3GPP TSG SA WG3 Security — S3#11 **S3-000155**

22-24 February, 2000

Mainz, Germany

Source: **T-Mobil**

Title: **Related CRs and documents on EUIC from other groups**

Document for: **Information**

Agenda Item: **7.1**

The following documents were provided by T-Mobil for information:

RAN WG2 document: Introduction of EUIC

T WG3 CR to 33.102: Alignment of Enhanced User Identity Confidentiality feature with S3 requirements

CN WG1 CR to 24.008: Introduction of a new code point within the mobile identity IE, encrypted IMSI

SA WG2 CR to 23.060: Introduction of Enhanced User Identity Confidentiality

CN WG2B CR to 23.012: Introduction of Enhanced User Identity Confidentiality

CN WG2B CR to 23.003: Introduction of the Encrypted MSI

CN WG2B CR to 23.018: Introduction of Enhanced User Identity Confidentiality

CN WG2B CR to 29.002: Introduction of Enhanced User Identity Confidentiality

CN WG2B CR to 23.008: Introduction of the TEMSI

CN WG2B document Proposed Liaison on LS on comments to Enhanced User Identity Confidentiality

3GPP TSG-RAN WG2 Meeting #11 **TSGR2#11(00)0xxx**
Torino, Italy, February 28th – March 3rd, 2000

Agenda Item: x.x

Source: T-Mobil

Title: Introduction of EUIC
(Enhanced User Identification Confidentiality)

Document for: Discussion and Decision

Introduction

During TSG SA#6 it became apparent that the full R'99 security features as defined and specified by SA3 are not fully implemented into the current set of 3GPP specifications. Therefore it is allowed to include open issues for R'99 until TSG SA#7 [Tdoc TSGS#6(99)622].

One open issue is the Enhanced User Identification Confidentiality (EUIC) for which actually work is done e.g. in SA3 and CN1. They adopt their specifications to use the EUIC feature for Release 99.

It is also necessary to modify the RAN specification TS 25.331 due to implementation of this feature.

This Change Request to TS 25.331 proposes the modification of the UE identity in the way that a new UE identification (Extended Encrypted Mobile Subscriber Identity – XEMSI) and a temporary UE identity (Temporary Encrypted Mobile Subscriber Identity – TEMSI) is introduced that allows to identify and page an UE with an encrypted identity and not with its IMSI in clear form.

3GPP TSG-RAN WG2 Meeting #11
Torino, Italy, February 28th – March 3rd, 2000

Document R2-000xxx

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.

25.331	CR	xxx	Current Version:	3.1.0

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

For submission to:	TSG-RAN#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	X

Source: T-Mobil **Date:** Feb. 11, 2000

Subject: Inclusion of Enhanced User Identification Confidentiality (EUIC)

Work item:

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

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature	X		Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: Implementation of Enhanced User Identification Confidentiality (EUIC) in 3GPP specifications due to decision made in SA#6.

Clauses affected: 3.2, 8.5.1, 9.1, 10.1.16, 10.1.xx, 10.2.3.16, 10.2.3.25

Other specs affected:			
Other 3G core specifications		→ List of CRs:	23.003, 23.012, 23.018, 23.060, 24.008, 29.002, 31.102, 33.102, 33.103, 33.105
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
		→ 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.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in [1] apply.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ACK	Acknowledgement
AICH	Acquisition Indicator CHannel
AM	Acknowledged Mode
AS	Access Stratum
ASN.1	Abstract Syntax Notation.1
BCCH	Broadcast Control Channel
BCFE	Broadcast Control Functional Entity
BER	Bite Error Rate
BLER	BLock Error Rate
BSS	Base Station Sub-system
C	Conditional
CCPCH	Common Control Physical CHannel
CCCH	Common Control Channel
CN	Core Network
CM	Connection Management
CPCH	Common Packet CHannel
C-RNTI	Cell RNTI
DCA	Dynamic Channel Allocation
DCCH	Dedicated Control Channel
DCFE	Dedicated Control Functional Entity
DCH	Dedicated Channel
DC-SAP	Dedicated Control SAP
DL	Downlink
DRAC	Dynamic Resource Allocation Control
DSCH	Downlink Shared Channel
DTCH	Dedicated Traffic Channel
EUIC	Enhanced User Identification Confidentiality
FACH	Forward Access Channel
FAUSCH	Fast Uplink Signalling Channel
FDD	Frequency Division Duplex
FFS	For Further Study
GC-SAP	General Control SAP
ID	Identifier
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IE	Information element
IP	Internet Protocol
ISCP	Interference on Signal Code Power
LAI	Location Area Identity
L1	Layer 1
L2	Layer 2
L3	Layer 3
M	Mandatory
MAC	Media Access Control
MCC	Mobile Country Code
MM	Mobility Management

MNC	Mobile Network Code
MS	Mobile Station
NAS	Non Access Stratum
Nt-SAP	Notification SAP
NW	Network
O	Optional
ODMA	Opportunity Driven Multiple Access
PCCH	Paging Control Channel
PCH	Paging Channel
PDCP	Packet Data Convergence Protocol
PDSCH	Physical Downlink Shared Channel
PDU	Protocol Data Unit
PLMN	Public Land Mobile Network
PNFE	Paging and Notification Control Functional Entity
PRACH	Physical Random Access CHannel
P-TMSI	Packet Temporary Mobile Subscriber Identity
PUSCH	Physical Uplink Shared Channel
QoS	Quality of Service
RAB	Radio access bearer
RB	Radio Bearer
RAI	Routing Area Identity
RACH	Random Access CHannel
RB	Radio Bearer
RFE	Routing Functional Entity
RL	Radio Link
RLC	Radio Link Control
RNTI	Radio Network Temporary Identifier
RNC	Radio Network Controller
RRC	Radio Resource Control
RSCP	Received Signal Code Power
RSSI	Received Signal Strength Indicator
SAP	Service Access Point
SCFE	Shared Control Function Entity
SF	Spreading Factor
SHCCH	Shared Control Channel
SIR	Signal to Interference Ratio
SSDT	Site Selection Diversity Transmission
S-RNTI	SRNC - RNTI
tbd	to be decided
TDD	Time Division Duplex
TEMSI	Temporary Encrypted Mobile Subscriber Identity
TF	Transport Format
TFCS	Transport Format Combination Set
TFS	Transport Format Set
TME	Transfer Mode Entity
TMSI	Temporary Mobile Subscriber Identity
Tr	Transparent
Tx	Transmission
UE	User Equipment
UL	Uplink
UM	Unacknowledged Mode
UMTS	Universal Mobile Telecommunications System
UNACK	Unacknowledgement
URA	UTRAN Registration Area
U-RNTI	UTRAN-RNTI
USCH	Uplink Shared Channel
UTRAN	UMTS Terrestrial Radio Access Network
XEMSI	Extended Encrypted Mobile Subscriber Identity

8.5 General procedures

8.5.1 Selection of initial UE identity

The purpose of the IE "Initial UE identity" is to provide a unique UE identification at the establishment of an RRC connection. The type of identity shall be selected by the UE according to the following.
If the variable SELECTED_CN in the UE has the value "GSM-MAP", the UE shall choose "UE id type" in the IE "Initial UE identity" with the following priority:

1. TMSI (GSM-MAP): The TMSI (GSM-MAP) shall be chosen if available. The IE "LAI" in the IE "Initial UE identity" shall also be present when TMSI (GSM-MAP) is used, for making it unique.

2. P-TMSI (GSM-MAP): The P-TMSI (GSM-MAP) shall be chosen if available and no TMSI (GSM-MAP) is available. The IE "RAI" in the IE "Initial UE identity" shall in this case also be present when P-TMSI (GSM-MAP) is used, for making it unique.

3. TEMSI (GSM-MAP): The TEMSI (GSM-MAP) shall be chosen if neither TMSI (GSM-MAP) nor P-TMSI (GSM-MAP) is available.

4. XEMSI (GSM-MAP): The XEMSI (GSM-MAP) shall be chosen if no TMSI (GSM-MAP), P-TMSI (GSM-MAP) or TEMSI (GSM-MAP) is available.

5. IMSI (GSM-MAP): The IMSI (GSM-MAP) shall be chosen if available and no XEMSI (GSM-MAP), TEMSI (GSM-MAP), TMSI (GSM-MAP) or P-TMSI (GSM-MAP) is available.
   If a UE supports the EUIC feature and the feature is activated the IMSI shall never be chosen.

6. IMEI: The IMEI shall be chosen when none of the above ~~three~~ five conditions are fulfilled.

When being used, the IEs "TMSI (GSM-MAP)," "P-TMSI (GSM-MAP)", "TEMSI (GSM-MAP)", "XEMSI (GSM-MAP)", "IMSI (GSM-MAP)", "LAI" and "RAI" shall be set equal to the values of the corresponding identities stored in the USIM or SIM.

9 Protocol states

9.1 RRC States and State Transitions including GSM

Figure 46 shows the RRC states in Connected Mode, including transitions between UTRAN connected mode and GSM connected mode for PSTN/ISDN domain services, and between UTRAN connected mode and GSM/GPRS packet modes for IP domain services. It also shows the transitions between Idle Mode and UTRAN Connected Mode and further the transitions within UTRAN connected Mode.

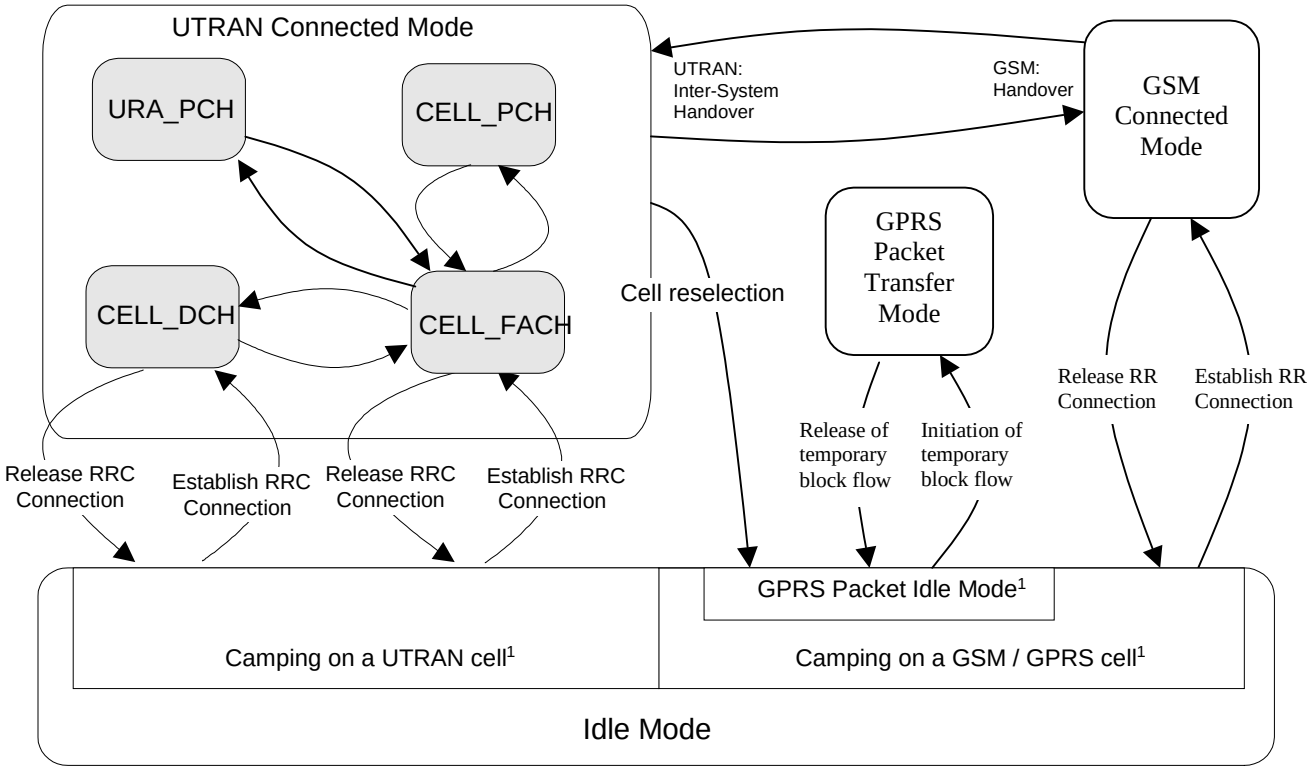

Figure 46: RRC States and State Transitions including GSM
[1: The indicated division within Idle Mode is only included for clarification and shall not be interpreted as states.]

It shall be noted that not all states may be applicable for all UE connections. For a given QoS requirement on the UE connection, only a subset of the states may be relevant.
After power on, the UE stays in Idle Mode until it transmits a request to establish an RRC Connection. In Idle Mode the connection of the UE is closed on all layers of the access stratum. In Idle Mode the UE is identified by non-access stratum identities such as IMSI, XEMSI, TEMSI, TMSI and P-TMSI. In addition, the UTRAN has no own information about the individual Idle Mode UEs, and it can only address e.g. all UEs in a cell or all UEs monitoring a paging occasion. The UE behaviour within this mode is described in [4].
The UTRAN Connected Mode is entered when the RRC Connection is established. The UE is assigned a radio network temporary identity (RNTI) to be used as UE identity on common transport channels.
NOTE: The exact definition of RRC connection needs further refinement.

The RRC states within UTRAN Connected Mode reflect the level of UE connection and which transport channels that can be used by the UE.

For inactive stationary data users the UE may fall back to PCH on both the Cell and URA levels. That is, upon the need for paging, the UTRAN shall check the current level of connection of the given UE, and decide whether the paging message shall be sent within the URA, or should it be sent via a specific cell.

10.1.16 PAGING TYPE 2

This message is used to page an UE in connected mode, when using the DCCH for CN originated paging.

RLC-SAP: AM

Logical channel: DCCH

Direction: UTRAN → UE

Information Element	Presence	Multi	IE type and reference	Semantics description
Message Type	M			
UE information elements				
Integrity check info	O			
CN Information elements				
CN domain identity	M			
Paging Record Type Identifier	M		Enumerated (IMSI (GSM-MAP), TEMSI (GSM-MAP), TMSI (GSM-MAP)/ P-TMSI, IMSI (DS-41), TMSI (DS-41))	
UE Information elements				
Paging cause	M			

10.2.1.xx XEMSI (GSM-MAP)

This IE contains an Extended Encrypted Mobile Subscriber Identity, used towards a GSM-MAP type of core network.

Information Element/Group name	Presence	Range	IE type and reference	Semantics description
XEMSI (GSM-MAP)	M		Bitstring (192)	Setting specified in [TS 23.003]

10.2.1.xx TEMSI (GSM-MAP)

This IE contains a Temporary Encrypted Mobile Subscriber Identity, used towards a GSM-MAP type of core network.

Information Element/Group name	Presence	Range	IE type and reference	Semantics description
TEMSI (GSM-MAP)	M			Setting specified in [TS 23.003]

10.2.3.16 Initial UE identity

This information element identifies the UE at a request of an RRC connection.

Information Element/Group name	Presence	Range	IE type and reference	Semantics description
CHOICE UE id type	M			
>IMSI (GSM-MAP)			IMSI (GSM-MAP)	
>XEMSI (GSM-MAP)			XEMSI (GSM-MAP)	
>TEMSI (GSM-MAP)			TEMSI (GSM-MAP)	
>TMSI (GSM-MAP)			TMSI (GSM-MAP)	
>P-TMSI (GSM-MAP)			P-TMSI (GSM-MAP)	
>IMEI			IMEI	
>ESN (DS-41)			TIA/EIA/IS-2000-4	
>IMSI (DS-41)			TIA/EIA/IS-2000-4	
>IMSI and ESN (DS-41)			TIA/EIA/IS-2000-4	
>TMSI (DS-41)			TIA/EIA/IS-2000-4	
LAI (GSM-MAP)			TS 24.008	
RAI (GSM-MAP)			TS 24.008	

CHOICE *UE Id Type*	Condition under which the given *UE Id Type* is used
IMSI(GSM-MAP)	See section 8.5.1
XEMSI (GSM-MAP)	See section 8.5.1
TEMSI (GSM-MAP)	See section 8.5.1
TMSI(GSM-MAP)	See section 8.5.1
P-TMSI(GSM-MAP)	See section 8.5.1
IMEI	See section 8.5.1
ESN (DS-41)	See section 8.5.1
IMSI (DS-41)	See section 8.5.1
IMSI and ESN (DS-41)	See section 8.5.1
TMSI (DS-41)	See section 8.5.1

10.2.3.25 Paging record

Information Element/Group name	Presence	Range	IE type and reference	Semantics description
Paging originator	M		Enumerated (UTRAN,CN)	
Paging cause	C isCN			
CN domain identity	C isCN			
CHOICE CN Identity	C idleMode			
>IMSI (GSM-MAP)			IMSI (GSM-MAP)	
>TEMSI (GSM-MAP)			TEMSI (GSM-MAP)	
>TMSI (GSM-MAP)			TMSI (GSM-MAP)	
>P-TMSI (GSM-MAP)			P-TMSI (GSM-MAP)	
>IMSI (DS-41)			TIA/EIA/IS-2000-4	
>TMSI (DS-41)			TIA/EIA/IS-2000-4	
U-RNTI	C connected Mode			

Condition	Explanation
IsCN	This information element is included where the page is originated from the CN.
IdleMode	This IE is included for UE not having RRC Connection.
ConnectedMode	This IE is included for UE having RRC Connection.

CHOICE CN *Identity*	Condition under which the given *Identity* is chosen
IMSI	For idle mode pages
TEMSI	For idle mode pages
TMSI	For idle mode pages
P-TMSI	For idle mode pages
IMSI(DS-41)	For idle mode pages
TMSI(DS-41)	For idle mode pages

3GPP TSG-T3 #13
Tokyo, Japan, 21.-24. 2. 2000

Document T3-00-xxxx
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.

33.102	CR		Current Version:	3.0.0

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

For submission to:	TSG-T #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: (U)SIM [X] ME [X] UTRAN / Radio [ ] Core Network [ ]
(at least one should be marked with an X)

Source: T-Mobil **Date:**

Subject: Enhanced User Identity Confidentiality

Work item:

Category:

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature	X		Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

(only one category shall be marked with an X)

Reason for change: Alignment of Enhanced User Identity Confidentiality feature with S3 requirements

Clauses affected:

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.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

[1] 3G TS 21.111: "USIM and IC Card Requirements".

[2] 3G TS 22.011: "Service accessibility".

[3] 3G TS 22.024: "Description of Charge Advice Information (CAI)".

[4] 3G TS 22.030: "Man-Machine Interface (MMI) of the Mobile Station (MS)".

[5] 3G TS 23.038: "Alphabets and language".

[6] 3G TS 23.040: "Technical realization of the Short Message Service (SMS) Point-to-Point (PP)".

