**3GPP TSG-WG SA2 Meeting #139E S2-200XXXX**

**Elbonia, 1 – 12 June, 2020 (revision of S2-20XXXXX)**

**Source: LG Electronics**

**Title: KI #1, Sol #7: Update to remove ENs**

**Document for: Approval**

**Agenda Item: 8.4 Study on system enablers for multi-USIM devices**

**Work Item / Release: FS\_MUSIM / Rel-17**

*Abstract of the contribution: This paper proposes to update Solution #7: Push Notification to solve editor's notes.*

# Background

In Solution #7: Push Notification, there are following editor's notes.

Editor's note: The security aspects of the communication between UE and Paging Server, including any privacy issues, will be addressed by SA WG3.

Editor's note: The details for the assignment of UE identity and credential which enable the UE to establish a secure connection with the Paging Server via the Internet are FFS.

Editor's note: The applicability of this solution in conjunction with extended buffering is FFS.

Editor's note: Further clarifications on the interactions between the IP application client for Paging Notifications and the 3GPP layers in the UE are FFS.

These editor's notes are associated with the nature of this solution, i.e. the Push Notification is sent to the UE using IP packet though user plane. In order to solve above this issue, this paper proposes to update solution so that the Push Notification is sent using SMS message instead of sending IP packet to the UE.

# Proposal

It is proposed to capture the following solution to TR 23.761.

**\* \* \* \* Start of Change \* \* \* \***

## 6.7 Solution #7: Push Notification via SMS

### 6.7.1 Introduction

The solution applies to Key Issue #1 "Handling of MT service" and Key Issue #2 "Enabling Paging Reception".

The solution applies to both 5GS and EPS.

The solution relies on Push Notification that is delivered via theSMS.

The solution applies to Single Rx Multi-USIM devices only.

### 6.7.2 Functional Description

Depicted in Figure 6.7.2-1 is a Dual-USIM device that is simultaneously registered to 5GS/EPS A (system A) and 5GS/EPS B (system B).



Figure 6.7.2-1: Simultaneous paging from AMF (or MME) in system A and system B

Upon registration to the network associated with USIM A the UE indicates to the network (AMF) that it wants to register for paging events, e.g. because it is unable to monitor the paging channel during an active communication via the network associated with USIM B or would like to avoid creating reception gaps. During the registration, the UE also provides MSISDN of USIM B so that the paging event is sent to the provided MSISDN.

NOTE 1: The MSISDN of the other system can be preconfigured as a part of subscription data via pre-configuration e.g. when the user subscribes multi-sim plan.

If the network (AMF) acknowledges the UE request, the AMF provides a credential for the UE which enables the security validation of paging information in SMS. This is illustrated in Figure 6.7.2-1 for the case where both systems are 5GS, but the same principle applies if either or both systems are EPS.

NOTE 2: The USIM credential can be reused to validate SMS. The details will be addressed by SA WG3.

Similarly, upon connecting to the network associated with USIM B the UE provides MSISDN of USIM A and receives credential for security validation of paging information.

NOTE 3: There is no business relationship between system A and system B in this solution.

When the UE needs to be paged for MT service in system A, the SMF (or MME) in system A initiates the direct paging in system A (refer to red dashed line in Figure 6.7.2-1) and after some delay (the value of which depends on configured paging strategy in the AMF) it provides MSISDN of USIM B and SMS payload contains Push Notification to SMS-SC via NEF (or SCEF). The following cases may arise:

1. UE was engaged in active communication via system B; in this case the UE will not be able to listen to the Uu paging in system A, but it will receive the Push Notification from ystem A via SMS. Upon reception of the Push Notification the UE decides whether it should suspend the communication in system B and respond to the Uu paging in system A.

2. UE was in Idle state in both system A and system B. The UE will be paged sequentially: initially in system A only and after some delay also via SMS with the Push Notification. In system B, a DL packet for the UE is received, that triggers "normal" paging, which can be successful or unsuccessful, independently from the fact that the UE has responded in system A or not.

Editor's note: How to prevent loops if system B uses the same solution is FFS (i.e. how to avoid that the Push Notification perceived as U-plane data by system B triggers a Push Notification towards system A).

The Push Notification in SMS content is equivalent to the content of the Uu Paging message. As a minimum it includes an indication of the service type that triggered the paging and an identifier that non-ambiguously points to the USIM in the Multi-USIM device for which the paging is intended.

### 6.7.3 Procedures

Editor's note: This clause describes high-level procedures and information flows for the solution.

6.7.3.1 5GS Procedure



**Figure 6.7.3.1-1: Push Notification via SMS procedure in 5GS**

1. The UE registers to PLMN\_2 with USIM\_B.

2. The UE sends Registration Request to PLMN\_1 with USIM\_A. In the request message, the UE includes Multi SIM indication and MSISDN of USIM\_B to indicate that the UE wants to receive Push Notification via SMS.

