**3GPP TSG-SA/WG2 Meeting #139-e *S2-2003593***

**Electronic meeting, 2020-06-01 – 2020-06-12**

**Source: Ericsson**

**Title: KI#2, New Sol: Support of edge relocation, triggering of new DNS query by the UE**

**Document for: Approval**

**Agenda Item: 8.3**

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

***Abstract of the contribution:****This contribution proposes solution for supporting UEs in edge relocations*

# 1 Introduction

This contribution proposes a solution for support the UE in edge relocation.

# 2 Proposal

\*\*\*\*\*\*\*\*\*\*\*\*\* Start Changes \*\*\*\*\*\*\*\*\*\*\*\*\*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.501: "System Architecture for the 5G System".

[3] 3GPP TS 23.502: "Procedures for the 5G System".

[4] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System".

[5] 3GPP TR 23.758: "Study on application architecture for enabling Edge Applications".

[6] 3GPP TS 22.261: "Service requirements for the 5G system".

[7] IETF RFC 7871: "Client Subnet in DNS Queries".

[xx] IETF RFC 792: "INTERNET CONTROL MESSAGE PROTOCOL".

[yy] IETF RFC 7157: "IPv6 Multihoming without Network Address Translation".

[zz] IETF RFC 1122; Requirements for Internet Hosts -- Communication Layer

\*\*\*\*\*\*\*\*\*\*\* Next 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: Support of edge relocation, triggering of new DNS query by the UE |  | X |  |  |

\*\*\*\*\*\*\*\*\*\*\* Next Change (all new) \*\*\*\*\*\*\*\*\*\*\*

## 6.X Solution #X: Support of edge relocation, triggering of new DNS query by the UE

### 6.x.1 Solution description

The solutions address Key Issue #2: Edge relocation.

The solution in this clause is a complement to application controlled server relocation, where the application layer triggers the UE to move from one server to another.

The assumption for these solutions is that the UE is using DNS to find an edge application server. As the UE moves, the PSA may change. At this point the UE may need to do a new discovery of the application server.

The three connectivity models, distributed anchor, multiple session and session breakout (using UL-CL or BP). From an edge relocation point of view multiple sessions and distributed anchor are similar.

Distributed anchor and multiple sessions, regardless if SSC mode 2 or 3 is used (clauses 4.3.5.1-3 of TS 23.502 [3]):

- When the UE moves, the network will trigger the UE to establish a new PDU session. This triggers the UE to do DNS query to find a suitable application server in the new PSA. The UE should not use the cached DNS result for the old PDU session in the new PDU session.

Session breakout there are 2 cases, IPv6 multi homing with a BP or UL-CL (clause 4.3.5.7 of TS 23.502 [3]):

- For BP, as the UE moves, the network sets up a new local PSA. The UE gets a new IPv6 prefix (and routing rules) and removal of old prefix. A new prefix also means new DNS servers according to RFC 7157 [yy]. This means that the UE will drop the existing application traffic and need do a new DNS query, since the UE should not use the cached DNS result for the old prefix.

- For UL-CL, the UE is not aware that local breakout is used for a specific application traffic flow. Hence, when the network moves the local PSA, the UE is not aware that change has been made. After a move of PSA, when the UE tries to contact the edge application server, the UPF/SMF will respond with an ICMP Destination Unreachable Message (see RFC 792 [xx] and RFC 1122 [zz]) with code 3 (Port Unreachable) or 7 (destination host unknown) It is assumed that the DNS result that was used to find the application server in the previous PSA either has very low time to live or that the result only contained one IP address.

For this to work, it is expected the TTL (if short TTL is used) is followed by the UE for EC applications, and that UE follows the recommendation in RFC 1122 [zz] for hard errors, i.e. the UE is not trying to reach the address which results in ICMP responses (unreachable code 3 or 7). If application should continue the only alternative left for the UE is to do a new discovery.

Editor’s note: It is FFS if both code 3 and 7 can be used, or if only code 3 is the only feasible option.

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Editor’s note: It is FFS for how to re-solve the concern related to ICMP security issues e.g. addressed in S3-201391

### 6.X.2 Procedures

#### 6.x.2.1 Session breakout using UL-CL, UE is not aware of change of PSA for a flow



**Figure 6.X.2.2: ICMP triggered discovery**

The pre-requisite for the flow is that UE has a PDU session, it has discovered an edge application server (AS) and the network has inserted an UL-CL with a local PSA that will break out the application traffic to the AS.

1. UE has ongoing application traffic with Old AS via Old PSA and UL-CL.

2. SMF insert a new UL-CL and a new local PSA.

3. UE sends an IP packet, which is caught in UPF and depending on how step 4 is done the packet may be forwarded to SMF.

4. SMF or UPF generates an ICMP Destination unreachable message with code 3 (Port Unreachable) or 7 (destination host unknown). This can be done by e.g.

- SMF installs a forwarding rule in UPF to forward any IP packet destine to Old AS to be forwarded to SMF, and SMF generates the ICMP packet to be sent to the UE via UPF.

- N4 is updated by e.g. SMF installs a PDR to match any IP packet destined to Old AS. This is linked to a FAR with an Application Action that indicates that ICMP shall be sent (new application action value).

Editor’s Note: The criteria or trigger for step 4 is FFS. It may be the triggers for EAS relocation, e.g based on the UE location and the DNAI change.

5. When UE has received the ICMP Destination unreachable message, it is expected that the UE follows TTL and follows RFC 1122 [zz] for hard errors.

6. UE uses the new AS for the application traffic.

Editor’s note: It is FFS for how to re-solve the concern related to ICMP security issues e.g. addressed in S3-201391

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

UE need to trigger DNS request on new PDU session, i.e. when distributed anchor and multiple PDU sessions are used.

SMF to send routing rules to UE and UE to trigger a DNS request if routing rules excludes a prefix to AS.

Depending on solution for UL-CL, SMF to generate ICMP, or UPF to generate ICMP based on new N4 functionality.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* End Changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*