[7] 3G TS 23.060 : "General Packet Radio Service (GPRS); Service description; Stage 2".

[8] 3G TS 23.073: "Support of Localised Service Area (SoLSA)".

[9] 3G TS 24.008: "Mobile Radio Interface Layer 3 specification".

[10] 3G TS 24.011: "Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".

[11] 3G TS 31.101: "UICC-Terminal Interface, Physical and Logical Characteristics".

[12] 3G TS 31.111: "USIM Application Toolkit (USAT)".

[13] 3G TS 33.102: "3G Security Architecture".

[14] 3G TS 33.103: "3G Security; Integration Guidelines".

[15] 3G TS 22.086: "Advice of charge (AoC) Supplementary Services - Stage 1".

[16] 3G TS 23.041: "Technical realization of Short Message Service Cell Broadcast (SMSCB)".

[16] 3G TS 23.003: "Numbering, adressing and identification".

[17] GSM 02.07: "Mobile Stations (MS) features".

[18] GSM 11.11: "Specification of the Subscriber Identity Module – Mobile Equipment (SIM – ME) interface".

[19] ISO 639 (1988): "Code for the representation of names of languages".

[20] ISO/IEC 7816-4 (1995): "Identification cards - Integrated circuit(s) cards with contacts, Part 4: Interindustry commands for interchange".

[21] ISO/IEC 7816-5 (1994): "Identification cards - Integrated circuit(s) cards with contacts, Part 5: Numbering system and registration procedure for application identifiers ".

[22] ITU-T Recommendation E.164: "Numbering plan for the ISDN era".

[23] ITU-T Recommendation T.50: "International Alphabet No. 5". (ISO 646: 1983, "Information processing - ISO 7-bits coded characters set for information interchange".)

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

ADM: Access condition to an EF which is under the control of the authority which creates this file

3.2 Symbols

For the purposes of the present document, the following symbols apply:

||	Concatenation
⊕	Exclusive or
f1	Message authentication function used to compute MAC
f1*	A message authentication code (MAC) function with the property that no valuable information can be inferred from the function values of f1* about those of f1, ... , f5 and vice versa.
f2	Message authentication function used to compute RES and XRES
f3	Key generating function used to compute CK
f4	Key generating function used to compute IK
f5	Key generating function used to compute AK
f6	Encryption function to encipher the IMSI
f10	Encryption function used to compute TEMSI

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

3GPP	3rd Generation Partnership Project
AC	Access Condition
ADF	Application Dedicated File
AID	Application IDentifier
AK	Anonymity key
ALW	ALWays
AMF	Authentication Management Field
AoC	Advice of Charge
AuC	Authentication Centre
AUTN	Authentication token
BDN	Barred Dialling Number
CCP	Capability Configuration Parameter
CK	Cipher key
CS	Circuit switched
DF	Dedicated File
DO	Data Object
EF	Elementary File
EMUI	Encrypted Mobile User Identity
EUIC	Enhanced User Identity Confidentiality
FCI	File Control Information
FFS	For Further Study
GK	User group key
GMSI	Group Identity
GSM	Global System for Mobile communications
HE	Home Environment
ICC	Integrated Circuit Card

ID	IDentifier
IK	Integrity key
IMSI	International Mobile Subscriber Identity
K	USIM Individual key
KSI	Key Set Identifier
K_C	Cryptographic key used by the cipher A5
LSB	Least Significant Bit
MAC	Message authentication code
MAC-A	MAC used for authentication and key agreement
MAC-I	MAC used for data integrity of signalling messages
MCC	Mobile Country Code
MF	Master File
MMI	Man Machine Interface
MNC	Mobile Network Code
MODE	Indication packet switched / circuit switched mode
MSB	Most Significant Bit
NEV	NEVer
NPI	Numbering Plan Identifier
OFM	Operational Feature Monitor
PIN	Personal Identification Number
PS	Packet switched
RAND	Random challenge
$RAND_{MS}$	Random challenge stored in the USIM
RES	User response
RFU	Reserved for Future Use
RST	Reset
SDN	Service dialling number
SE	Security Environment
SFI	Short EF Identifier
SQN	Sequence number
SRES	Signed RESponse calculated by a USIM
SW	Status Word
TEMSI	Temporary encrypted user identity (IMSI)
TLV	Tag Length Value
USAT	USIM Application Toolkit
USIM	Universal Subscriber Identity Module
XRES	Expected user RESponse
XEMSI	Extended encrypted user identity (MSIN)

4.2.41 EF_{GMSI} (Group Identity)

This EF contains the group identity of the mobile subscriber. This group identity references a group key GK, stored in the USIM, which is used for enhanced user identity confidentiality (enciphering of the IMSI).

Identifier: '6FC2'	Structure: transparent	Optional
File size: 4 bytes	Update activity: low	

Access Conditions:

READ	PIN
UPDATE	ADM
DEACTIVATE	ADM
ACTIVATE	ADM

Bytes	Description	M/O	Length
1 to 4	Group Identity	M	4 bytes

- Group Identity GMSI
  Coding:
  the least significant bit of GMSI is the least significant bit of the 4th byte. The most significant bit of GMSI is the most significant bit of the first byte.

4.2.42 $EF_{UIDNADR}$ (User Identity Decryption Node Adress)

This EF contains User Identity Decryption Node Adress UIDN_ADR used to locate the node for decryption of user identities. This file is required if service n°26 (EUIC) is available.

Identifier: '6FC4'	Structure: transparent	Optional
File size: 40 ?? bytes	Update activity: low	

Access Conditions:

READ	PIN
UPDATE	ADM
DEACTIVATE	ADM
ACTIVATE	ADM

Bytes	Description	M/O	Length
1 to 40	User Identity Decryption Node Adress	M	40 bytes

- User Identity Decryption Node Adress
  Coding:
  the least significant bit of UIDN_ADR is the least significant bit of the 40th byte. The most significant bit of UIDN_ADR is the most significant bit of the first byte. Unused digits are padded with 'FF'.

4.2.4~~3~~2 $EF_{Hiddenkey}$ (Key for hidden phone book entries)

This EF contains the hidden key that has to be verified by the ME in order to display the phone book entries that are marked as hidden. The hidden key can consist of 4 to 8 digits.

Identifier: '6FC3'	Structure: transparent	Optional
File size: 4 bytes	Update activity: low	

Access Conditions:

READ	PIN
UPDATE	PIN
DEACTIVATE	ADM
ACTIVATE	ADM

Bytes	Description	M/O	Length
1 to 4	Hidden Key	M	4 bytes

- Hidden Key

Coding:

the hidden key is coded on 4 bytes using BCD coding. The minimum number of digits is 4. Unused digits are padded with 'FF'.

NOTE: The phone book entries marked as hidden are not scrambled by means of the hidden key. The are stored in plain text in the phone book.

4.2.44~~3~~ Files required for 2G Access

...

4.2.44~~3~~.1 EF_{Kc} (Ciphering key Kc)

...

4.2.44~~3~~.2 EF_{KcGPRS} (GPRS Ciphering key KcGPRS)

...

4.2.44~~3~~.3 $EF_{LOCIGPRS}$ (GPRS location information)

...

4.2.44~~3~~.4 EF_{LOCI2G} (Location Information for 2G access)

...

4.2.44~~3~~.5 EF_{BCCH} (Broadcast Control Channels)

...

5.2.1 Authentication algorithms computation

The ME selects a USIM application and uses the INTERNAL AUTHENTICATE command (see 7.1.1). The response is sent to the ME (in case of the T=0 protocol when requested by a subsequent GET RESPONSE command).

~~5.2.2 IMSI request~~

~~The ME performs the reading procedure with EF_{IMSI}.~~

5.2.3 Access control information request

The ME performs the reading procedure with EF_{ACC}.

5.2.4 HPLMN search period request

The ME performs the reading procedure with EF_{HPLMN}.

5.2.5 Location information

Request: The ME performs the reading procedure with EF_{LOCI}.
Update: The ME performs the updating procedure with EF_{LOCI}.

In the case when updating EF_{LOCI} with data containing the TMSI value and the card reports the error '92 40' (Memory Problem), the ME shall terminate 3G operation.

5.2.6 Cipher and Integrity key

Request: The ME performs the reading procedure with EF_{Keys}.
Update: The ME performs the updating procedure with EF_{Keys}.

5.2.7 Forbidden PLMN

Request: The ME performs the reading procedure with EF_{FPLMN}.
Update: The ME performs the updating procedure with EF_{FPLMN}.

5.2.8 LSA information

Request: The ME performs the reading procedure with EF_{SAI}, EF_{SLL} and its associated LSA Descriptor files.
Update: The ME performs the updating procedure with EF_{SLL}.

5.2.9 User Identity Request

The ME selects a USIM and checks service n°26 ~~no. 26~~ (Enhanced user identity confidentiality). If service n°26 ~~no. 26~~ is not available then the ME performs the reading procedure with EF_{IMSI}.

Otherwise the ME uses the Encipher ~~IMSI~~ User Identity function to encipher the MSIN with cryptographic function f6(see 7.2.1). Then the ME uses the Encipher User Identity function to encipher the IMSI with cryptographic function f10(see 7.2.1) to obtain the TEMSI. In both cases ~~T~~the response is received by the ME (in case of the T=0 protocol when requested by a subsequent GET RESPONSE command).

NOTE: The TEMSI is used by the serving network to page a particular user.

Then the ME performs the read~~s~~ing procedure~~s~~ with EF_{GMSI} to obtain the group identity ~~out of EF_{GMSI}~~, and with $EF_{UIDNADR}$ to obtain the User Identity Decryption Node Adress UIDN_ADR. The ME concatenates UIDN_ADR ,~~the HE id,~~ the group identity ~~GMSI~~ and the enciphered ~~I~~MSIN to obtain XEMSI and sends that to the network.

5.2.10 GSM Cipher key

Request: The ME performs the reading procedure with EF_{Kc}.
Update: The ME performs the updating procedure with EF_{Kc}.

7 USIM Commands

…

7.2 Encipher ~~IMSI~~User Identity

7.2.1 Command description

The function is used during the procedure for identification of the user via the radio access path. It operates in two modes:

- ~~by means of the~~ encipher~~ed~~ the permanent user identity (IMSI) (see TS 23.003 [..]).

- encipher the MSIN which is a part of the IMSI (see TS 23.003 [..]).

For the execution of the command the USIM uses the group key GK and the sequence number $SEQ_{UIC/UE}$ which are stored internally in the USIM.

Each time the command is invoked in the first mode (to encipher the IMSI), ~~T~~the USIM increments the internal sequence number $SEQ_{UIC/UE}$ that holds the value from the last execution of 'Encipher User Identity~~IMSI~~'.

Next the USIM computes the enciphered IMSI as $f6_{GK}$ ($SEQ_{UIC/UE}$ ‖ ~~I~~MSIN), or the enciphered MSIN as $f10_{GK}$ ($SEQ_{UIC/UE}$ ‖ MSIN), ~~-~~which is then returned in the command response.

The function is related to a particular USIM and shall not be executable unless the USIM or any sub-directory has been selected as the Current Directory and a successful PIN verification procedure has been performed (see clause 5).

Input:
- none

Output:
- enciphered IMSI or MSIN.

7.2.2 Command parameters and data

Code	Value
CLA	As defined in 3G TS 31.101
INS	'2A'
P1	See below~~'00'~~
P2	'00'
Lc	not present
Data	not present
Le	Length of EMSI (L1)

Parameter P1 specifies the command mode as follows:

Coding of the reference control P1

Coding b8-b1	Meaning
'XXXXXXX0'	Encipher MSIN with f6
'XXXXXXX1'	Encipher IMSI with f10

Parameter Le specifies the expected length of the response. This is depending on the further specification of functions f6 and f10.

Command parameters/data:

none

Response parameters/data:

Byte(s)	Description	Length
1	Length of encrypted ~~IMSI~~Identity (L1)	1
2 to (L1+1)	Encrypted Identity~~IMSI~~	L1

The most significant bit of the encrypted Identity ~~IMSI~~ is coded on bit 8 of byte 2.

7.3.2 Status Words of the Commands

The following table shows for each command the possible status conditions returned (marked by an asterisk *). Status conditions of GSM and USIM applications are on the left and right sides of the table, respectively.

Commands and status words

AUTHENTICATE	ENCIPHER ~~IMSI~~USer	
		90 00
		91 XX
*	*	9F XX
		61XX#
		93 00
		92 0X
*	*	65 81
		94 00
		94 02
		94 04
*		94 08
		98 02
*	*	69 82
		98 08
		98 10
		98 40
		98 50
*		98 62
*	*	67 XX
*	*	6B XX
		6D XX
*	*	6E XX
*	*	6F XX
		62 81
		62 83
		62 82
		62 84
		62 00
		63 CX
		69 81
*	*	69 84
*	*	69 85
		69 86
		6A 81
		6A 82
		6A 83
		6A 84
		6A 85
*	*	6A 86
		6A 87
*	*	6A 88
		6C XX

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Document N1-000280
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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24.008	**CR**	**122rev1**	Current Version:	3.2.1

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

For submission to: *list expected approval meeting # here ↑*		for approval	X	strategic		*(for SMG use only)*
		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	X

Source: T-Mobil **Date:** 11.02.00

Subject: Introduction of a new code point within the mobile identity IE, encrypted IMSI

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	X
C	Functional modification of feature	
D	Editorial modification	

Release:

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

Reason for change: This CR is necessary to introduce Enhanced User Identity Confidentiality according the WI security.
A new code point , named XEMSI will be introduced. This code point address the encrypted IMSI and the necessary routing information.

Clauses affected: 10.5.1.4, 10.5.3.4, 10.5.5.9, 4.7.9.1.2

Other specs affected:

Other 3G core specifications		→ List of CRs:	23.003, 23.012, 23.018, 25.331, 29.002, 31.102, 33.103,33.105
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.

10.5.1.4 Mobile Identity

The purpose of the *Mobile Identity* information element is to provide either the international mobile subscriber identity, IMSI, the temporary mobile subscriber identity, TMSI/P-TMSI, the international mobile equipment identity, IMEI ~~or~~ the international mobile equipment identity together with the software version number, IMEISV ,the extended encrypted IMSI (XEMSI) or the Temporary encrypted mobile subscriber identity TEMSI .

The IMSI shall not exceed 15 digits, the TMSI/P-TMSI is 4 octets long, the TEMSI is 8 octets long, and the IMEI is composed of 15 digits, the IMEISV is 16 digits. The XEMSI is composed of an UIDN ADDR (max. 15 digits, coded as E.164 address) and an encrypted IMSI (presented by a Octet String with 1 to 12 octets) (see TS 23.003).

For packet paging the network shall select the mobile identity type with the following priority:

1- P-TMSI: The P-TMSI shall be used if it is available.

2- IMSI: The IMSI/TEMSI shall be used in cases where no P-TMSI is available.

If a mobile user supports encrypted IMSI (XEMSI) then the TEMSI will be used instead of the IMSI. For all other transactions except emergency call establishment, emergency call re-establishment, mobile terminated call establishment, the identification procedure, the GMM identification procedure, the GMM authentication and ciphering procedure and the ciphering mode setting procedure, the mobile station and the network shall select the mobile identity type with the following priority:

1- TMSI: The TMSI shall be used if it is available.

2- IMSI: The IMSI/XEMSI shall be used in cases where no TMSI is available.

For mobile terminated call establishment the mobile station shall select the same mobile identity type as received from the network in the PAGING REQUEST message. If a mobile user supports encrypted IMSI (XEMSI) then the XEMSI will be used instead of the IMSI.

For emergency call establishment and re-establishment the mobile station shall select the mobile identity type with the following priority:

1- TMSI: The TMSI shall be used if it is available.

2- IMSI: The IMSI/XEMSI shall be used in cases where no TMSI is available.

3- IMEI: The IMEI shall be used in cases where no SIM is available or the SIM is considered as not valid by the mobile station or no IMSI or TMSI is available.

In the identification procedure and in the GMM identification procedure the mobile station shall select the mobile identity type which was requested by the network. If a mobile user supports encrypted IMSI (XEMSI) then the XEMSI will be used instead of the IMSI.

In the ciphering mode setting procedure and in the GMM authentication and ciphering procedure the mobile shall select the IMEISV.

The *Mobile Identity* information element is coded as shown in figure 10.5.4/TS 24.008 and table 10.5.4/TS 24.008.

The *Mobile Identity* is a type 4 information element with a minimum length of 3 octet and 24 ~~11~~ octets length maximal. Further restriction on the length may be applied, e.g. number plans.

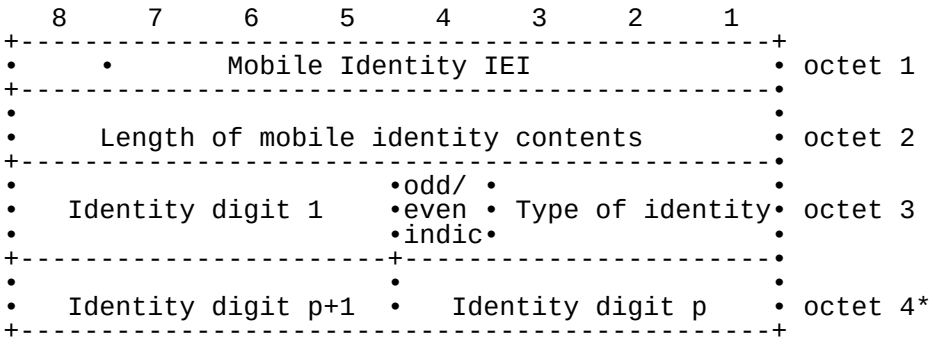

Figure 10.5.4/TS 24.008 *Mobile Identity* information element (TMSI/P-TMSI/TEMSI, IMSI, IMEI, IMEISV)

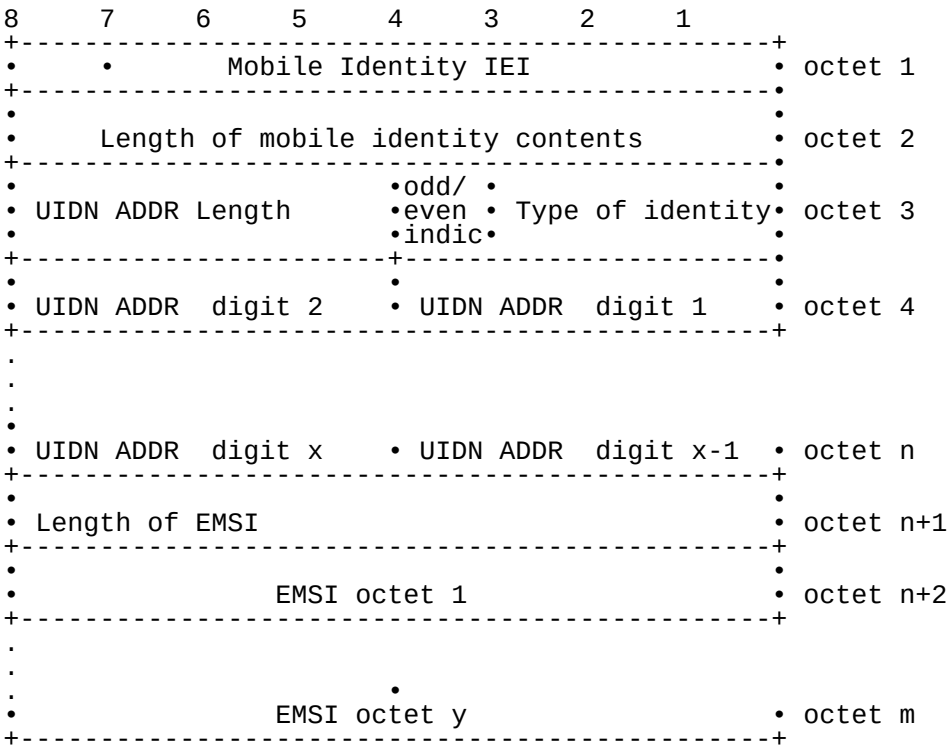

Figure 10.5.x/TS24.008 Mobile Identity information element (XEMSI)

Table 10.5.4/TS 24.008: *Mobile Identity* information element

Type of identity (octet 3) Bits **3 2 1** 0 0 1 IMSI 0 1 0 IMEI 0 1 1 IMEISV 1 0 0 TMSI/P-TMSI 1 0 1 XEMSI note 2) 1 1 0 TEMSI 0 0 0 No Identity note 1) All other values are reserved. Odd/even indication (octet 3) Bit **4** 0 even number of identity digits and also when the TMSI/P-TMSI is used 1 odd number of identity digits Identity digits (octet 3 etc) For the IMSI, IMEI , UIDN ADDR and IMEISV this field is coded using BCD coding. If the number of identity digits is even then bits 5 to 8 of the last octet shall be filled with an end mark coded as "1111". If the mobile identity is the TMSI/P-TMSI/TEMSI then bits 5 to 8 of octet 3 are coded as "1111" and bit 8 of octet 4 is the most significant bit and bit 1 of the last octet the least significant bit. The coding of the TMSI/P-TMSI is left open for each administration.

