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Sophia Antipolis, 20-24 September 1999

TSG-CN WG1 Meeting #6 *N1-(99)880*
Oxford, UK
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Source: **3GPP CN1**
To: **3GPP RAN2**
CC: **3GPP RAN3**
Title: LS on Uplink core network layer 3 message numbering

Following on from our previous liaison to RAN 3 and RAN 2 in N1-99603, N1 has studied the issue a bit more. We attach a proposal for a solution (N1-99728) which seems to have a small impact on the R98 core network. However, this proposed solution appears to have some impact on the work of RAN2.

Basically, the requirement is that the uplink signalling to the MSC uses a radio interface layer 2 signalling scheme with a window size of less than or equal to three. This will permit the use of an "evolved GSM MSC" rather than tending to require a "revolutionised GSM MSC".

A copy of the proposal which was put to CN1 is attached for your information.

Can RAN 2 please comment on the feasibility of this approach from a UTRAN perspective?

3GPP CN1
Oxford, UK, 16-20/08/1999

Tdoc N1 99728
(Following N1-99603)
(Relating to Incoming LS N1-99713)

Source: **Vodafone**
To: **TSG-CN1**
Document for: **Discussion**

Uplink Layer 3 Messages

GSM CC and MM software requires the delivery of CC and MM messages without duplication. This document proposes a technique to ensure that this is achieved when using the UTRAN.

Normally, the layer 2 protocol (GSM 04.06) ensures the error free, loss-less and in sequence delivery of CC and MM messages. However, if the layer 2 link is re-established for some reason (e.g. at handover, handover failure, assignment etc.) the layer 2 protocol cannot guarantee that uplink CC/MM messages arrive without duplication.

Just one example of when duplication can occur, is when a BTS receives a layer 2 message on the uplink without error, and sends out an acknowledgement that is not received by the MS because the MS has since moved onto another cell. The MS now has an unacknowledged message and so retransmits the original message. With a window size of 1, the 'front end' of the MSC is always expecting the sequence numbers of the layer 3 messages to alternate between 0 and 1. If the MSC receives a message with a sequence number matching that of the previously received message (e.g. 1,1), the MSC will discard the second one.

UMTS will offer an improved signalling performance, probably by using a larger window size. Consideration has to be made as to how UMTS mobiles will inter-operate with the GSM core network at layer 3. For instance, if a UMTS mobile is handed over to a GSM cell, and (due to a large window size) several messages remain unacknowledged in the handset, it will retransmit these messages to the GSM MSC, which will only be able to discard one of the messages. The others will be sent on to the rest of the software, possibly triggering errors and dropped calls.

One proposed solution is to increase the GSM window size for R'99 by extending the 'Send Sequence Number (N(SD))' field in octet 2 of the layer 3 header. The current format of the layer 3 header is shown in figure 1. Our proposal is shown in figure 2.

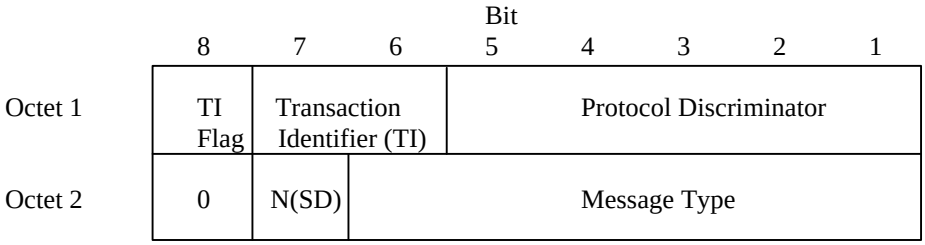

Figure 1: Standard Layer 3 Message Header

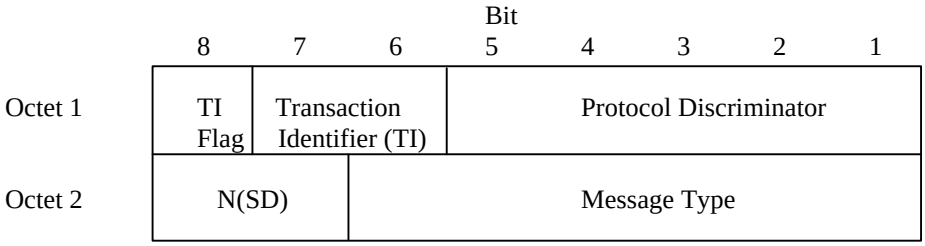

Figure 2: Proposed Layer 3 Message Header

Bit 8 of the second octet is currently reserved for future extension, and it is therefore proposed that this bit is used to create a 2-bit N(SD) field, as shown in figure 2.

The specifications (GSM 04.07 section 11.2.3.2) say that bit 8 of octet 2 is "reserved for future extension." The possibility of R'99 mobiles communicating with R'98 (or older) networks must be considered. R'99 mobiles must not set bit 8 of the second octet to 1, if they are communicating with older networks. The use of this bit-8 could be controlled by a bit

broadcast on the BCCH by GSM networks. This broadcast bit could be the same one that controls the mobile's use of R'99 or R'98 classmark encoding.

It is unlikely that the other field in the second octet- the 'Message Type' field will need extending. It is a 6-bit field and therefore has a range of 0 to 63 in each direction (uplink and downlink). Currently, there are in the order of 30 CC messages, and in the order of 20 MM messages, so there is plenty of scope for future expansion without extending this field. This makes it more justifiable to use bit 8 to extend the N(SD) field.

The way in which the MSC handles the extended N(SD) field is very much open for different implementations. One option is that the 'front end' of the MSC checks for duplication, and then sets bit 8 to 0 before passing the messages on. This means that the rest of the MSC's behaviour in the way it currently deals with this bit need not be changed.

Downlink Layer 3 Messages

The problem of duplication is rare on the downlink, even when a layer 2 link is re-established (e.g. at handover). This is because the network can suspend all CC/MM messages whilst reallocation or handover takes place, and then resume the transmission of the CC/MM messages again on the new logical link.

It should be noted that the downlink window size does not have to equal the uplink window size.

Consequence for 3GPP RAN WG2/WG3

If CN1 was to adopt this approach, RAN group needs to ensure that UMTS layer 2 signalling to the R'99 MSC has a window size less than or equal to 3.

Note: A bit on the UMTS broadcast control channel could control whether the mobile uses a layer 2 window size of =<3 or greater.

Consequence for SMG2

A bit on the BCCH would be needed, to broadcast to mobiles whether to use layer 3 message numbering, modulo 4 or (for R'98 or older networks) layer 3 message numbering, modulo 2.