3. If the AMF allows to send Push Notification via SMS, the AMF includes Multi SIM indication to notify that the Push Notification via SMS will be performed.

4. When there is downlink data, the SMF requests to setup user plane resources by triggering Namf\_Communication\_N1N2MessageTransfer service.

5. The AMF may send Paging request to the RAN. The AMF also triggers Nnef\_Trigger\_Delivery request to send Push Notification via SMS to the UE. The AMF provides MSISDN of USIM\_B and Push Notification. The Push Notification includes Service Type that triggered Push Notification and PLMN identity. In addition, the AMF may provide validity time of the Push Notification message.

6. The NEF sends Submit Trigger message to the SMS-SC. The NEF relays Push Notification, MSISDN of USIM\_B and validity time received from the AMF.

7. The SMS-SC response to the NEF.

8. The NEF response to the AMF.

9. The SMS-SC generates SMS message which contains Push Notification. If SMS-SC receives validity time, it sets Validity-Period of the SMS message with the received validity time. The SMS-SC sends the generated SMS message to the UE by using the received MSISDN of USIM\_B.

10. When the UE receives the Push Notification via SMS the UE may send SMS Delivery Report according to the configuration of SMS-SC. In this case, the UE may include Push Notification response. The Push Notification response may indicate that the UE will not respond to the paging.

11. The SMS-SC sends the Message Delivery Report to the NEF to notify that the SMS is delivered. If the UE sends Push Notification response, the SMS-SC includes the Push Notification response in the message.

12. The NEF triggers Nnef\_Trigger\_Delivery Notify service to notify that the SMS is delivered. If the NEF receives Push Notification response, it is sent to the AMF. Based on the received information, the AMF knows that whether the UE received Push Notification and whether the UE will respond to the Push Notification.

13. The UE decides whether to receive service in PLMN\_1 considering validity time of the SMS message, Service Type that triggered Push Notification, ongoing services in PLMN\_2, time stamp of SMS message, etc. If the UE decides to receive service in PLMN1, the UE sends Service Request message to PLMN\_1 with USM\_A.

6.7.3.2 EPS Procedure



**Figure 6.7.3.2-1: Push Notification via SMS procedure in EPS**

1. The UE attaches to PLMN\_2 with USIM\_B.

2. The UE sends Attach / TAU Request to PLMN\_1 with USIM\_A. In the request message, the UE includes Multi SIM indication and MSISDN of USIM\_B to indicate that the UE wants to receive Push Notification via SMS.

3. If the MME allows to send Push Notification via SMS, the MME includes Multi SIM indication to notify that the Push Notification via SMS will be performed.

4. When there is downlink data, the S-GW sends Downlink Data Notification to the MME.

5. The MME may send Paging request to the RAN. The MME also sends Device Trigger request to send Push Notification via SMS to the UE. The MME provides MSISDN of USIM\_B and Push Notification. The Push Notification includes Service Type that triggered Push Notification and PLMN identity. In addition, the MME may provide validity time of the Push Notification message.

6. The SCEF sends Submit Trigger message to the SMS-SC. The SCEF relays Push Notification, MSISDN of USIM\_B and validity time received from the MME.

7. The SMS-SC response to the SCEF.

8. The SCEF response to the MME.

9. The SMS-SC generates SMS message which contains Push Notification. If SMS-SC receives validity time, it sets Validity-Period of the SMS message with the received validity time. The SMS-SC sends the generated SMS message to the UE by using the received MSISDN of USIM\_B.

10. When the UE receives the Push Notification via SMS the UE may send SMS Delivery Report according to the configuration of SMS-SC. In this case, the UE may include Push Notification response. The Push Notification response may indicate that the UE will not respond to the paging.

11. The SMS-SC sends the Message Delivery Report to the SCEF to notify that the SMS is delivered. If the UE sends Push Notification response, the SMS-SC includes the Push Notification response in the message.

12. The SCEF sends Device Trigger Report to notify that the SMS is delivered. If the NEF receives Push Notification response, it is sent to the MME. Based on the received information, the MME knows that whether the UE received Push Notification and whether the UE will respond to the Push Notification.

13. The UE decides whether to receive service in PLMN\_1 considering validity time of the SMS message, Service Type that triggered Push Notification, ongoing services in PLMN\_2, time stamp of SMS message, etc. If the UE decides to receive service in PLMN1, the UE sends Service Request message to PLMN\_1 with USM\_A.

### 6.7.4 Impacts on services, entities and interfaces

**AMF:**

- handles UE request for Push Notification via SMS.

- requests to send Push Notification via SMS to the SMS-SC via NEF (or SCEF)

**UE:**

- requests and receives information from the AMF for being paged with Push Notifications via SMS.

- handles Push Notification received via SMS.

**NEF:**

- requests to the SMS-SC to send SMS contains Push Notification.

**\* \* \* \* End of Change \* \* \* \***