NOTE 1: This can be used in the case when a fill paging message without any valid identity has to be sent on the paging subchannel.

NOTE 2: The coding of the XEMSI within the identity digits is as following according 3G TS 23.003:

The UIDN ADDR is the E.164 address of the User Identity Decryption Node (UIDN) with a maximum length of 15 digits.

The EMSI (Encrypted IMSI) is an octet string with the minimum of 1 and the maximum length of 12 octets.

10.5.3.4 Identity type

The purpose of the *Identity Type* information element is to specify which identity is requested.

The *Identity Type* information element is coded as shown in figure 10.5.78/TS 24.008 and table 10.5.92/TS 24.008.

The *Identity Type* is a type 1 information element .

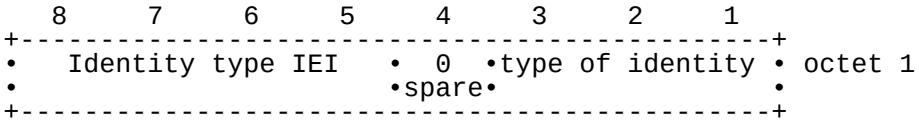

Figure 10.5.78/TS 24.008 *Identity Type* information element

Table 10.5.92/TS 24.008: *Identity Type* information element

Type of identity (octet 1) Bits 3 2 1	
0 0 1	IMSI
0 1 0	IMEI
0 1 1	IMEISV
1 0 0	TMSI
1 0 1	XEMSI see 10.5.1.4
1 1 0	TEMSI see 10.5.1.4
All other values are reserved.	

10.5.5.9 Identity type 2

The purpose of the *identity type 2* information element is to specify which identity is requested.

The *identity type 2* is a type 1 information element.

The *identity type 2* information element is coded as shown in figure 10.5.125/TS 24.008 and table 10.5.142/TS 24.008.

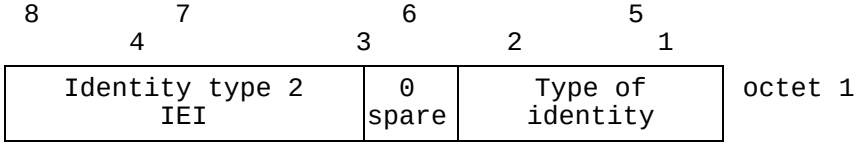

Figure 10.5.125/TS 24.008: *Identity type 2* information element

Table 10.5.142/TS 24.008: *Identity type 2* information element

Type of identity (octet 1) Bits 3 2 1	
0 0 1	IMSI
0 1 0	IMEI
0 1 1	IMEISV
1 0 0	TMSI
1 0 1	XEMSI see 10.5.1.4
1 1 0	TEMSI see 10.5.1.4

All other values are interpreted as *IMSI* by this version of the protocol.

4.7.9.1.2 Paging for GPRS services using IMSI

Paging for GPRS services using IMSI is an abnormal procedure used for error recovery in the network.

The network may initiate paging using IMSI if the P-TMSI is not available due to a network failure. If the mobile supports enhanced user identity confidentiality, than the TEMSI will be used instead of IMSI:

To initiate the procedure the GMM entity in the network requests the RR sublayer to start paging (see GSM 04.18, GSM 04.60 [75], TS 25.331 and TS 25.413).

Upon reception of a paging indication for GPRS services using IMSI/TEMSI, the MS shall locally deactivate any active PDP contexts and locally detach from GPRS. The local detach includes deleting any RAI, P-TMSI, P-TMSI signature and GPRS ciphering key sequence number stored, setting the GPRS update status to GU2 NOT UPDATED and changing state to GMM-DEREGISTERED.

After performing the local detach, the MS shall then perform a GPRS attach or combined GPRS attach procedure. After performing the attach, a MS should activate PDP context(s) to replace any previously active PDP context(s).

NOTE: In some cases, user interaction may be required and then the MS cannot activate the PDP context(s) automatically.

NOTE: The MS does not respond to the paging except with the Attach Request. Hence timer T3313 in the network is not used when paging with IMSI/TIMSI.

NOTE: Paging without DRX parameters may require a considerable extension of the paging duration

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

f) The VLR acknowledges with Insert Subscriber Data Ack (IMSI).

g) After finishing the inter-MSC location update procedures, the HLR responds with Update Location Ack (IMSI) to the new VLR.

h) The VLR responds with Location Update Accept (VLR TMSI) to the SGSN.

8) The SGSN selects Radio Priority SMS, and sends an Attach Accept (P-TMSI, VLR TMSI, P-TMSI Signature, Radio Priority SMS) message to the MS. P-TMSI is included if the SGSN allocates a new P-TMSI.

9) If P-TMSI or VLR TMSI was changed, the MS acknowledges the received TMSI(s) by returning an Attach Complete message to the SGSN.

10) If VLR TMSI was changed, the SGSN confirms the VLR TMSI re-allocation by sending a TMSI Reallocation Complete message to the VLR.

If the Attach Request cannot be accepted, the SGSN returns an Attach Reject (IMSI, Cause) message to the MS.

For an MS with GPRS-CSI defined, CAMEL interaction may be performed, see referenced procedure in 3G TS 23.078:

C1) CAMEL-GPRS-Attach-Request.

6.5.2 UMTS PS Attach Function

[It is an outstanding task to merge this subclause with "GPRS Attach Function".]

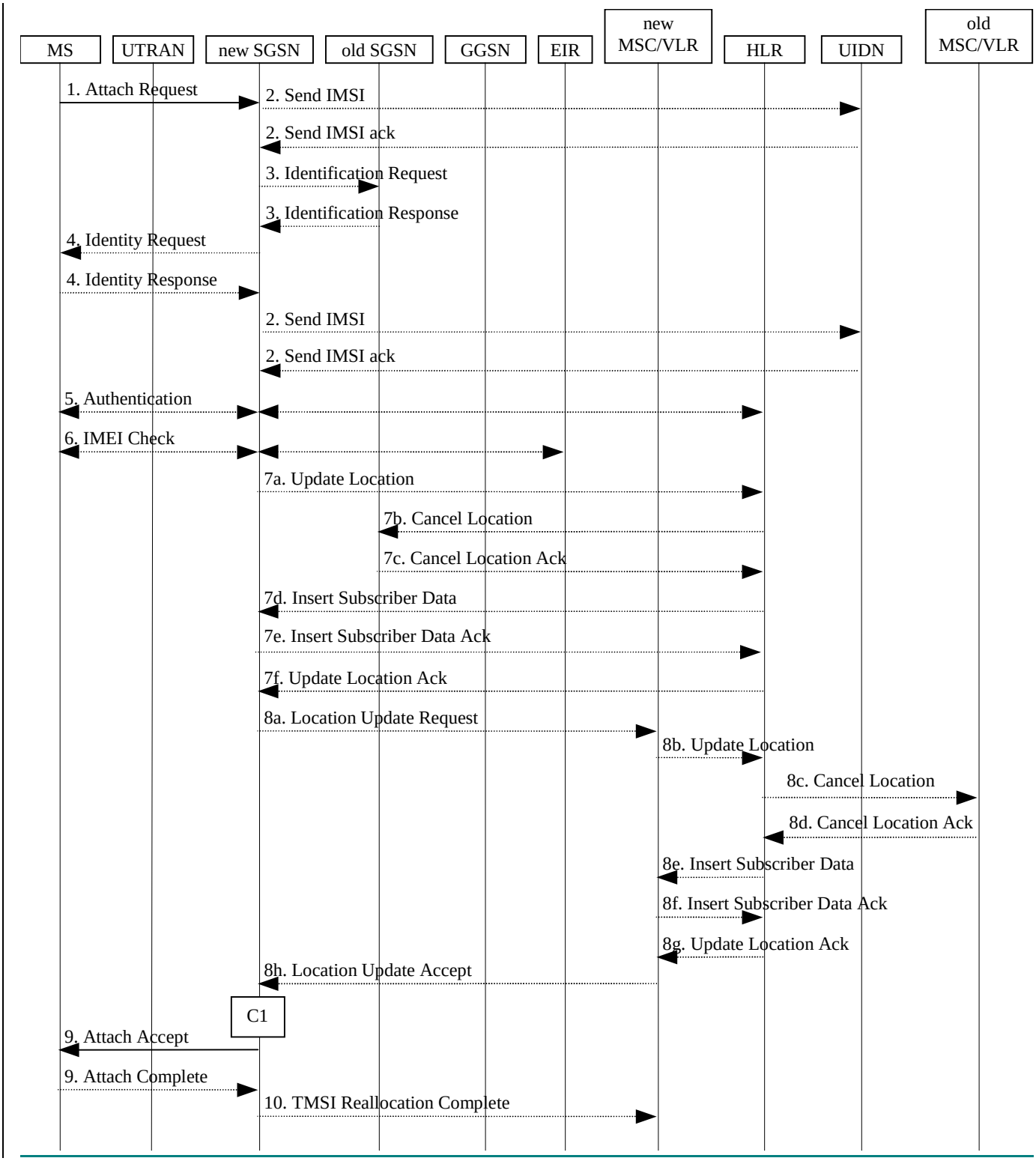
A PS-attached MS makes a CS attach via the SGSN with the combined RA / LA update procedure if the network operates in mode I. In network operates in mode II, or if the MS is not PS-attached, then the MS makes a normal CS attach. A CS-attached MS engaged in a CS connection shall use the (non-combined) PS Attach procedure when it performs a PS attach.

In the attach procedure, the MS shall provide its identity and an indication of which type of attach that is to be executed. The identity provided to the network shall be the MS's Packet TMSI (P-TMSI) or IMSI or EMSI (Encrypted Mobile Subscriber Identity) and UIDN (User Identity Decryption Node) address. P-TMSI and the RAI associated with the P-TMSI shall be provided if the MS has a valid P-TMSI. If the MS does not have a valid P-TMSI, then the MS shall provide its IMSI or EMSI and UIDN Address. The SGSN shall be able to request the decryption of an EMSI by the UIDN of the home network. The different types of attach are PS attach and combined PS / CS attach.

After having executed the PS attach, the MS is in the PMM-CONNECTED state and MM contexts are established in the MS and the SGSN. The MS may then activate PDP contexts as described in subclause "Activation Procedures".

An CS-attached MS that cannot operate in CS/PS mode of operation shall follow the normal CS detach procedure before it makes a PS attach. A PS-attached MS that cannot operate in CS/PS mode of operation shall perform a PS detach before it makes a CS attach.

The Combined PS / CS Attach procedure is illustrated in Figure 22. Each step is explained in the following list.


MS
UTRAN
new SGSN
old SGSN
GGSN
EIR
new MSC/VLR
HLR
UIDN
old MSC/VLR
1. Attach Request
2. Send IMSI
2. Send IMSI ack
3. Identification Request
3. Identification Response
4. Identity Request
4. Identity Response
2. Send IMSI
2. Send IMSI ack
5. Authentication
6. IMEI Check
7a. Update Location
7b. Cancel Location
7c. Cancel Location Ack
7d. Insert Subscriber Data
7e. Insert Subscriber Data Ack
7f. Update Location Ack
8a. Location Update Request
8b. Update Location
8c. Cancel Location
8d. Cancel Location Ack
8e. Insert Subscriber Data
8f. Insert Subscriber Data Ack
8g. Update Location Ack
8h. Location Update Accept
C1
9. Attach Accept
9. Attach Complete
10. TMSI Reallocation Complete

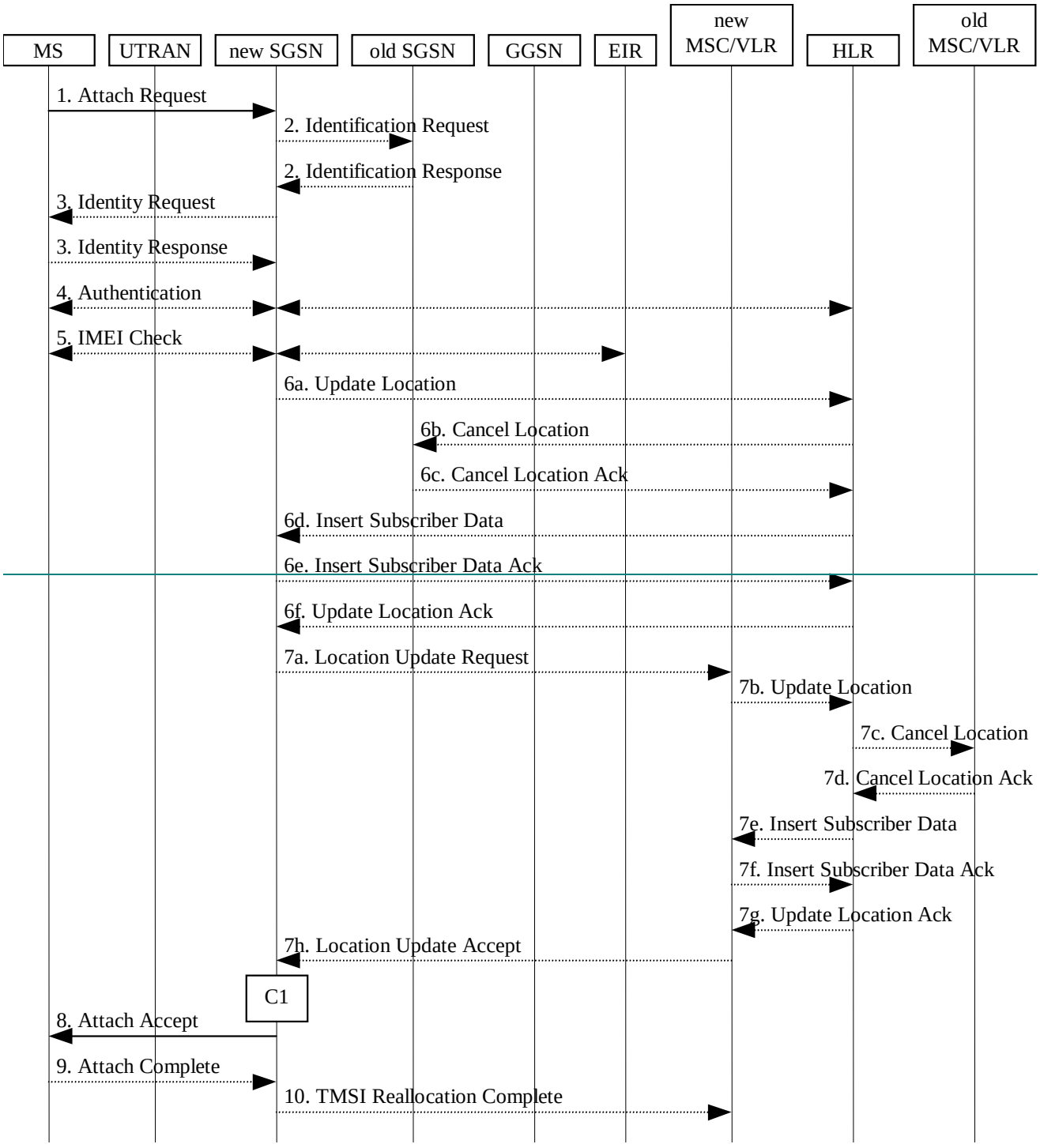


Figure 22: Combined PS / CS Attach Procedure

1) The MS initiates the attach procedure by the transmission of an Attach Request (IMSI or P-TMSI and old RAI or EMSI and UIDN Address), Core Network Classmark, KSI, Attach Type, old P-TMSI Signature, Follow on request) message to the SGSN. IMSI shall be included if the MS does not have a valid P-TMSI available. If the MS uses P-TMSI for identifying itself and if it has also stored its old P-TMSI Signature, then the MS shall include the old P-TMSI Signature in the Attach Request message. If the MS has a valid P-TMSI, then P-TMSI and the old RAI associated with P-TMSI shall be included. KSI shall be included if the MS has valid security parameters. Core Network Classmark is describe in subclause "Core Network Classmark". Follow on request shall be set by MS if there is pending uplink traffic (signalling or user data). The SGSN may use, as an implementation option, the follow on request indication to release or keep the Iu connection after the completion

of the PS Attach procedure. Attach Type indicates which type of attach that is to be performed, i.e., PS attach only, PS Attach while already CS attached, or combined PS / CS attach.

2) If the MS identifies itself with an EMSI and UIDN Address, the SGSN shall request decryption of the EMSI from the UIDN. The SGSN shall send a Send IMSI (EMSI) towards the UIDN. If the UIDN provides in the Send IMSI Ack the IMSI of the serving subscriber, processing in the SGSN shall continue based on this identity. If the UIDN returns a Send IMSI negative response, then the SGSN shall reject the Attach Request.

