULCL1. So the original data path from UE to application server is via ULCL1. When the UE moves, and SMF decides to remove ULCL1 which corresponding to DNAI1, and inserts ULCL2 corresponding to DNAI2.
2. The SMF sends DNS re-resolution indication to UE via PDU Session Modification Command. The indication may be associated with an area information, which is indicated by the IP segment, subnet info, a list of FQDNs or DNS suffixes. The application server which is located in the indicated area need be rediscovered.

If the area information is not included, it means all the DNS cache information is cleaned.

1. The UE either remove or replace (i.e. with the new DNS record) the DNS records stored locally. If the area information is included in the DNS re-resolution indication, the UE only remove or replace the DNS records corresponding to that area information.

4~6. When the UE wants to establish a connection with an application server for which the DNS record has been removed, the UE send a DNS query. The new DNS query can also be done immediately if the UE receives the DNS re-resolution indication, i.e. the DNS record is replaced by the new application server information.

Then based on the solution on how to find the edge application server, the best application server that can serve the UE, e.g. the application server located in the edge computing network corresponding to ULCL2, is selected.

The UE connects to the new application server located in the edge computing network corresponding ULCL2.

### 6.X.3 Impacts on Existing Nodes and Functionality

* SMF: send DNS re-resolution indication and area information to UE when DNAI changes.
* UE: rediscover application server and store new DNS records based on DNS re-resolution indication and area information received from network.
* **\* \* \* \* End of changes \* \* \* \***