**SA WG2 Meeting #139-e S2-2000xxxx**

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**Source: Nokia, Nokia Shanghai Bell**

**Title: Operator controlled Handling of Paging Cause code**

**Document for: Approval**

**Agenda Item: 8.4**

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*Abstract of the contribution: xxx*

# Discussion

In the scope of the study on MULTI-USIM UEs in 3GPP rel-17 it is proposed in TR 23.761 Solution #1: “Handling of MT service with Paging Cause” that a PLMN may include a paging cause helping a receiving UE to determine whether it is interested to respond to paging with a service request. It can then be up to implementation deciding how the UE replies, if it does reply at all.

The inconvenient with the UE not replying at all though is that the network has no way to detect whether the UE is not reachable, or it just did not respond to paging deliberately. The network then can only mark the UE as unreachable and the UE can only exit this state by registering again due to mobility or periodic registration. This is therefore causing undesirable side effects to other service the UE may be interested in. This may introduce a delay up to the periodic registration timer in receiving further paging.

Unfortunately, there is no testable nor standardised behaviour so far avoiding this side effect.

We therefore propose that if the UE receives a paging from the network it shall anyhow provide a response: either it shall initiate a SR if the UE is interested in responding or a message indicating it is not interested in the MT service/or busy (along the lines of the Solution #3: Busy indication as a paging response). The issue with the current solutions though is that the response signalling the user is busy may not be sent and therefore the paging fails … and the UE becomes unreachable. For instance, the user is not paying attention to the request for input for any reason. In general, there is no testable relationship between the UE behaviour and the paging timers used in the network.

For the operators to safeguard themselves from this undesirable outcome, that may lead to customers complaining they miss important MT services or notifications they are interested in, or they are subject to considerable delay (up to the periodic registration timer) we propose that in the registration accept the PLMN may provide a timer defining an upper bound before the UE autonomously indicates to the network that the UE is not interested in the paging, without waiting for user input. This timer should be < than the time it takes for the network to determine the paging has failed.

# Proposal

It is proposed to add the following text to TR 23.761

**Proposed changes**

## 6.X Solution #X: Operator-defined upper bound timer for paging response

### 6.X.1 Introduction

This is a solution complementing any other solution to KI#1 that allows a UE user to decide whether it is interested in accepting a paging. This solution allows the operator to have a deterministic behaviours form the UEs registered with the PLMN which are acting as MULTI-USIM devices by providing them with an upper bound timer for paging response, whereby the network either will receive a service request indicating the paging was accepted and the UE is establishing connectivity with the network, or the UE indicates it is not interested in the MT service and therefore indicates to complete the paging procedure without establishing UE connectivity with the network, while preserving the UE reachability.

### 6.X.2 Functional Description

When a UE registers and indicates (e.g. in MUSIM Assistance Information) that is behaving as Multi-USIM device, then the Network provides in a registration response message or, in 5GS, at any time in a UE configuration update message an Upper Bound Timer for paging response specifying that the UE shall provide a response to paging (if paging message is received) within the time indicated by the timer. This way, even if the user missed the request for input from the UE so the UE can be instructed to respond to paging, the UE can autonomously complete the paging procedure one way or another by the time indicated by the network. The network indicates a timer < the time the network gives up paging the UE and considers it unreachable.

### 6.X.3 Procedures

#### 6.x.3.1

The UE configuration in 5GS (similar concepts in EPS apply by changing registration messages to the equivalent in EPS) can happen at Registration or by means of a UE configuration Update procedure at any time. See figures 6.x.3.1-1 and 6.x.3.1-2



Figure 6.x.3.1-1: Configuration of the timer in the UE during a registration procedure



Figure 6.x.3.1-2: Configuration of the timer in the UE during a registration procedure

Once the UE is configured with the timer, then if the UE is being paged and the user does not provide input to the UE when prompted to assess whether the user intends to accept the MT service, when the timer configured in the UE elapses the UE completes autonomously the Paging procedure as shown in figure 6.x.3.1-3.



Figure 6.x.3.1-3: User does not provide input to the UE in time and the UE autonomously completes the paging procedure

### 6.X.4 Impacts on existing entities and interfaces

UE: support of the timer configuration, storage and processing using the procedures indicated above

AMF, MME: support the support of the timer configuration, and the procedures indicated above

RAN: only impacted by the handling of a message indicating the UE intends to not respond to paging (maybe along the lines of solution #3.)

**End of Proposed changes**