3) If the MS identifies itself with P-TMSI and the SGSN has changed since detach, the new SGSN sends an Identification Request (P-TMSI, old RAI, old P-TMSI Signature) to the old SGSN to request the IMSI. The old SGSN responds with Identification Response (IMSI, Authentication vector). If the MS is not known in the old SGSN, the old SGSN responds with an appropriate error cause. The old SGSN also validates the old P-TMSI Signature and responds with an appropriate error cause if it does not match the value stored in the old SGSN.

~~3~~4) If the MS is unknown in both the old and new SGSN, the SGSN sends an Identity Request (Identity Type = IMSI) to the MS. The MS responds with Identity Response (IMSI or EMSI and UIDN Address). If the MS identifies itself with an EMSI and UIDN Address, the SGSN shall obtain the IMSI via the procedure defined in 2).

~~4~~5) The authentication functions are defined in the subclause "Security Function". If no MM context for the MS exists anywhere in the network, then authentication is mandatory. Ciphering procedures are described in subclause "Security Function". If P-TMSI allocation is going to be done, and if ciphering is supported by the network, ciphering mode shall be set.

~~5~~6) The equipment checking functions are defined in the subclause "Identity Check Procedures". Equipment checking is optional.

~~6~~7) If the SGSN number has changed since the GPRS detach, or if it is the very first attach, then the SGSN informs the HLR:

a) The SGSN sends an Update Location (SGSN Number, SGSN Address, IMSI) to the HLR.

b) The HLR sends Cancel Location (IMSI, Cancellation Type) to the old SGSN with Cancellation Type set to Update Procedure.

c) The old SGSN acknowledges with Cancel Location Ack (IMSI). If there are any ongoing procedures for that MS, the old SGSN shall wait until these procedures are finished before removing the MM and PDP contexts.

d) The HLR sends Insert Subscriber Data (IMSI, GPRS Subscription Data) to the new SGSN.

e) The new SGSN validates the MS's presence in the (new) RA. If due to regional subscription restrictions the MS is not allowed to attach in the RA, the SGSN rejects the Attach Request with an appropriate cause, and may return an Insert Subscriber Data Ack (IMSI, SGSN Area Restricted) message to the HLR. If subscription checking fails for other reasons, the SGSN rejects the Attach Request with an appropriate cause and returns an Insert Subscriber Data Ack (IMSI, Cause) message to the HLR. If all checks are successful then the SGSN constructs an MM context for the MS and returns an Insert Subscriber Data Ack (IMSI) message to the HLR.

f) The HLR acknowledges the Update Location message by sending an Update Location Ack to the SGSN after the cancelling of old MM context and insertion of new MM context are finished. If the Update Location is rejected by the HLR, the SGSN rejects the Attach Request from the MS with an appropriate cause.

~~7~~8) If Attach Type in step 1 indicated PS Attach while already CS attached, or combined PS / CS attach, then the VLR shall be updated if the Gs interface is installed. The VLR number is derived from the RA information. The SGSN starts the location update procedure towards the new MSC/VLR upon receipt of the first Insert Subscriber Data message from the HLR in step 6 d). This operation marks the MS as GPRS-attached in the VLR.

a) The SGSN sends a Location Update Request (new LAI, IMSI, SGSN Number, Location Update Type) message to the VLR. Location Update Type shall indicate CS attach if Attach Type indicated combined PS / CS attach. Otherwise, Location Update Type shall indicate normal location update. The VLR creates an association with the SGSN by storing SGSN Number.

b) If the LA update is inter-MSC, the new VLR sends Update Location (IMSI, new VLR) to the HLR.

c) If the LA update is inter-MSC, the HLR sends a Cancel Location (IMSI) to the old VLR.

d) The old VLR acknowledges with Cancel Location Ack (IMSI).

e) If the LA update is inter-MSC, the HLR sends Insert Subscriber Data (IMSI, GSM subscriber data) to the new VLR.

f) The VLR acknowledges with Insert Subscriber Data Ack (IMSI).

g) After finishing the inter-MSC location update procedures, the HLR responds with Update Location Ack (IMSI) to the new VLR.

h) The VLR responds with Location Update Accept (VLR TMSI) to the SGSN.

9~~8~~) The SGSN selects Radio Priority SMS, and sends an Attach Accept (P-TMSI, VLR TMSI, P-TMSI Signature, Radio Priority SMS) message to the MS. P-TMSI is included if the SGSN allocates a new P-TMSI.

10~~9~~) If P-TMSI or VLR TMSI was changed, the MS acknowledges the received TMSI(s) by returning an Attach Complete message to the SGSN.

11~~10~~) If VLR TMSI was changed, the SGSN confirms the VLR TMSI re-allocation by sending a TMSI Reallocation Complete message to the VLR.

If the Attach Request cannot be accepted, the SGSN returns an Attach Reject (IMSI, Cause) message to the MS.

For an MS with GPRS-CSI defined, CAMEL interaction may be performed, see referenced procedure in 3G TS 23.078:

C1) CAMEL-GPRS-Attach-Request.

6.6 Detach Function

The PS Detach procedure allows:

- an MS to inform the network that it does not want access the SGSN-based services any longer; and
- the network to inform an MS that it does not have access to the SGSN-based services any more.

The Detach function allows an MS to inform the network that it wants to make a PS and/or CS detach, and it allows the network to inform an MS that it has been PS-detached or CS-detached by the network.

The different types of detach are:

- CS detach;
- PS detach; and
- combined PS / CS detach (MS-initiated only).

The MS is detached either explicitly or implicitly:

- Explicit detach: The network or the MS explicitly requests detach.
- Implicit detach: The network detaches the MS, without notifying the MS, a configuration-dependent time after the mobile reachable timer expired, or after an irrecoverable radio error causes disconnection of the logical link.

In the explicit detach case, a Detach Request (Cause) is sent by the SGSN to the MS, or by the MS to the SGSN.

The MS can make a CS detach in one of two ways depending on if it is PS-attached or not:

- A PS-attached MS sends a Detach Request message to the SGSN, indicating a CS detach. This can be made in combination with PS detach.
- An MS that is not PS-attached makes the CS detach as already defined in GSM or UMTS.

In the MO Detach Request message there is an indication to tell if the detach is due to switch off or not. The indication is needed to know whether a Detach Accept message should be returned or not.

3GPP TSG CN WG2
Milan, Italy, 14 - 16 February 2000

Document N2B000340
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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23.012	CR	003r3	Current Version:	3.1.0

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

For submission to: *list expected approval meeting # here ↑*		for approval	X	strategic		*(for SMG use only)*
		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 [ ] Core Network [X]

Source: T-Mobil **Date:** 17.01.00

Subject: Introduction of Enhanced User Identity Confidentiality

Work item: Security

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

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature	X		Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: The procedures for Enhanced User Identity Confidentiality are introduced.

Clauses affected: 2.6, 4.1.2.1, 4.1.2.9

Other specs affected:	Other 3G core specifications		→ List of CRs:	23.002-???; 23.003-015r2, 23.018-036r2, 23.060-???, 24.008-???, 25.331-???, 29.002-???, 31.102-???, 33.103-???, 33.105-???
	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

2.4.2 Implicit IMSI detach

Implicit IMSI detach operation is the action taken by the VLR to mark an MS as detached when there has been no successful contact between the MS and the network for a time determined by the implicit detach timer. The value of the implicit detach timer is derived from the periodic location updating timer. During an established radio contact, the implicit detach timer shall be prevented from triggering implicit detach. At the release of the radio connection, the implicit detach timer shall be reset and restarted. Implicit IMSI detach shall also be performed in the case of a negative response to an IMEI check.

2.5 Use of the term mobile station (MS) in the present document

In order to simplify the text the term Mobile Station (MS) as used in relation to location management refers to the entity where the IMSI is stored, i.e., in card operated MSs the term Mobile Station (MS) refers to the card.

2.6 Enhanced User Identity Confidentiality

Enhanced User Identity Confidentiality is a mechanism used in the 3rd generation mobile telecommunication system to allow the identification of a user on the radio access by means of the Encrypted Mobile Subscriber Identity (EMSI) and Temporarily Mobile Subscriber Identity (TEMSI). For details concerning the structure of the EMSI and TEMSI see 3G TS 23.003.

The serving VLR shall be able to request decryption of the user identity by the User Identity Decryption Node (UIDN) of the home network.

As a result of the decryption of the EMSI the UIDN shall provide the IMSI and the TEMSI. The TEMSI shall be used by the VLR for addressing of the MS, if the MS can not be addressed with a TMSI.

For details concerning the 3rd generation Security Architecture see 3G TS 33.102.

3 General procedures in the network related to Location Management

3.1 Procedures in the MSC related to Location Updating

The MSC shall pass messages related to location updating between the MS and the VLR.

3.2 Procedures in the VLR related to Location Updating

FFS

3.3 Procedures in the HLR related to Location Updating

FFS

3.4 Normal Location Updating and IMSI detach/attach operation

When receiving a Location Updating Request or an IMSI detach/attach message from an MS, the MSC shall convey the message to its associated Visitor Location Register. Any response from the location register shall similarly be conveyed to the MS.

3.5 IMSI enquiry procedure

The MS shall identify itself by either the IMSI, the EMSI or the TMSI plus Location Area Identification of the previous VLR. In the latter case the new VLR shall attempt to request the IMSI and authentication parameters from the previous VLR by the methods defined in GSM 09.02.

3.6 Information transfer between Visitor and Home Location Registers

3.6.1 Procedures for location management

Detailed procedures for exchange of and location updating information between visitor and home location registers are given in GSM 09.02. Below follows an overview of these procedures.

3.6.1.1 Location updating procedure

This procedure is used when an MS registers with a Visitor Location Register.

The VLR provides its address to the HLR.

The VLR may also allocate an optional identity for the MS at location updating: the Local Mobile Station Identity (see GSM 03.03).

3.6.1.2 Downloading of subscriber parameters to the VLR

As a part of the location updating procedure, the Home Location Register will convey the subscriber parameters of the MS which need to be known by the visitor location register for proper call handling. This procedure is also used whenever there is a change in the subscriber parameters that need to be conveyed to the VLR (e.g. change in subscription, a change in supplementary services activation status).

If the HPLMN applies the multinumbering option, different MSISDNs are allocated for different Basic Services (see GSM 09.07) and stored in the HLR. Among these MSISDNs, the Basic MSISDN Indicator as part of the HLR subscriber data (see GSM 03.08) marks the 'Basic MSISDN' to be sent to the VLR at location update. It is used in the VLR for call handling as calling party and as line identity.

3.6.1.3 Location cancellation procedure

The procedure is used by the home location register to remove a MS from a visitor location register. The procedure will normally be used when the MS has moved to an area controlled by a different location register. The procedure can also be used in other cases, e.g. an MS ceases to be a subscriber of the Home PLMN.

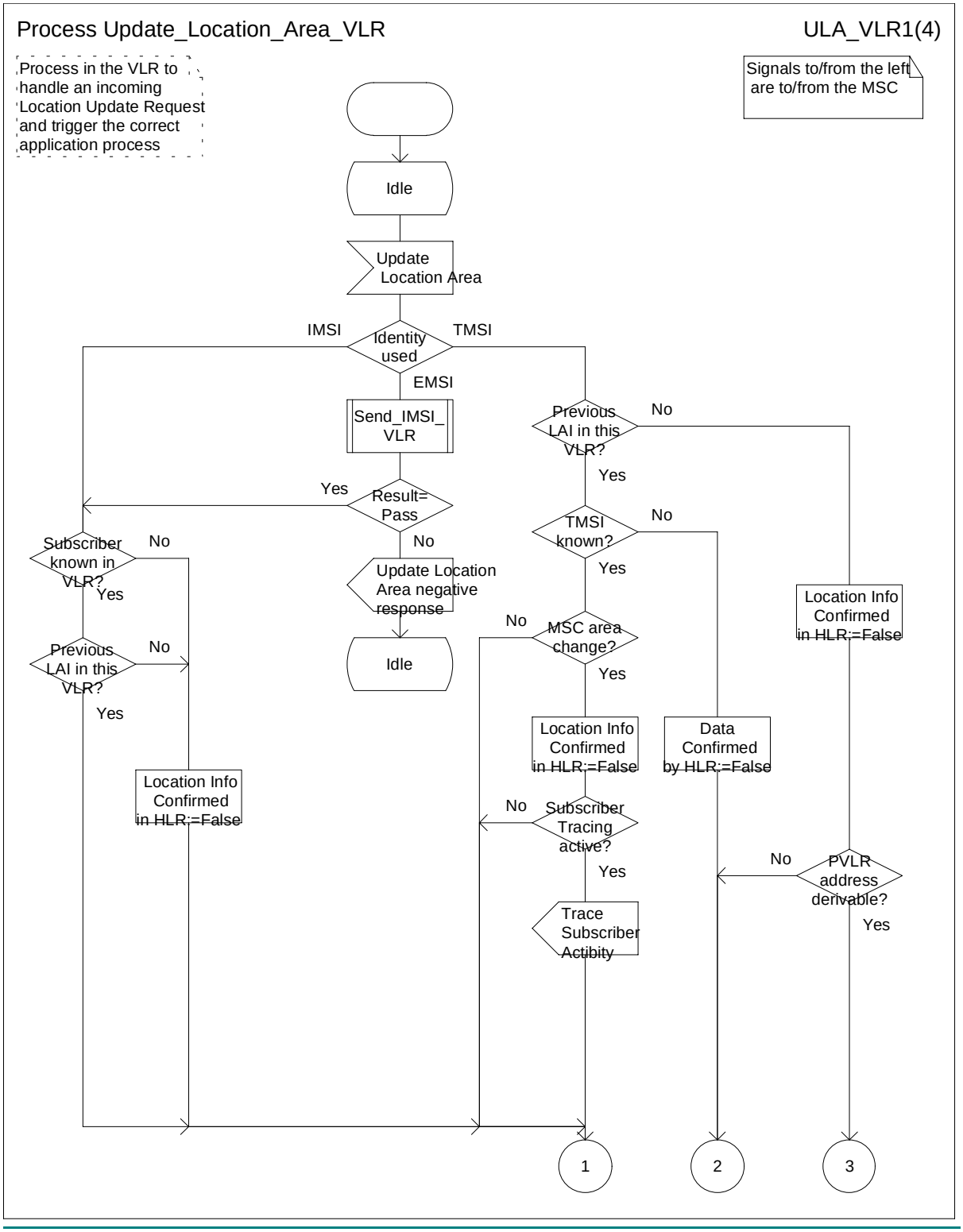
3.6.1.4 Mobile subscriber purging procedure

A VLR may purge the subscriber data for an MS which has not established radio contact for a period determined by the network operator. Purging means to delete the subscriber data and to "freeze" the TMSI that has been allocated to the purged MS in order to avoid double TMSI allocation. The VLR shall inform the HLR of the purging.

When the HLR is informed of the purging, it shall set the flag "MS purged" in the IMSI record of the MS concerned. Presence of the "MS purged" flag will cause any request for routing information for a call or short message to the MS to be treated as if the MS were not reachable.

In the VLR, the "frozen" TMSI is freed for usage in the TMSI allocation procedure by location updating for the purged MS in the same VLR, location cancellation for the purged MS or, in exceptional cases, by O&M.

In the HLR, the "MS purged" flag is reset by the location updating procedure and after reload of data from the non-volatile back-up that is performed when the HLR restarts after a failure.


Process Update_Location_Area_VLR
ULA_VLR1(4)
Process in the VLR to handle an incoming Location Update Request and trigger the correct application process
Signals to/from the left are to/from the MSC
Idle
Update Location Area
IMSI
Identity used
TMSI
EMSI
Send_IMSI_ VLR
Result= Pass
Yes
No
Update Location Area negative response
Idle
Subscriber known in VLR?
Previous LAI in this VLR?
Location Info Confirmed in HLR:=False
Previous LAI in this VLR?
TMSI known?
MSC area change?
Location Info Confirmed in HLR:=False
Data Confirmed by HLR:=False
Location Info Confirmed in HLR:=False
Subscriber Tracing active?
Trace Subscriber Actibity
PVLR address derivable?
1
2
3

