

Source: [TSG-CN1] Vodafone

To: TSG RAN WG 2, RAN WG 3

**draft LS to RAN WG 3 and RAN WG 2 on Release '99, MSC issues with GSM 04.08**

## 1 Introduction

Over the previous few years, UMTS has been manipulated into basically just a new radio interface to the "GSM core network". As a consequence of this, the UTRAN now needs to be made to interwork with GSM MSCs (and SGSNs), particularly at the 04.08 CM and MM levels. However, GSM MSCs are not totally independent of the radio interface and so the UTRAN may well have to adapt to at least some of the MSCs' peculiarities.

TSG CN1 believe that the issues listed below need to be considered. RAN WG 2 and RAN WG 3 are invited to respond to the questions below.

## 2 Enhanced UMTS radio interface layer 2 protocol for signalling messages

In GSM, the radio interface layer 2 protocol specified in GSM 04.06 uses a 'window size of one'. This has generally been viewed as a deficiency in the GSM radio interface, but, it is an integral part of the GSM system and its influence extends all the way to the MSC.

With UMTS, most people are expecting an improved signalling performance (eg by using a larger window size), however great care must be taken to ensure that the UTRAN can still interoperate correctly with GSM MSCs.

### 2.1 Uplink Layer 3 messages

The MM and CC software in the GSM MSC expects MM and CC messages to be delivered error free, in sequence, without loss and *without duplication*.

On the uplink, GSM's layer 2 protocol (GSM 04.06) can ensure that messages are not lost and it can ensure that messages arrive in order. However it is unable to ensure that uplink messages are not duplicated when the layer 2 link between the mobile and a BTS has to be reestablished (eg at handover, handover failure, assignment, etc).

Duplication occurs when an uplink message has been received by the BTS without error, but, the layer 2 acknowledgement is sent and not received, because the acknowledgement is sent after, say, a Handover Command has been sent to the mobile.

Owing to the window size of one, it is not possible for more than one message to be duplicated, so a one bit uplink message number is used in GSM MM and CM to allow "the front end of the messages.

If a larger window size is used in GSM then more messages can be duplicated and a larger layer 3 message number is needed. The one bit message number is bit 7 of the message type field and it is therefore not easy to extend this field.

The UTRAN is different to GSM in that, because of soft handover, the "layer 2 protocol for DTAP signalling messages" needs to run between the Serving RNC and the mobile. This may mean that 'soft handover' and 'assignment' ought not to cause any problems. The potential problem areas seem to be:

- i) SRNC relocation
- ii) 'inter RNC' hard handover via the MSC
- iii) handover to GSM (or other radio systems)

iv) RRC connection reestablishment

Can TSG RAN WG 2 and TSG RAN WG 3 comment on whether uplink message duplication is avoided during these and other procedures? Are there any other potential problem areas?

## **2.2 Downlink L3 signalling messages**

In GSM, loss of these messages is handled/prevented by (amongst other things) the following processes:

- i) the MSC halts the transmission of DTAP messages in between transmission of the A interface Handover Command and reception of the corresponding A interface Handover Complete/Failure message.
- ii) in the BSC, buffered DTAP messages (on SAPI 0) have to be transmitted to the mobile before any external Handover Command message.

The MSC can employ similar techniques to handle SRNC relocation and inter RNC/BSC external handovers.

Can RAN WG 2 and/or RAN WG 3 advise CN 1 as to how downlink DTAP messages are protected within the UTRAN?

## **2.3 SMS**

In the GSM BSS, SMS is treated as a 'low priority' service which can be interrupted by time critical events such as handover. To avoid serious loss of performance, GSM MSCs (and SGSNs) implement a crude LLC protocol for SMS. (Basically the SMS message is retransmitted if it has not been acknowledged either before a timer expires, or, soon after, say, a Handover Performed message is received by the MSC).

Can RAN WG 2 and/or RAN WG 3 advise CN 1 as to how the UTRAN will handle SMS?

## **3 GSM RR's influence on Call Control**

Significant parts of 04.08 Call Control depend upon whether or not a speech capable traffic channel has been allocated to a mobile. (eg in a mobile terminating call it is usually the change from GSM SDCCH to TCH which causes the called mobile to start ringing and to transmit the Call Control Alerting message.)

Can RAN WG 2 and/or RAN WG 3 advise CN 1 as to whether or not there is a UMTS equivalent to the GSM concept of, "when an *appropriate channel* is available"?

In particular, RAN WG 2 is requested to identify which primitive is passed from the RLC/MAC protocol to the higher layers to indicate the availability of the suitable channel.

Sections 5.2 and 5.2.2.3.2 of GSM 04.08 v6.x.0 give some background information and are attached.

RAN WG 2 and RAN WG 3 are requested to advise CN 1 of any other information on the UTRAN which they consider to be relevant to the GSM Call Control protocol.

## 5.2 Call establishment procedures

Establishment of a call is initiated by request of upper layer in either the mobile station or the network; it consists of:

- the establishment of a CC connection between the mobile station and the network;
- the activation of the codec or interworking function.

Whenever it is specified in GSM 04.08, section 5 that the mobile station shall attach the user connection, this means that the mobile station shall activate the codec or interworking function as soon as an appropriate channel is available. The mobile station shall de-activate the codec or interworking function whenever an appropriate channel is no longer available. As soon as an appropriate channel is (again) available, the codec or interworking function shall be re-activated. If a new order to attach the user connection is received, the new order shall supersede the previous one.

A channel shall be considered as appropriate if it is consistent with the possibly negotiated bearer capability applicable for the actual phase of the call. The mobile station shall not consider a channel as not appropriate because the type of the channel (full rate/half rate) is not the preferred one. If:

- the user connection has to be attached but no appropriate channel is available for a contiguous time of 30 seconds; or if
- the codec or interworking function is de-activated for a contiguous time of 30 seconds;

then the mobile station may initiate call clearing.

Upon request of upper layers to establish a call, restricting conditions for the establishment of the call are examined. These restricting conditions concern the states of parallel CC entities and are defined elsewhere. If these restricting conditions are fulfilled, the call establishment is rejected. Otherwise a CC entity in state U0, "null", is selected to establish the call. It initiates the establishment by requesting the MM sublayer to establish an MM connection.

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### 5.2.2.3.2 Receipt of CALL CONFIRMED and ALERTING by the network

The call control entity of the network in the "call present" state, shall, upon receipt of a CALL CONFIRMED message: stop timer T303, start timer T310 and enter the "mobile terminating call confirmed" state.

The call control entity of the mobile station having entered the "mobile terminating call confirmed" state, if the call is accepted at the called user side, the mobile station proceeds as described in 5.2.2.5. Otherwise, if the signal information element was present in the SETUP message user alerting is initiated at the mobile station side; if the signal information element was not present in the SETUP message, user alerting is initiated when an appropriate channel is available.

Here, initiation of user alerting means:

- the generation of an appropriate tone or indication at the mobile station; and
- sending of an ALERTING message by the call control entity of the MS to its peer entity in the network and entering the "call received" state.

The call control entity of the network in the "mobile terminated call confirmed" state shall, upon receipt of an ALERTING message: send a corresponding ALERTING indication to the calling user; stop timer T310; start timer T301, and enter the "call received" state.

In the "mobile terminating call confirmed" state or the "call received" state, if the user of a mobile station is User Determined User Busy then a DISCONNECT message shall be sent with cause #17 "user busy". In the "mobile terminating call confirmed" state, if the user of a mobile station wishes to reject the call then a DISCONNECT message shall be sent with cause #21 "call rejected".