3GPP TSG SA 3 meeting #11
Mainz, Germany, 22-24 February 2000

***Document* S3-000135**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

33.105	CR	010	Current Version:	3.2.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	SA 7	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)* (U)SIM [X] ME [X] UTRAN / Radio [X] Core Network [ ]

Source: Siemens Atea **Date:**

Subject: Data integrity

Work item: Security

Category: *(only one category shall be marked with an X)*

F	Correction	
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
C	Functional modification of feature	
D	Editorial modification	X

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: The provision for shorter integrity keys is deleted from the text.
Additional editorial changes.

Clauses affected: 5.3

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

5.3 Data integrity

5.3.1 Overview

The mechanism for data integrity of signalling data that is described in 6.6 of [1] requires the following cryptographic function:

f9 UMTS integrity algorithm.

Figure 3 illustrates the use of the function f9 to derive a MAC-I from a signalling message.

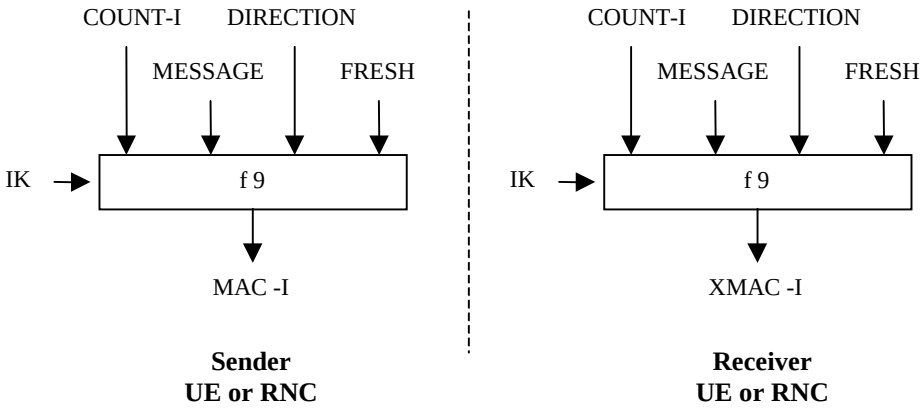

Figure 5.3.1: Derivation of MAC-I (or XMAC-I) on a signalling message

The input parameters to the algorithm are the Integrity Key (IK), a time dependent input (COUNT-I), a random value generated by the network side (FRESH), the direction bit (DIRECTION) and the signalling data (MESSAGE). Based on these input parameters the user computes with the function f9 the message authentication code for data integrity (MAC-I) which is appended to the message when sent over the radio access link. The receiver computes XMAC-I on the messages received in the same way as the sender computed MAC-I on the message sent.

5.3.2 Use

The MAC function f9 shall be used to authenticate the data integrity and data origin of signalling data transmitted between UE and RNC.

5.3.3 Allocation

The MAC function f9 is allocated to the UE and the RNC.

Integrity protection shall be applied at the RRC layer.

5.3.4 Extent of standardisation

The function f9 is fully standardized.

5.3.5 Implementation and operational considerations

The algorithm should be designed to accommodate a range of implementation options including hardware and software implementations.

5.3.6 Type of algorithm

The function f9 shall be a MAC function.

5.3.7 Interface

5.3.7.1 IK

IK: the integrity key

IK[0], IK[1], …, IK[127]

The length of IK is 128 bits.

5.3.7.2 COUNT-I

COUNT-I: a frame dependent input.

COUNT-I[0], COUNT-I[1], …, COUNT-I[31]

The length of COUNT-I is 32 bits.

The input parameter COUNT-I protects against replay during a connection. It is a value incremented by one for each integrity protected message. COUNT-I consists of two parts: the HYPERFRAME NUMBER (HFN) as the most significant part and a RRC Sequence Number as the least significant part. The initial value of the hyperframe number is sent by the user to the network at connection set-up. The user stores the greatest used hyperframe number from the previous connection and increments it by one. In this way the user is assured that no COUNT-I value is re-used (by the network) with the same integrity key.

5.3.7.3 FRESH

FRESH: a random number generated by the RNC.

FRESH[0], FRESH[1], …, FRESH[31]

The length of FRESH is 32 bits.

The same integrity key may be used for several consecutive connections. This FRESH value is an input to the algorithm in order to assure the network side that the user is not replaying old MAC-Is.

5.3.7.4 MESSAGE

MESSAGE: the signalling data.

MESSAGE[0], MESSAGE[1], …, MESSAGE[X19-1]

The maximum length of MESSAGE is X19.

5.3.7.5 DIRECTION

DIRECTION: the direction of transmission of signalling messages (user to network or network to users).

DIRECTION[0]

The length of DIRECTION is 1 bit.

The same integrity key may be used for uplink and downlink channels simultaneously associated with a UE.

5.3.7.6 MAC-I (and equivalently XMAC-I)

MAC-I: the message authentication code for data integrity authentication

MAC-I[0], MAC-I[1], …, MAC-I[31]

The length of MAC-I is 32 bits.