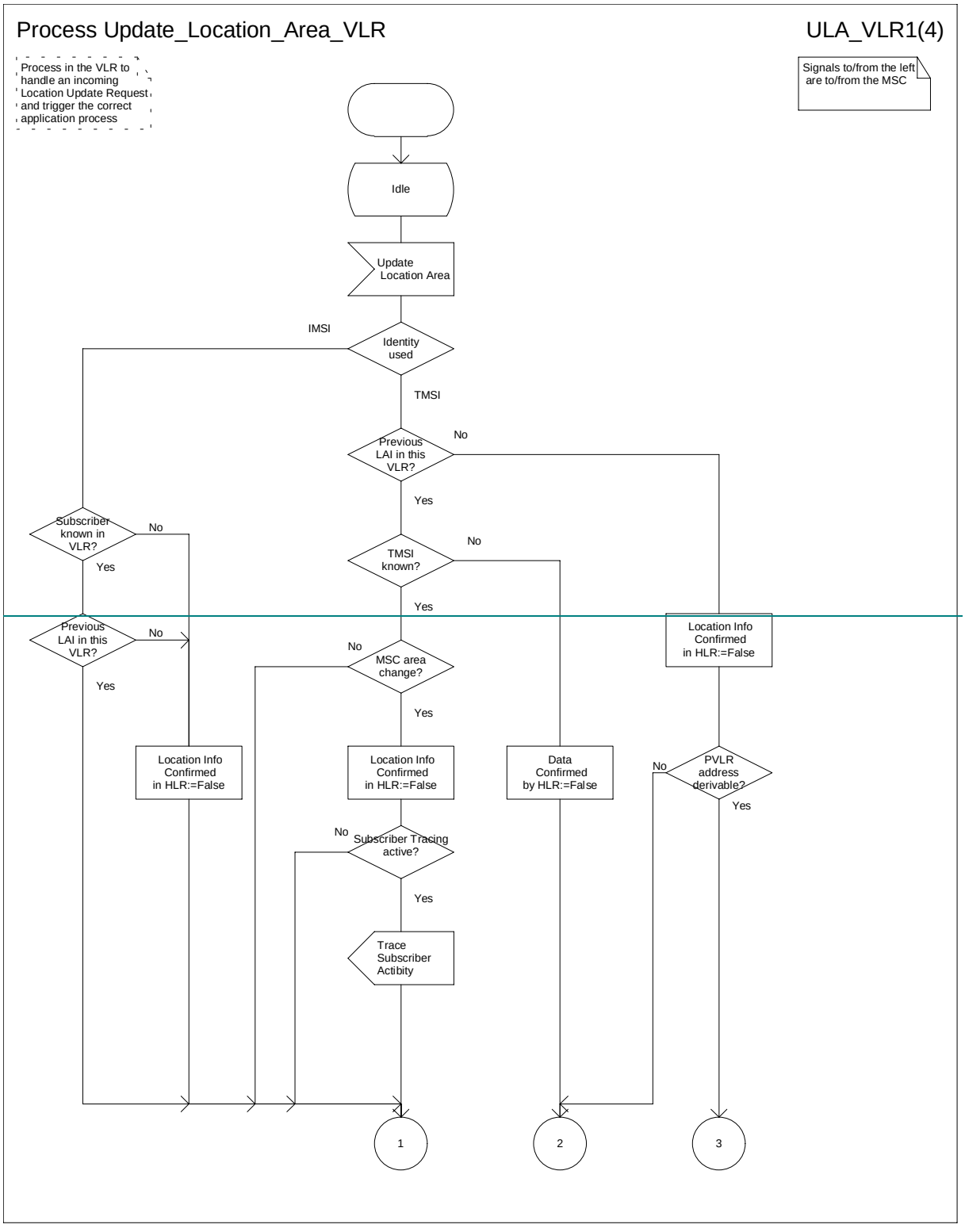


Figure 4.1.2.1 (sheet 1 of 4): Process Update_Location_Area_VLR

4.1.2.9 Procedure Send_IMSI_VLR

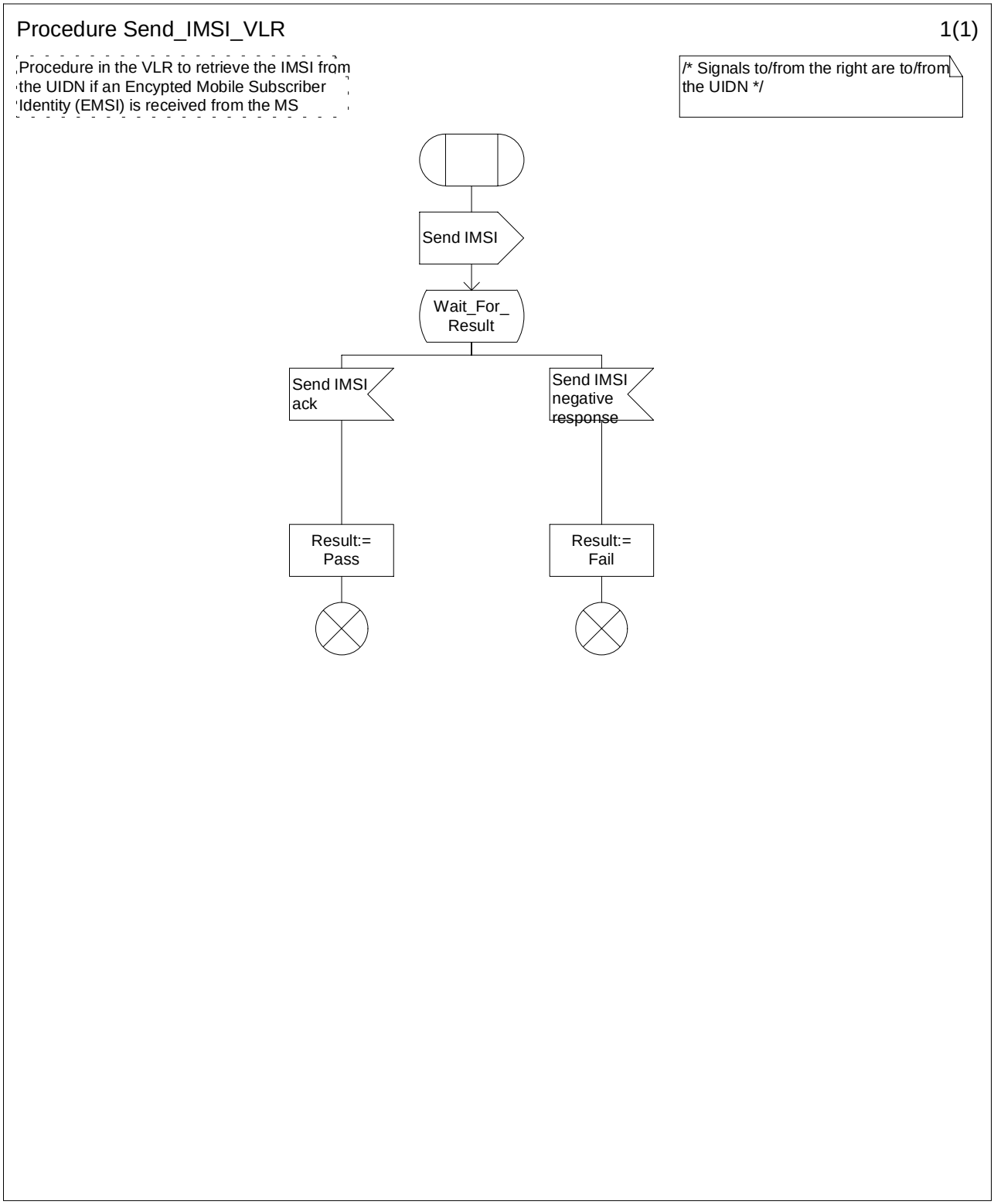


Figure 4.1.2.9: Procedure Send_IMSI_VLR

3GPP TSG CN WG2 SWG-B
Milan, Italy, 14 – 16 February 2000

Document *N2B000341*
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or for SMG, use the format P-99-xxx

CHANGE REQUEST

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23.003	CR	015r3	Current Version:	3.3.0

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

For submission to:		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: (U)SIM [X] ME [X] UTRAN / Radio [ ] Core Network [X]
(at least one should be marked with an X)

Source: T-Mobil **Date:** 14.02.00

Subject: Introduction of the Encrypted MSI

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	X
C	Functional modification of feature	
D	Editorial modification	

Release:

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

Reason for change: This CR is necessary to introduce Enhanced User Identity Confidentiality according the WI security.

Clauses affected: 2.1, new sections 2.5 and 2.6, 8.2

Other specs affected:	Other 3G core specifications	X	→ List of CRs:	23.002-???; 23.008-???, 23.012-003r2, 23.018-036r2, 23.060-???, 24.008-???, 25.331-???, 29.002-???, 31.102-???, 33.103-???, 33.105-???
	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:

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

2 Identification of mobile subscribers

2.1 General

A unique International Mobile Subscriber Identity (IMSI) shall be allocated to each mobile subscriber in the GSM system.

NOTE: This IMSI is the concept referred to by CCITT as "International Mobile Station Identity".

In order to support the subscriber identity confidentiality service the VLRs and SGSNs may allocate Temporary Mobile Subscriber Identities (TMSI) to visiting mobile subscribers. The VLR and SGSNs must be capable of correlating an allocated TMSI with the IMSI of the MS to which it is allocated.

An MS may be allocated two TMSIs, one for services provided through the MSC, and the other for services provided through the SGSN (P-TMSI for short).

In order to support enhanced subscriber identity confidentiality as defined in 3G TS 33.102, the following Identifications may be allocated to an MS:

- The Mobile Station will identify itself with an Encrypted Mobile Subscriber Identity (EMSI) instead of the IMSI. The VLR and the SGSN shall be able to request decryption of an EMSI in the home network of the visiting mobile subscriber.

- The Temporarily Encrypted Mobile Subscriber Identity (TEMSI) is calculated independently by the SIM and the UIDN from the EMSI using a home network operator specific algorithm. The VLR and SGSN must be capable of correlating an allocated TEMSI with the IMSI and TMSI to which it is allocated. It is used if the MS can not be identified by an TMSI or P-TMSI.

For addressing on resources used for GPRS, a Temporary Logical Link Identity (TLLI) is used. The TLLI to use is built by the MS either on the basis of the P-TMSI (local or foreign TLLI), or directly (random TLLI).

In order to speed up the search for subscriber data in the VLR a supplementary Local Mobile Station Identity (LMSI) is defined.

The LMSI may be allocated by the VLR at location updating and is sent to the HLR together with the IMSI. The HLR makes no use of it but includes it together with the IMSI in all messages sent to the VLR concerning that MS.

2.2 Composition of IMSI

IMSI is composed as shown in figure 1.

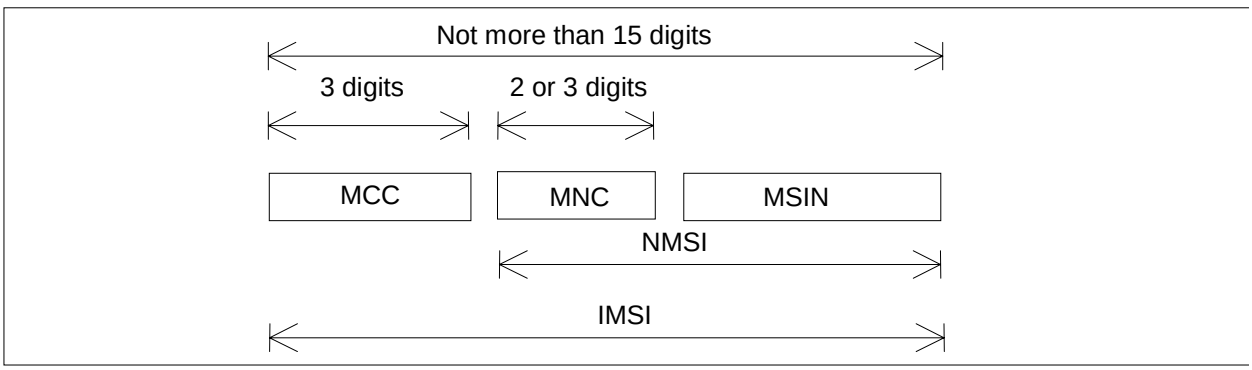

Figure 1: Structure of IMSI

IMSI is composed of three parts:

i) Mobile Country Code (MCC) consisting of three digits. The MCC identifies uniquely the country of domicile of the mobile subscriber;

2.5 Structure of EMSI

The EMSI consists of maximum 12 octets. The structure of the EMSI is home network operator specific.

2.6 Structure of TEMSI

The TEMSI consists of 8 octets. It is calculated independently by the SIM and the UIDN from the EMSI using a home network operator specific algorithm.

2.75 Structure of LMSI

The LMSI consists of 4 octets and may be allocated by the VLR.

2.86 Structure of TLLI

A TLLI is built by the MS or by the SGSN either on the basis of the P-TMSI (local or foreign TLLI), or directly (random or auxiliary TLLI), according to the following rules.

The TLLI consists of 32 bits, numbered from 0 to 31 by order of significance, with bit 0 being the LSB.

A local TLLI is built by a MS which has a valid P-TMSI as follows:

bits 31 down to 30 are set to 1; and

bits 29 down to 0 are set equal to bits 29 to 0 of the P-TMSI.

A foreign TLLI is built by a MS which has a valid P-TMSI as follows:

bit 31 is set to 1 and bit 30 is set to 0; and

bits 29 down to 0 are set equal to bits 29 to 0 of the P-TMSI.

A random TLLI is built by an MS as follows:

8 SCCP subsystem numbers

Subsystem numbers are used to identify applications within network entities which use SCCP signalling. In GSM, subsystem numbers may be used between PLMNs, in which case they are taken from the globally standardised range (1 - 31) or the part of the national network range (129 – 150) reserved for GSM use between PLMNs, or within a PLMN, in which case they are taken from the part of the national network range (32 – 128 & 151 - 254) not reserved for GSM use between PLMNs.

8.1 Globally standardised subsystem numbers used for GSM

The following globally standardised subsystem numbers have been allocated for use by GSM:

0000 0110 HLR (MAP);

0000 0111 VLR (MAP);

0000 1000 MSC (MAP);

0000 1001 EIR (MAP);

0000 1010 is allocated for evolution (possible Authentication centre).

8.2 National network subsystem numbers used for GSM

The following national network subsystem numbers have been allocated for use within GSM networks:

1111 1010 BSC (BSSAP-LE)

1111 1011 MSC (BSSAP-LE)

1111 1100 SMLC (BSSAP-LE)

1111 1101 BSS O&M (A interface);

1111 1110 BSSAP (A interface).

The following national network subsystem numbers have been allocated for use within and between GSM networks:

1000 1101 UIDN(MAP);

1000 1110 RANAP;

1000 1111 RNSAP;

1001 0001 GMLC(MAP);

1001 0010 CAP;

1001 0011 gsmSCF(MAP);

1001 0100 SIWF(MAP);

1001 0101 SGSN(MAP);

1001 0110 GGSN(MAP);

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23.018	CR	036r3	Current Version:	3.3.0

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

For submission to: *list expected approval meeting # here ↑*

for approval [ ]
for information [ ]

strategic [ ]
non-strategic [ ]
(for SMG use only)

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 [ ] Core Network [X]

Source: T-Mobil **Date:** 14.02.00

Subject: Introduction of Enhanced User Identity Confidentiality

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	[X]
C	Functional modification of feature	[ ]
D	Editorial modification	[ ]

Release:

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

Reason for change: This CR introduces the changes required for Enhanced User Identity Confidentiality.

Clauses affected: 7.1.2, 8.1.19, 8.1.28

Other specs affected:

Other 3G core specifications	[ ]	→ List of CRs: 23.002-???, 23.003-015, 23.008-???, 23.012-003, 23.060-???, 24.008-???, 25.331-???, 29.002-092, 31.102-???, 33.103-???, 33.105-???
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:


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7.1.2 Functional requirements of VLR

7.1.2.1 Process OCH_VLR

7.1.2.2 Procedure Process_Access_Request_VLR

Sheet 1: the procedure Send_IMSI_VLR is defined in the Location Management Procedures in 3G TS 23.012.

Sheet 1: it is a network operator decision (subject to MoU requirements) how often an MS should be authenticated.

Sheet 2: the processes Update_Location_VLR and Subscriber_Present_VLR are described in GSM 09.02 [23]

Sheet 2: it is a network operator decision (subject to MoU requirements) whether a connection should be ciphered.

Sheet 3: it is a network operator decision (subject to MoU requirements) how often an IMEI should be checked.

Sheet 3, sheet 4, sheet 5: the procedure CCBS_Report_MS_Activity is specific to CCBS; it is specified in GSM 03.93 [19].

Sheet 5: it is a network operator decision whether emergency calls are allowed from an ME with no SIM.

7.1.2.3 Procedure OG_Call_Subscription_Check_VLR

Sheet 1: it is an implementation option to carry out the check for operator determined barring of all outgoing calls before the check on provisioning of the requested basic service.

Sheet 1: the procedure OG_CUG_Check is specific to CUG. If the VLR does not support CUG, processing continues from the "Yes" exit of the test "Result=Call allowed?".

Sheet 1: the procedure Get_LI_Subscription_Info_MO_VLR is specific to CLIR and COLP. If the VLR supports neither CLIR nor COLP, the procedure call is omitted.

Sheet 1: the procedure Get_AoC_Subscription_Info_VLR is specific to AoC.

Sheet 1: the procedure UUS_OCH_Check_Provision is specific to UUS; it is specified in GSM 03.87 [17]. If the VMSC does not support UUS, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 2: the procedure CAMEL_OCH_VLR is specific to CAMEL; it is specified in GSM 03.78 for CAMEL Phase 1 [8] and GSM 03.78 for CAMEL Phase 2 [9]. If the VLR does not support CAMEL, processing continues from connector 1 to the call to the procedure Check_OG_Barring.

Sheet 2: the negative response "call barred" indicates whether the reason is operator determined barring or supplementary service barring, according to the result returned by the procedure Check_OG_Barring.

7.1.2.4 Procedure Update_TEMSI_VLR

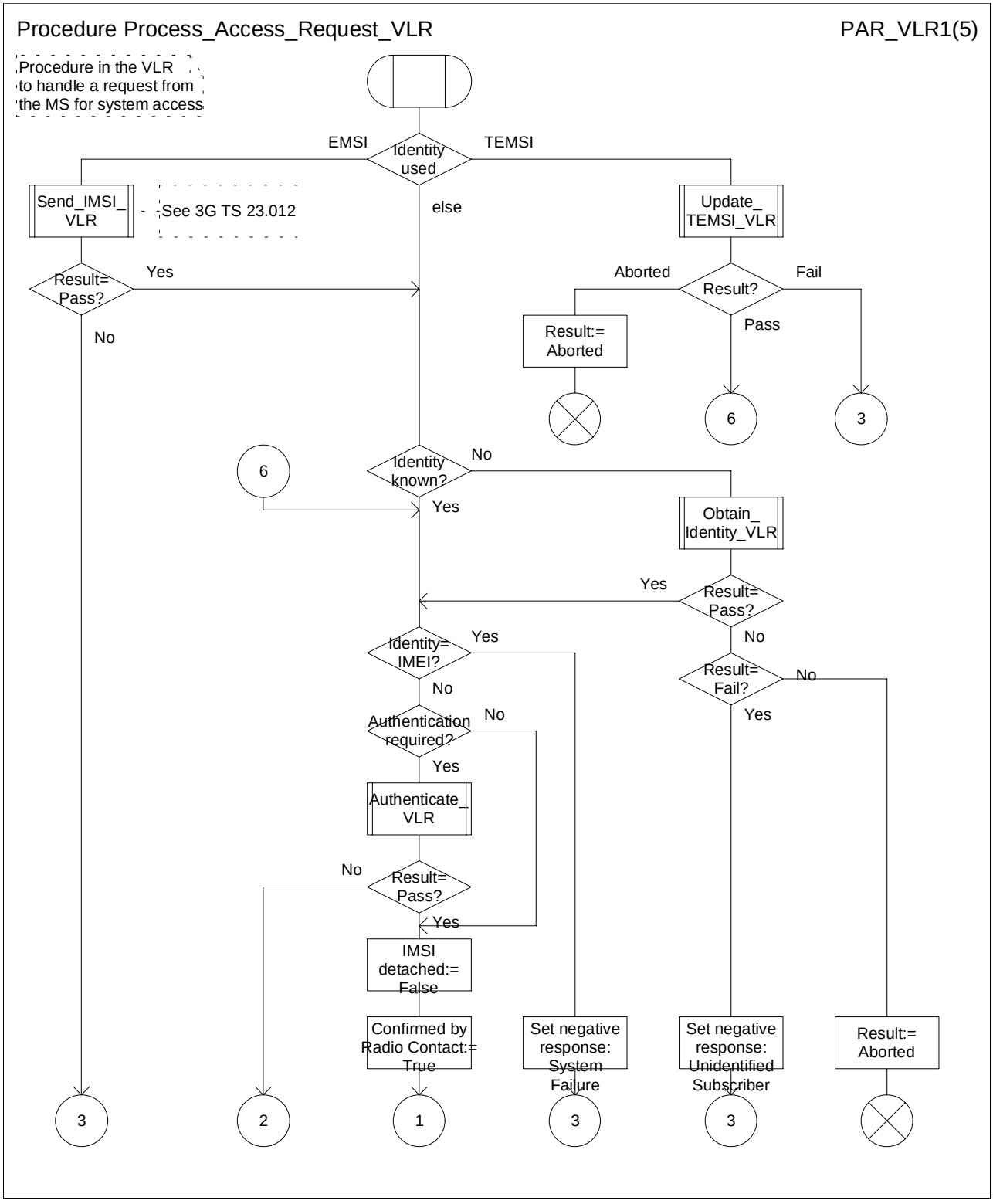
Sheet 1: the procedure Send_IMSI_VLR is defined in the Location Management Procedures in 3G TS 23.012.

7.1.2.4 Procedure Obtain_Identity_VLR

It is a network operator decision whether open (unciphered) identification of the MS by its IMSI is allowed.

7.1.2.5 Procedure Obtain_IMSI_VLR

Sheet 1: the procedure Send_IMSI_VLR is defined in the Location Management Procedures in 3G TS 23.012.


Procedure Process_Access_Request_VLR
PAR_VLR1(5)
Procedure in the VLR to handle a request from the MS for system access
Identity used
EMSI
TEMSI
else
Send_IMSI_VLR
See 3G TS 23.012
Update_TEMSI_VLR
Result= Pass?
Yes
No
Result?
Aborted
Fail
Pass
Result:= Aborted
6
3
Identity known?
No
Yes
Obtain_Identity_VLR
Result= Pass?
Yes
No
Identity= IMEI?
Yes
No
Result= Fail?
No
Yes
Authentication required?
No
Yes
Authenticate_VLR
Result= Pass?
No
Yes
IMSI detached:= False
Confirmed by Radio Contact:= True
Set negative response: System Failure
Set negative response: Unidentified Subscriber
Result:= Aborted
1
2
3

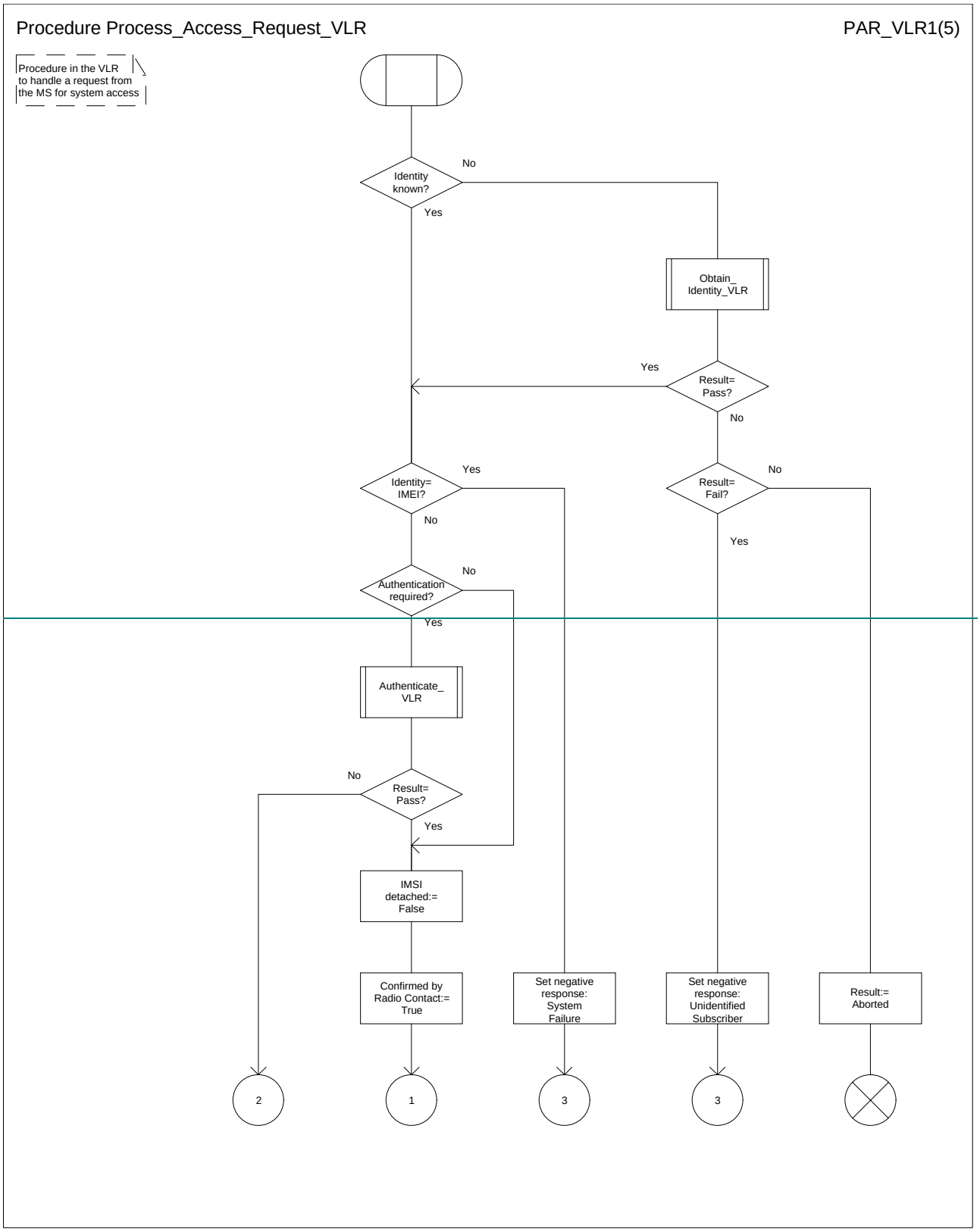


Figure 20a: Procedure Process_Access_Request_VLR (sheet 1)

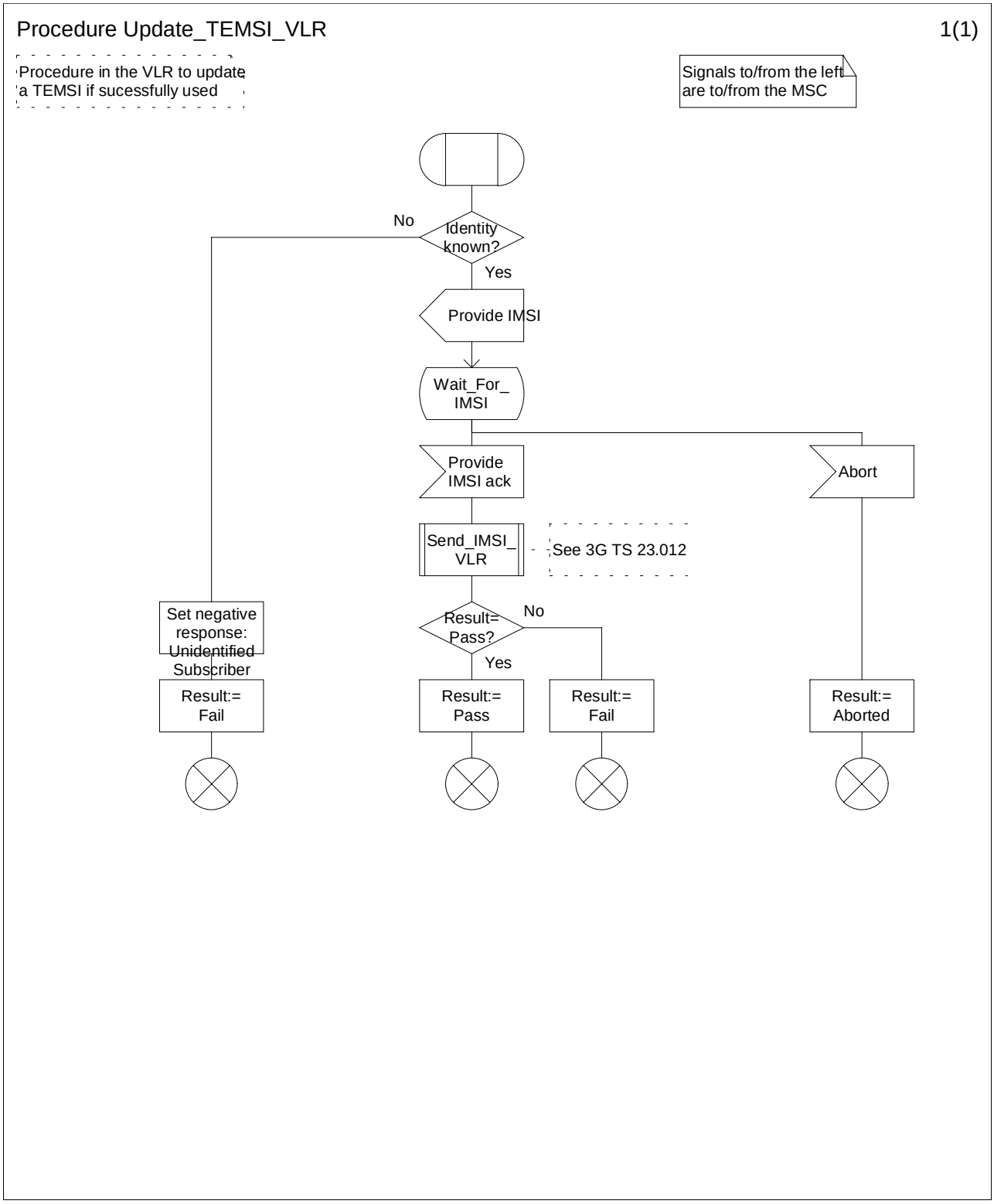
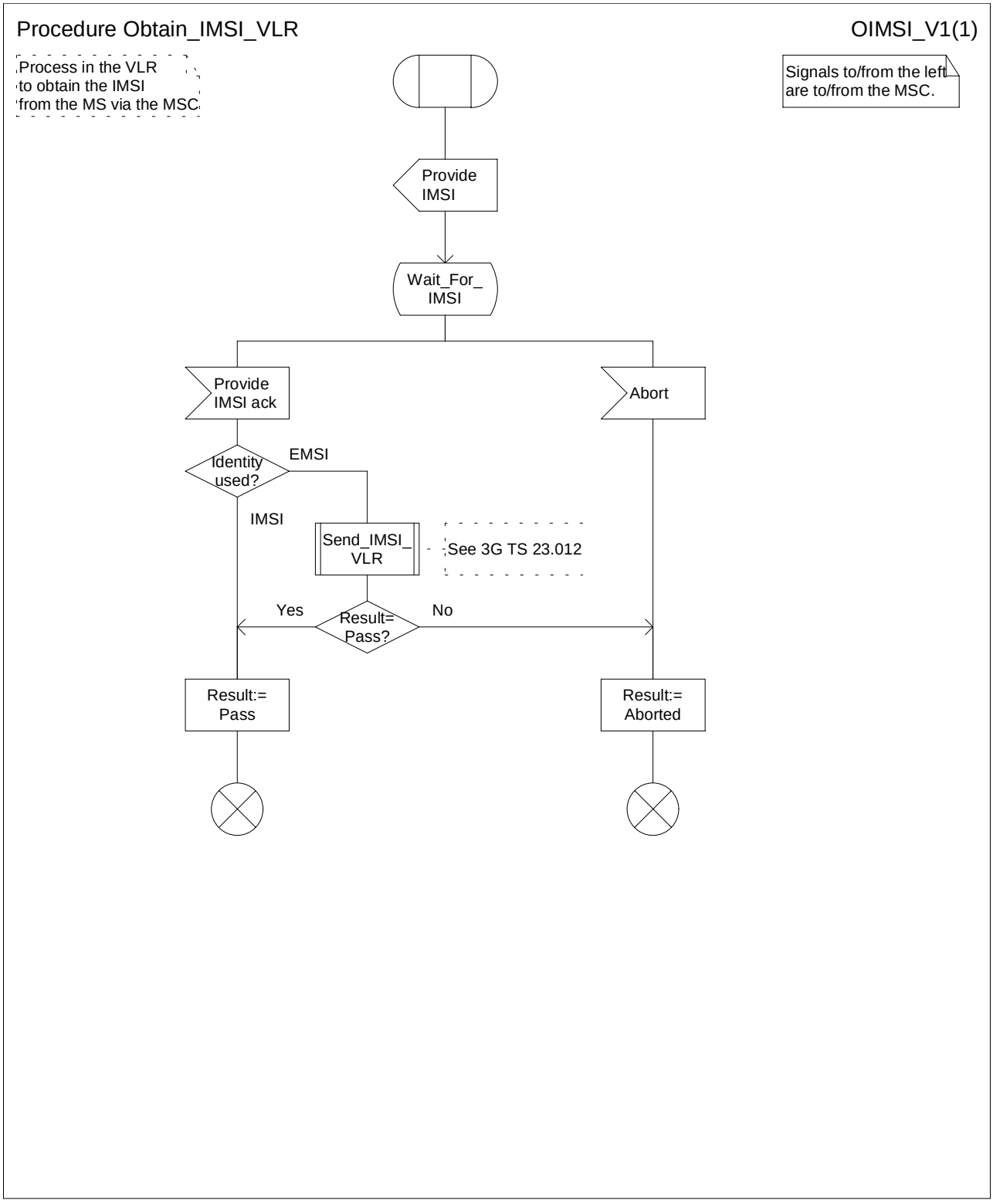


Figure 22: Procedure Update_TEMSI_VLR


Procedure Obtain_IMSI_VLR
OIMSI_V1(1)
Process in the VLR to obtain the IMSI from the MS via the MSC.
Signals to/from the left are to/from the MSC.
Provide IMSI
Wait_For_ IMSI
Provide IMSI ack
Abort
Identity used?
EMSI
IMSI
Send_IMSI_ VLR
See 3G TS 23.012
Yes
Result= Pass?
No
Result:= Pass
Result:= Aborted

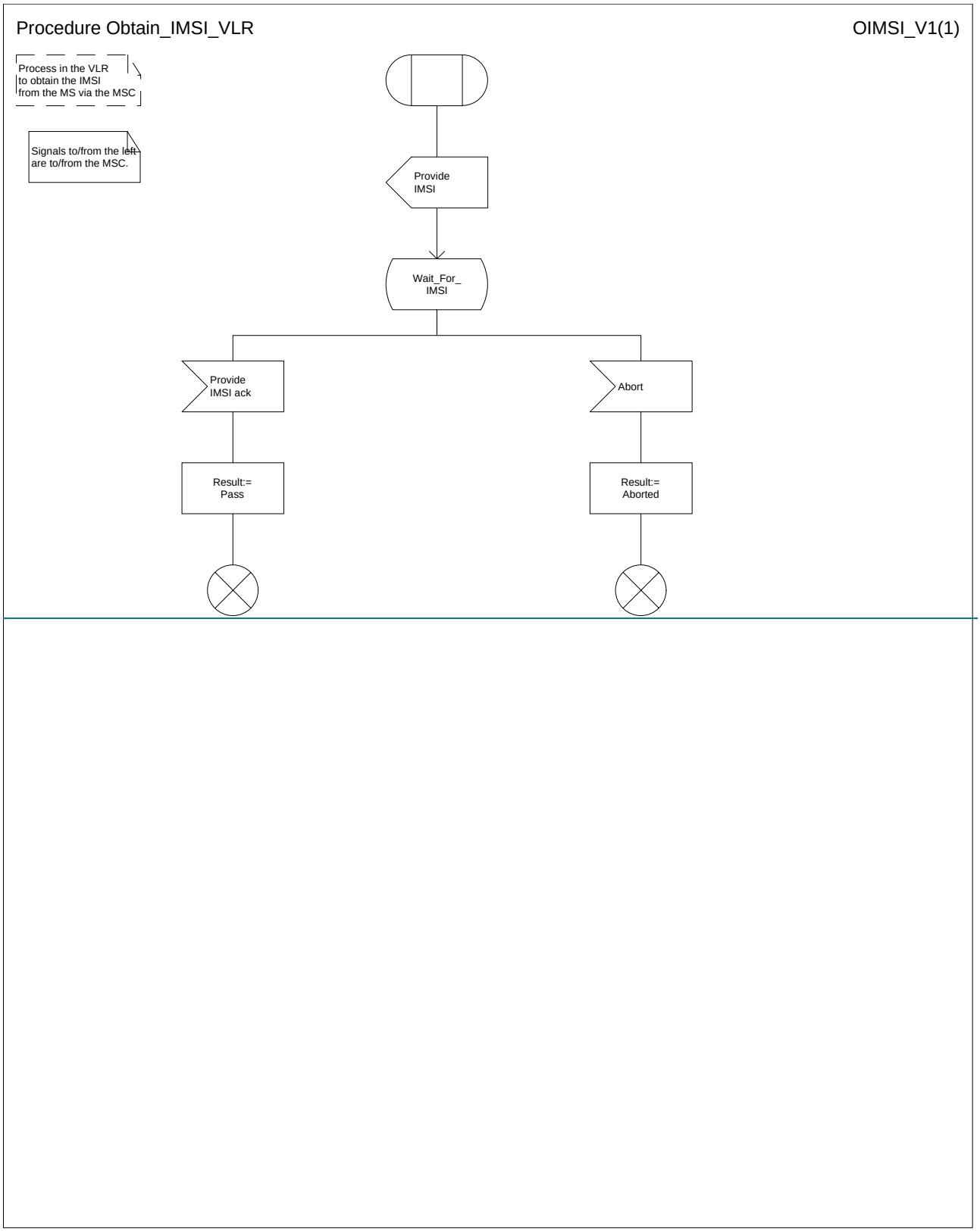


Figure 2~~43~~: Procedure Obtain_IMSI_VLR

8.1.14 Obtain Subscriber Info

The following information elements are required:

Information element name	Required	Description
IMSI	M	IMSI of the MS for which information is required.
Subscriber state requested	C	Indicates that the VLR requires state information for the MS. Shall be present if state information is required; otherwise shall be absent.

8.1.15 Obtain Subscriber Info ack

The following information elements are required:

Information element name	Required	Description
Subscriber state	C	Indicates whether the MS is busy (i.e. engaged on a circuit-switched call) or assumed idle. Shall be present if the VLR requested state information; otherwise shall be absent.

8.1.16 Page MS

The following information elements are required:

Information element name	Required	Description
IMSI	M	IMSI of the MS to be paged.
Location area ID	M	Location area in which the MS is to be paged.
Page type	M	Indicates whether the paging is for a circuit-switched call, MT SMS delivery or SS activity
Paging via SGSN possible	C	Indicates that paging via the SGSN is possible. Shall be present if the VLR determines that the MS can be paged via the SGSN; otherwise shall be absent.
TEMSI	C	TEMSI to be broadcast to identify the MS. Shall be present if stored in the VLR and no TMSI is available for identification of the MS, otherwise shall be absent. Only one of TEMSI or TMSI shall be present.
TMSI	O	TMSI to be broadcast to identify the MS. Only one of TEMSI or TMSI shall be present.

8.1.17 Page MS negative response

The negative response information element can take the following values:

- Absent subscriber;
- Busy subscriber (More calls possible);
- Busy subscriber (NDUB);
- System failure;
- Unknown location area ID.

The Page MS negative response Busy subscriber (More calls possible) also indicates the basic service which applies for the established call.

8.1.18 Page MS via SGSN

The following information elements are required:

Information element name	Required	Description
IMSI	M	IMSI of the MS to be paged.
eMLPP priority	O	Circuit-switched paging priority.
TMSI	O	TMSI to be broadcast to identify the MS.
Channel type	O	Type of channel required for the call.

8.1.19 Process Access Request

The following information elements are required:

Information element name	Required	Description
CM service type	M	Indicates the type of access required: normal MO call, emergency call or page response. Other values (short message service and SS request) defined for this IE are not considered in this specification.
Access connection status	M	Indicates whether or not the connection to the MS is ciphered and whether or not it is authenticated.
Current location area ID	M	Identity of the location area from which the access request was received.
Serving cell ID	M	Identity of the cell in use by the served subscriber.
IMSI	C	IMSI of the MS requesting the access. For normal MO call one of IMSI, EMSI or TMSI shall be present. For page response, one of IMSI, TEMSI or TMSI shall be present. For emergency call, one of IMSI, TMSI, EMSI or IMEI shall be present.
TMSI	C	TMSI of the MS requesting the access. For normal MO call one of IMSI, EMSI or TMSI shall be present. For page response, one of IMSI, TEMSI or TMSI shall be present. For emergency call, one of IMSI, EMSI, TMSI or IMEI shall be present.
EMSI	C	EMSI of the MS requesting the access. For normal MO call one of IMSI, EMSI or TMSI shall be present. For emergency call, one of IMSI, TMSI, EMSI or IMEI shall be present.
UIDN Address	C	Indicates the Address of the UIDN (see 3G TS 33.102). It shall be present if the subscriber is identified by the EMSI, otherwise shall be absent.
TEMSI	C	TEMSI of the MS requesting the access. For page response, one of IMSI, TEMSI or TMSI shall be present.
IMEI	C	IMEI of the MS requesting the access. For normal MO call or page response, one of IMSI or TMSI shall be present. For emergency call, one of IMSI, TMSI, EMSI or IMEI shall be present.
CKSN	C	Cipher key sequence number of the MS requesting the access. Shall be present if TMSI is present; otherwise shall be absent.

8.1.20 Process Access Request ack

The following information elements are required:

Information element name	Required	Description
IMSI	C	IMSI of the MS requesting the access. For normal MO call or page response, shall be present. For emergency call, one of IMSI or IMEI shall be present.
IMEI	C	IMEI of the MS requesting the access. For normal MO call or page response, shall be absent. For emergency call, one of IMSI or IMEI shall be present.
MSISDN	O	MSISDN of the MS requesting the access.

8.1.28 Provide IMSI ack

The following information element is required:

Information element name	Required	Description
IMSI	C~~M~~	IMSI of the MS involved in the access request. One of IMSI or EMSI shall be present.
EMSI	C	EMSI of the MS involved in the access request. One of IMSI or EMSI shall be present.
UIDN Address	C	Indicates the Address of the UIDN (see 3G TS 33.102). It shall be present if the subscriber is identified by the EMSI, otherwise shall be absent.

8.1.29 Radio connection released

This message contains no information elements.

8.1.30 Search For MS

The following information elements are required:

Information element name	Required	Description
IMSI	M	IMSI of the MS to be paged in all location areas.
Page type	M	Indicates whether the paging is for a circuit-switched call, MT SMS delivery or SS activity
Paging via SGSN possible	C	Indicates that paging via the SGSN is possible. Shall be present if the VLR determines that the MS can be paged via the SGSN; otherwise shall be absent.
TEMSI	C	TEMSI to be broadcast to identify the MS. Shall be present if stored in the VLR and no TMSI is available for identification of the MS, otherwise shall be absent. Only one of TEMSI or TMSI shall be present.
TMSI	O	TMSI to be broadcast to identify the MS. Only one of TEMSI or TMSI shall be present.

8.1.31 Search For MS ack

The following information element is required:

Information element name	Required	Description
Location area ID	M	Location area in which the MS responded to the page.

8.1.32 Search For MS negative response

The negative response information element can take the following values:

- Absent subscriber;
- Busy subscriber (More calls possible);
- Busy subscriber (NDUB);
- System failure.

The Search For MS negative response Busy subscriber (More calls possible) also indicates the basic service which applies for the established call.

8.1.33 Search for MS via SGSN

The following information elements are required:

Information element name	Required	Description
IMSI	M	IMSI of the MS to be paged.
eMLPP priority	O	Circuit-switched paging priority.
TEMSI	C	TEMSI to be broadcast to identify the MS. Shall be present if stored in the VLR and no TMSI is available for identification of the MS, otherwise shall be absent. Only one of TEMSI or TMSI shall be present.
TMSI	O	TMSI to be broadcast to identify the MS. Only one of TEMSI or TMSI shall be present.
Channel type	O	Type of channel required for the call.

8.7 Messages on the Gs interface

8.7.1 Page MS

The following information elements are required:

Information element name	Required	Description
IMSI	M	IMSI of the MS to be paged.
eMLPP priority	C	Circuit-switched paging priority. Shall be present if it was received in the Page MS via SGSN request or Search for MS via SGSN request; otherwise shall be absent.
TEMSI	C	TEMSI to be broadcast to identify the MS. Shall be present if it was received in the Page MS via SGSN request or Search for MS via SGSN request; otherwise shall be absent.
TMSI	C	TMSI to be broadcast to identify the MS. Shall be present if it was received in the Page MS via SGSN request or Search for MS via SGSN request; otherwise shall be absent.
Location area identity	C	Location area identity of the location area where the mobile is registered, according to the subscriber data in the VLR. Shall be present if the VLR can supply it; otherwise shall be absent.
Channel type	C	Type of channel required for the call. Shall be present if it was received in the Page MS via SGSN request or Search for MS via SGSN request; otherwise shall be absent.

8.7.2 Send MS information

The following information elements are required:

Information element name	Required	Description
IMSI	M	IMSI of the MS for which information is required.
Information requested	M	Information required for the specified MS.

8.7.3 Send MS information ack

The following information elements are required:

Information element name	Required	Description
IMSI	M	IMSI of the MS for which information is required.
Cell ID	M (note)	Cell ID of the cell in which the MS last established radio contact
Location information age	M (note)	Time in minutes since the MS last established a radio transaction

NOTE: Although they are optional in the protocol, these IEs are mandatory in this context.

8.7.4 Send MS information negative response

The negative response information element can take the following value:

- No response from SGSN

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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.

29.002	CR	092r2	Current Version:	3.3.1

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

For submission to: *list expected approval meeting # here ↑*

for approval [ ]
for information [ ]

strategic [ ]
non-strategic [ ]
(for SMG use only)

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 [ ] ME [ ] UTRAN / Radio [ ] Core Network [X]

Source: T-Mobil **Date:** 14.02.00

Subject: Introduction of Enhanced User Identity Confidentiality

Work item: Security

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

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature	X		Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: This CR introduces the changes required for Enhanced User Identity Confidentiality.

Clauses affected:

Other specs affected:

Other 3G core specifications	[ ]	→ List of CRs: 23.002-???, 23.003-015, 23.008-???, 23.012-003, 23.018-036, 23.060-???, 24.008-???, 25.331-???, 31.102-???, 33.103-???, 33.105-???
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

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****** First Modified Section******

5.1.2 Overload control for MAP entities

For all MAP entities, especially the HLR, the following overload control method is applied:

If overload of a MAP entity is detected requests for certain MAP operations (see tables 5.1/1, 5.1/2, 5.1/3 and 5.1/4) may be ignored by the responder. The decision as to which MAP Operations may be ignored is made by the MAP service provider and is based upon the priority of the application context.

Since most of the affected MAP operations are supervised in the originating entity by TC timers (medium) an additional delay effect is achieved for the incoming traffic.

If overload levels are applicable in the Location Registers the MAP operations should be discarded taking into account the priority of their application context (see table 5.1/1 for HLR, table 5.1/2 for MSC/VLR, table 5.1/3 for the SGSN and table 5.1/4 for the SMLC; the lowest priority is discarded first).

The ranking of priorities given in the tables 5.1/1, 5.1/2, 5.1/3 and 5.1/4 is not normative. The tables can only be seen as a proposal which might be changed due to network operator/implementation matters.

Table 5.1/1: Priorities of Application Contexts for HLR as Responder

	Responder = HLR	**Initiating Entity**
Priority high		
	Mobility Management	
	networkLocUp (updateLocation), (restoreData/v2), (sendParameters/v1)	VLR
	gprsLocationUpdate (updateGPRSLocation/v3),	SGSN
	infoRetrieval (sendAuthenticationInfo/v2/v3), (sendParameters/v1)	VLR/SGSN
	istAlerting (istAlert/v3) (purgeMS/v2/v3)	MSC msPurging VLR
	msPurging (purgeMS/v3)	SGSN
	Short Message Service	
	shortMsgGateway (sendRoutingInfoforSM), (reportSM-DeliveryStatus)	GMSC
	mwdMngt (readyForSM/v2/v3), (noteSubscriberPresent/v1)	VLR/SGSN
	Mobile Terminating Traffic	
	locInfoRetrieval (sendRoutingInfo)	GMSC
	anyTimeEnquiry (anyTimeInterrogation)	gsmSCF
	reporting (statusReport)	VLR
	Location Services	
	locationSvcGateway (sendRoutingInfoforLCS/v3)	GMLC
	Subscriber Controlled Inputs (Supplementary Services)	
	networkFunctionalSs (registerSS), (eraseSS), (activateSS), (deactivateSS), (interrogateSS), (registerPassword), (processUnstructuredSS-Data/v1), (beginSubscriberActivity/v1)	VLR
	callCompletion (registerCCEntry), (eraseCCEntry)	VLR
	networkUnstructuredSs (processUnstructuredSS-Request/v2)	VLR
	imsiRetrieval (sendIMSI/v2/v3)	VLR
	gprsLocationInfoRetrieval (sendRoutingInfoForGprs/v3)	GGSN/SGSN
	failureReport (failureReport/v3)	GGSN/SGSN
Priority low		

NOTE: The application context name is the last component but one of the object identifier.
Operation names are given in brackets for information with "/vn" appended to vn only operations.

Table 5.1/3: Priorities of Application Contexts for SGSN as Responder

Responder = SGSN	Initiating Entity
Priority high	
Mobility and Location Register Management	
locationCancel	HLR
(cancelLocation v3)	
reset	HLR
(reset)	
subscriberDataMngt	HLR
(insertSubscriberData v3),	
(deleteSubscriberData v3)	
tracing	HLR
(activateTraceMode),	
(deactivateTraceMode)	
Short Message Service	
shortMsgMT-Relay	MSC
(MT-ForwardSM v3)	
(forwardSM v1/v2)	
Network-Requested PDP context activation	
gprsNotify	HLR
(noteMsPresentForGprs v3),	
Priority low	

NOTE: The application context name is the last component but one of the object identifier.
Operation names are given in brackets for information with "/vn" appended to vn.

Table 5.1/2: Priorities of Application Contexts for MSC/VLR as Responder

Responder = MSC/VLR	Initiating Entity
Priority high	
Handover	
handoverControl (prepareHandover/v2), (performHandover/v1)	MSC
Mobility and Location Register Management	
locationCancel (cancelLocation)	HLR
reset (reset)	HLR
immediateTermination (istCommand/v3)	HLR
interVlrInfoRetrieval (sendIdentification/v2/v3), (sendParameters/v1)	VLR
subscriberDataMngt (insertSubscriberData), (deleteSubscriberData)	HLR
tracing (activateTraceMode), (deactivateTraceMode)	HLR
Short Message Service	
shortMsgMO-Relay (MO-ForwardSM v3) (forwardSM v1/v2)	MSC/SGSN
shortMsgMT-Relay (MT-ForwardSM v3) (forwardSM v1/v2)	MSC
shortMsgAlert (alertServiceCentre/v2), (alertServiceCentreWithoutResult/v1)	HLR
Mobile Terminating Traffic	
roamingNbEnquiry (provideRoamingNumber)	HLR
callControlTransfer (resumeCallHandling)	MSC
subscriberInfoEnquiry (provideSubscriberInformation)	HLR
reporting (remoteUserFree) (SetReportingState)	HLR
Location Services	
locationSvcEnquiry (provideSubscriberLocation v3)	GMLC
Network-Initiated USSD	
networkUnstructuredSs (unstructuredSS-Request/v2), (unstructuredSS-Notify/v2)	HLR
Priority low	

NOTE: The application context name is the last component but one of the object identifier.
Operation names are given in brackets for information with "/vn" appended to vn only operations.

****** Next Modified Section******

6.1.3.11 Summary table

The following tables summarize the SCCP address used for invoke operations. As a principle, within a PLMN either an SPC or a GT may be used (network operation option), whereas when addressing an entity outside the PLMN the GT must be used. The address type mentioned in the table (e.g. MSISDN) is used as GT or to derive the SPC.

For a response, the originating address passed in the invoke is used as SCCP Called Party Adress. For extra-PLMN addressing the own E.164 entity address is used as SCCP Calling Party Address; for intra-PLMN addressing an SPC derived from the entity number may be used instead. When using an SPC, the SPC may be taken directly from MTP.

Table 6.1/1

to from	fixed net work	HLR	VLR	MSC	EIR	gsmSCF	SIWF	SGSN	GGSN
fixed network	---	E:GT T:MSISDN	---	---	---	---	---	---	---
home location register	---	---	I:SPC/GT E:GT T:VLR NUMBER	---	---	I:SPC/GT E:GT T:gsmSCF NUMBER	---	I:SPC/GT E:GT T:SGSN NUMBER	I:SPC/GT E:GT T:GGSN NUMBER
visitor location register	---	I:SPC/GT E:GT T:MGT (outside World Zone 1)/MSISDN (World Zone 1/)HLR NUMBER (note)	I:SPC/GT E:GT T:VLR NUMBER	---	---	I:SPC/GT E:GT T:gsmSCF NUMBER	---	---	---
mobile-services switching centre	---	I:SPC/GT E:GT T:MSISDN	I:SPC/GT E:GT T:VLR NUMBER	I:SPC/GT E:GT T:MSC NUMBER	I:SPC/GT E:GT T:EIR NUMBER	I:SPC/GT E:GT T:gsmSCF NUMBER	I:SPC/GT E:GT T:SIWF NUMBER	I:SPC/GT E:GT T:SGSN NUMBER	---
gsm Service Control Function	---	I:SPC/GT E:GT T:MSISDN	---	---	---	---	---	---	---
Shared Inter Working Function	---	---	---	I:SPC/GT E:GT T:MSC NUMBER	---	---	---	---	---
Serving GPRS Support Node	---	I:SPC/GT E:GT T:MGT/ MSISDN/HLR NUMBER	---	I:SPC/GT E:GT T:MSC NUMBER	I:SPC/GT E:GT T:EIR NUMBER	---	---	---	---
Gateway GPRS Support Node	---	I:SPC/GT E:GT T:MGT	---	---	---	---	---	---	---
Gateway Mobile Location Center	---	I:SPC/GT E:GT T:MSISDN, MGT (outside World Zone 1) or IMSI (World Zone 1) (note)	---	I:SPC/GT E:GT T:MSC NUMBER	---	---	---	---	---

I: Intra-PLMN E: Extra(Inter)-PLMN T: Address Type
GT: Global Title MGT: E.214 Mobile Global Title SPC: Signalling Point Code

NOTE: For initiating the location updating procedure and an authentication information retrieval from the HLR preceding it, the VLR has to derive the HLR address from the IMSI of the MS. The result can be an SPC or an E.214 Mobile Global Title if CCITT or ITU-T SCCP is used, or IMSI itself if ANSI SCCP is used (ANSI SCCP is used in World Zone 1).. When continuing the established update location dialogue (as with any other dialogue) the VLR must derive the routeing information towards the HLR from the Calling Party Address received with the first responding CONTINUE message until the dialogue terminating message is received.
For transactions invoked by the VLR after update location completion, the VLR may derive the information for addressing the HLR from addresses received in the course of the update location procedure (MSISDN or HLR number) or from the IMSI.

When invoking the Restore Data procedure and an authentication information retrieval from the HLR preceding it, the VLR must derive the information for addressing the HLR from the address information received in association with the roaming number request. This may be either the IMSI received as a parameter of the MAP message requesting the Roaming Number or the Calling Party Address associated with the MAP message requesting the Roaming Number.
The gsmSCF shall be addressed using more than one Global Title number. The first Global Title number is used to address a gsmSCF for MAP. The second Global Title number is used to address a gsmSCF for CAP.
For querying the HLR to obtain the VMSC address to support location services, the GMLC has to derive the HLR address from either the MSISDN or IMSI of the target MS. When using the IMSI, the result can be an SPC or an E.214 Mobile Global Title if CCITT or ITU-T SCCP is used, or IMSI itself if ANSI SCCP is used (ANSI SCCP is used in World Zone 1).

Table 6.1/2

to from	UIDN	GMLC
fixed network	---	---
home location register	---	---
visitor location register	I:SPC/GT E:GT T:UIDN NUMBER	---
mobile-services switching centre	---	---
gsm Service Control Function	---	I:SPC/GT E:GT T:MSISDN
Shared Inter Working Function	---	---
Serving GPRS Support Node	I:SPC/GT E:GT T:UIDN NUMBER	---
Gateway GPRS Support Node	---	---
Gateway Mobile Location Center	---	

I: Intra-PLMN E: Extra(Inter)-PLMN T: Address Type
GT: Global Title MGT: E.214 Mobile Global Title SPC: Signalling Point Code

****** Next Modified Section ******

7.6 Definition of parameters

Following is an alphabetic list of parameters used in the common MAP-services in subclause 7.3:

Application context name	7.3.1	Refuse reason	7.3.1
Destination address	7.3.1	Release method	7.3.2
Destination reference	7.3.1	Responding address	7.3.1
Diagnostic information	7.3.4	Result	7.3.1
Originating address	7.3.1	Source	7.3.5
Originating reference	7.3.1	Specific information	7.3.1/7.3.2/7.3.4
Problem diagnostic	7.3.6	User reason	7.3.4
Provider reason	7.3.5		

Following is an alphabetic list of parameters contained in this clause:

Extensible Forwarding info	7.6.3.15
Extensible Forwarding information for CSE	7.6.3.80
Extensible Forwarding Options	7.6.3.18
Extensible No reply condition timer	7.6.3.19
Extensible QoS-Subscribed	7.6.3.74
Extensible SS-Data	7.6.3.29
Extensible SS-Info	7.6.3.14
Extensible SS-Status	7.6.3.17
Extensible Teleservice	7.6.3.4
External Signal Information	7.6.9.4
Forwarded-to number	7.6.2.22
Forwarded-to subaddress	7.6.2.23
Forwarding feature	7.6.4.16
Forwarding information	7.6.4.15
Forwarding Options	7.6.4.6
GGSN address	7.6.2.40
GGSN number	7.6.2.41
GMSC CAMEL Subscription Info	7.6.3.34
GPRS enhancements support indicator	7.6.3.73
GPRS Node Indicator	7.6.8.14
GPRS Subscription Data	7.6.3.46
GPRS Subscription Data Withdraw	7.6.3.45
GPRS Support Indicator	7.6.8.15
Group Id	7.6.2.33
GSM bearer capability	7.6.3.6
Guidance information	7.6.4.22
Handover number	7.6.2.21
High Layer Compatibility	7.6.3.43
HLR Id	7.6.2.15
HLR number	7.6.2.13
HO-Number Not Required	7.6.6.7
IMEI	7.6.2.3
IMSI	7.6.2.1
Inter CUG options	7.6.3.27
Intra CUG restrictions	7.6.3.28
Invoke Id	7.6.1.1
ISDN Bearer Capability	7.6.3.41
IST Alert Timer	7.6.3.66
SM-RP-PRI	7.6.8.5
SM-RP-SMEA	7.6.8.17
SM-RP-UI	7.6.8.4
Sres	7.6.7.3
SS-Code	7.6.4.1
SS-Data	7.6.4.3
SS-Event	7.6.4.42
SS-Event-Data	7.6.4.43
SS-Info	7.6.4.24
SS-Status	7.6.4.2
Stored location area Id	7.6.2.5
Subscriber State	7.6.3.30
Subscriber Status	7.6.3.7
Super-Charger Supported in HLR	7.6.3.70
Super-Charger Supported in Serving Network Entity	7.6.3.71
Supported CAMEL Phases in VLR	7.6.3.36
Supported CAMEL Phases in SGSN	7.6.3.36A
Suppress T-CSI	7.6.3.33
Suppression of Announcement	7.6.3.32
Target cell Id	7.6.2.8
Target location area Id	7.6.2.7
Target MSC number	7.6.2.12
Teleservice	7.6.4.39
TEMSI	7.6.2.4
TMSI	7.6.2.2
Trace reference	7.6.10.2
Trace type	7.6.10.3
User error	7.6.1.4
USSD Data Coding Scheme	7.6.4.36
USSD String	7.6.4.37
UU Data	7.6.5.12
UUS CF Interaction	7.6.5.13
VBS Data	7.6.3.40
VGCS Data	7.6.3.39
VLR CAMEL Subscription Info	7.6.3.35
VLR number	7.6.2.14
VPLMN address allowed	7.6.3.48
Zone Code	7.6.2.28

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7.6.2.3 EMSI

This parameter is the Encrypted Mobile Subscriber Identity defined in 3G TS 23.003.

7.6.2.4 TEMSI

This parameter is the Temporarily Encrypted Mobile Subscriber Identity defined in 3G TS 23.003.

****** Next Modified Section******

8.1.4 MAP_SEND_IDENTIFICATION service

8.1.4.1 Definition

The MAP_SEND_IDENTIFICATION service is used between a VLR and a previous VLR to retrieve IMSI, TEMSI and authentication sets for a subscriber registering afresh in that VLR.

The MAP_SEND_IDENTIFICATION service is a confirmed service using the service primitives defined in table 8.1/4.

8.1.4.2 Service primitives

Table 8.1/4: MAP_SEND_IDENTIFICATION

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
TMSI	M	M(=)		
Number of requested vectors	M	M(=)		
Segmentation prohibited indicator	C	C (=)		
IMSI			C	C(=)
TEMSI			C	C(=)
Authentication set			U	C(=)
User error			C	C(=)
Provider error				O

8.1.4.3 Parameter definitions and use

Invoke Id

See definition in subclause 7.6.1.

TMSI

See definition in subclause 7.6.2.

TEMSI

See definition in subclause 7.6.2.

Number of requested vectors

A number indicating how many authentication vectors the new VLR is prepared to receive.

Segmentation prohibited indicator

This parameter indicates if the new VLR or SGSN allows message segmentation.

IMSI

See definition in subclause 7.6.2. The IMSI is to be returned if the service succeeds.

Authentication set

See definition in subclause 7.6.7. If the service succeeds a list of up to five authentication sets is returned, if there are any available.

User error

This parameter is mandatory if the service fails. The following error cause defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- unidentified subscriber.

Provider error

For definition of provider errors see subclause 7.6.1.

****** Next Modified Section******

9.2.1 MAP-SEND-IMSI service

9.2.1.1 Definition

This service is used by a VLR in order to fetch the IMSI of a subscriber in case of some Operation & Maintenance procedure where subscriber data are needed in the Visited PLMN and MSISDN is the only subscriber's identity known. This service is used by a VLR or SGSN in order to fetch the IMSI and TEMSI of a subscriber if the Mobile station identifies itself with an Encrypted Mobile Subscriber Identity (EMSI).

It is a confirmed service and consists of the primitive shown in table 9.2/1.

9.2.1.2 Service primitives

Table 9.2/1: MAP-SEND-IMSI

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
MSISDN	C	C(=)		
EMSI	C	C(=)		
IMSI			C	C(=)
TEMSI			C	C(=)
User error			C	C(=)
Provider error				O

9.2.1.3 Parameter use

All parameters are described in subclause 7.6. The following clarifications are applicable:

User error

Only one of the following values is applicable:

- Unknown subscriber;
- Unexpected data value;
- Data missing.

****** Next Modified Section******

17.1.6 Application Contexts

The following informative table lists the latest versions of the Application Contexts used in this specification, with the operations used by them and, where applicable, whether or not the operation description is exactly the same as for previous versions. Information in sections 17.6 & 17.7 relates only to the ACs in this table.

AC Name	AC Version	Operations Used	Comments *
locationCancellationContext	v3	cancelLocation	
equipmentMngtContext	v2	checkIMEI	
imsiRetrievalContext	v3	sendIMSI	
infoRetrievalContext	v3	sendAuthenticationInfo	
interVlrInfoRetrievalContext	v3	sendIdentification	
handoverControlContext	v2	prepareHandover forwardAccessSignalling sendEndSignal processAccessSignalling prepareSubsequentHandover	
mwdMngtContext	v3	readyForSM	
msPurgingContext	v3	purgeMS	

shortMsgAlertContext	v2	alertServiceCentre	
resetContext	v2	reset	
networkUnstructuredSsContext	v2	processUnstructuredSS-Request unstructuredSS-Request unstructuredSS-Notify	
tracingContext	v3	activateTraceMode deactivateTraceMode	
networkFunctionalSsContext	v2	registerSS eraseSS activateSS deactivateSS registerPassword interrogateSS getPassword	
shortMsgMO-RelayContext	v3	mo-forwardSM	
shortMsgMT-RelayContext	v3	mt-forwardSM	
shortMsgGatewayContext	v3	sendRoutingInfoForSM reportSM-DeliveryStatus InformServiceCentre	the syntax of this operation has been extended in comparison with release 96 version
networkLocUpContext	v3	updateLocation forwardCheckSs-Indication restoreData insertSubscriberData activateTraceMode	the syntax is the same in v1 & v2
gprsLocationUpdateContext	v3	updateGprsLocation insertSubscriberData activateTraceMode	
subscriberDataMngtContext	v3	insertSubscriberData deleteSubscriberData	
roamingNumberEnquiryContext	v3	provideRoamingNumber	
locationInfoRetrievalContext	v3	sendRoutingInfo	
gprsNotifyContext	v3	noteMsPresentForGprs	
gprsLocationInfoRetrievalContext	v3	sendRoutingInfoForGprs	
failureReportContext	v3	failureReport	
callControlTransferContext	v4	resumeCallHandling	
subscriberInfoEnquiryContext	v3	provideSubscriberInfo	
anyTimeEnquiryContext	v3	anyTimeInterrogation	
anyTimeInfoHandlingContext	v3	anyTimeSubscriptionInterrogation anyTimeModification	
ss-InvocationNotificationContext	v3	ss-InvocationNotification	
sIWFSAllocationContext	v3	provideSIWFSNumber sIWFSSignallingModify	
groupCallControlContext	v3	prepareGroupCall processGroupCallSignalling forwardGroupCallSignalling sendGroupCallEndSignal	
reportingContext	v3	setReportingState statusReport remoteUserFree	
callCompletionContext	v3	registerCC-Entry eraseCC-Entry	
istAlertingContext	v3	istAlert	
ImmediateTerminationContext	v3	istCommand	
locationSvcEnquiryContext	v3	provideSubscriberLocation subscriberLocationReport	
locationSvcGatewayContext	v3	sendRoutingInfoForLCS	
mm-EventReportingContext	v3	noteMM-Event	
subscriberDataModificationNotificationContext	v3	noteSubscriberDataModified	

NOTE (*): The syntax of the operations is not the same as in previous versions unless explicitly stated

****** Next Modified Section******

17.2.2.6 IMSI retrieval

This operation package includes the operation required for the IMSI retrieval procedure between HLR and VLR. Furthermore it is used for retrieval of IMSI and TEMSI between UIDN and VLR and between UIDN and SGSN.

```
IMSIRetrievalPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is VLR
     -- Supplier is UIDN if Consumer is VLR
     -- Supplier id UIDN if Consumer is SGSN
     CONSUMER INVOKES {
          sendIMSI}
```

The v2-equivalent package can be determined according to the rules described in subclause 17.2.1.****** Next Modified Section******

17.3.2.13 IMSI Retrieval

This application context is used for IMSI retrieval between HLR and VLR. Furthermore this application context is used for retrieval of IMSI and TEMSI between UIDN and VLR or between UIDN and SGSN. For the UIDN - VLR and UIDN - SGSN interfaces only version 3 of this application context is applicable.

```
imsiRetrievalContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is VLR
     -- Responder is UIDN if Initiator is VLR
     -- responder is UIDN if Initiator is SGSN
     INITIATOR CONSUMER OF {
          IMSIRetrievalPackage-v3}
::= {map-ac imsiRetrieval(26) version3(3)}
```

The following application-context-name is assigned to the v2-equivalent application-context:

```
{map-ac imsiRetrieval(26) version2(2)}
```

****** Next Modified Section******

17.3.3 ASN.1 Module for application-context-names

The following ASN.1 module summarizes the application-context-name assigned to MAP application-contexts.

```
MAP-ApplicationContexts {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ApplicationContexts (2) version6 (6)}

DEFINITIONS

::=

BEGIN


-- EXPORTS everything


IMPORTS
   gsm-NetworkId,
   ac-Id
FROM MobileDomainDefinitions {
   ccitt (0) identified-organization (4) etsi (0) mobileDomain (0)
   mobileDomainDefinitions (0) version1 (1)}
;

-- application-context-names

map-ac  OBJECT IDENTIFIER ::= {gsm-NetworkId ac-Id}
```

```
networkLocUpContext-v3  OBJECT IDENTIFIER ::=
     {map-ac networkLocUp(1) version3(3)}

locationCancellationContext-v3  OBJECT IDENTIFIER ::=
     {map-ac locationCancel(2) version3(3)}

roamingNumberEnquiryContext-v3  OBJECT IDENTIFIER ::=
     {map-ac roamingNbEnquiry(3) version3(3)}

locationInfoRetrievalContext-v3  OBJECT IDENTIFIER ::=
     {map-ac locInfoRetrieval(5) version3(3)}

resetContext-v2  OBJECT IDENTIFIER ::=
     {map-ac reset(10) version2(2)}

handoverControlContext-v2  OBJECT IDENTIFIER ::=
     {map-ac handoverControl(11) version2(2)}

equipmentMngtContext-v2  OBJECT IDENTIFIER ::=
     {map-ac equipmentMngt(13) version2(2)}

infoRetrievalContext-v3  OBJECT IDENTIFIER ::=
     {map-ac infoRetrieval(14) version3(3)}

interVlrInfoRetrievalContext-v3  OBJECT IDENTIFIER ::=
     {map-ac interVlrInfoRetrieval(15) version3(3)}

subscriberDataMngtContext-v3  OBJECT IDENTIFIER ::=
     {map-ac subscriberDataMngt(16) version3(3)}

tracingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac tracing(17) version3(3)}

networkFunctionalSsContext-v2  OBJECT IDENTIFIER ::=
     {map-ac networkFunctionalSs(18) version2(2)}

networkUnstructuredSsContext-v2  OBJECT IDENTIFIER ::=
     {map-ac networkUnstructuredSs(19) version2(2)}

shortMsgGatewayContext-v3  OBJECT IDENTIFIER ::=
     {map-ac shortMsgGateway(20) version3(3)}

shortMsgMO-RelayContext-v3  OBJECT IDENTIFIER ::=
     {map-ac shortMsgMO-Relay(21) version3(3)}

shortMsgAlertContext-v2  OBJECT IDENTIFIER ::=
     {map-ac shortMsgAlert(23) version2(2)}

mwdMngtContext-v3  OBJECT IDENTIFIER ::=
     {map-ac mwdMngt(24) version3(3)}

shortMsgMT-RelayContext-v3  OBJECT IDENTIFIER ::=
     {map-ac shortMsgMT-Relay(25) version3(3)}

imsiRetrievalContext-v3  OBJECT IDENTIFIER ::=
     {map-ac imsiRetrieval(26) version3(3)}

msPurgingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac msPurging(27) version3(3)}

subscriberInfoEnquiryContext-v3  OBJECT IDENTIFIER ::=
     {map-ac subscriberInfoEnquiry(28) version3(3)}

anyTimeInfoEnquiryContext-v3  OBJECT IDENTIFIER ::=
     {map-ac anyTimeInfoEnquiry(29) version3(3)}

callControlTransferContext-v4  OBJECT IDENTIFIER ::=
     {map-ac callControlTransfer(6) version4(4)}

ss-InvocationNotificationContext-v3  OBJECT IDENTIFIER ::=
     {map-ac ss-InvocationNotification(36) version3(3)}

sIWFSAllocationContext-v3  OBJECT IDENTIFIER ::=
     {map-ac sIWFSAllocation(12) version3(3)}
```

```
groupCallControlContext-v3  OBJECT IDENTIFIER ::=
     {map-ac groupCallControl(31) version3(3)}

gprsLocationUpdateContext-v3  OBJECT IDENTIFIER ::=
     {map-ac gprsLocationUpdate(32) version3(3)}

gprsLocationInfoRetrievalContext-v3  OBJECT IDENTIFIER ::=
     {map-ac gprsLocationInfoRetrieval(33) version3(3)}

failureReportContext-v3  OBJECT IDENTIFIER ::=
     {map-ac failureReport(34) version3(3)}

gprsNotifyContext-v3  OBJECT IDENTIFIER ::=
     {map-ac gprsNotify(35) version3(3)}

reportingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac reporting(7) version3(3)}

callCompletionContext-v3  OBJECT IDENTIFIER ::=
     {map-ac callCompletion(8) version3(3)}

istAlertingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac istAlerting(4) version3(3)}

serviceTerminationContext-v3  OBJECT IDENTIFIER ::=
     {map-ac immediateTermination(9) version3(3)}

locationSvcGatewayContext-v3  OBJECT IDENTIFIER ::=
     {map-ac locationSvcGateway(37) version3(3)}

locationSvcEnquiryContext-v3  OBJECT IDENTIFIER ::=
     {map-ac locationSvcEnquiry(38) version3(3)}


mm-EventReportingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac mm-EventReporting(42) version3(3)}

anyTimeInfoHandlingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac anyTimeInfoHandling(43) version3(3)}

subscriberDataModificationNotificationContext-v3  OBJECT IDENTIFIER ::=
     {map-ac subscriberDataModificationNotification(22) version3(3)}

-- The following Object Identifiers are reserved for application-
-- contexts existing in previous versions of the protocol
```

-- AC Name & Version	Object Identifier	
--		
-- networkLocUpContext-v1	map-ac networkLocUp (1)	version1 (1)
-- networkLocUpContext-v2	map-ac networkLocUp (1)	version2 (2)
-- locationCancellationContext-v1	map-ac locationCancellation (2)	version1 (1)
-- locationCancellationContext-v2	map-ac locationCancellation (2)	version2 (2)
-- roamingNumberEnquiryContext-v1	map-ac roamingNumberEnquiry (3)	version1 (1)
-- roamingNumberEnquiryContext-v2	map-ac roamingNumberEnquiry (3)	version2 (2)
-- locationInfoRetrievalContext-v1	map-ac locationInfoRetrieval (5)	version1 (1)
-- locationInfoRetrievalContext-v2	map-ac locationInfoRetrieval (5)	version2 (2)
-- resetContext-v1	map-ac reset (10)	version1 (1)
-- handoverControlContext-v1	map-ac handoverControl (11)	version1 (1)
-- equipmentMngtContext-v1	map-ac equipmentMngt (13)	version1 (1)
-- infoRetrievalContext-v1	map-ac infoRetrieval (14)	version1 (1)
-- infoRetrievalContext-v2	map-ac infoRetrieval (14)	version2 (2)
-- interVlrInfoRetrievalContext-v2	map-ac interVlrInfoRetrieval (15)	version2 (2)
-- subscriberDataMngtContext-v1	map-ac subscriberDataMngt (16)	version1 (1)
-- subscriberDataMngtContext-v2	map-ac subscriberDataMngt (16)	version2 (2)
-- tracingContext-v1	map-ac tracing (17)	version1 (1)
-- tracingContext-v2	map-ac tracing (17)	version2 (2)
-- networkFunctionalSsContext-v1	*map-ac networkFunctionalSs (18)*	*version1 (1)*
-- shortMsgGatewayContext-v1	map-ac shortMsgGateway (20)	version1 (1)
-- shortMsgGatewayContext-v2	map-ac shortMsgGateway (20)	version2 (2)
-- shortMsgRelayContext-v1	map-ac shortMsgRelay (21)	version1 (1)
-- shortMsgAlertContext-v1	map-ac shortMsgAlert (23)	version1 (1)
-- mwdMngtContext-v1	*map-ac mwdMngt (24)*	*version1 (1)*
-- mwdMngtContext-v2	map-ac mwdMngt (24)	version2 (2)
-- shortMsgMT-RelayContext-v2	map-ac shortMsgMT-Relay (25)	version2 (2)
-- msPurgingContext-v2	map-ac msPurging (27)	version2 (2)
-- callControlTransferContext-v3	map-ac callControlTransferContext (6)	version3 (3)
-- imsiRetrievalContext-v2	map-ac imsiRetrieval(26)	version2(2)}

```
END
```

****** Next Modified Section******

17.7.1 Mobile Service data types

```
MAP-MS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-MS-DataTypes (11) version6 (6)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS

   -- location registration types
   UpdateLocationArg,
   UpdateLocationRes,
   CancelLocationArg,
   CancelLocationRes,
   PurgeMS-Arg,
   PurgeMS-Res,
   SendIdentificationArg,
   SendIdentificationRes,
   UpdateGprsLocationArg,
   UpdateGprsLocationRes,
   IST-SupportIndicator,


   -- handover types
   PrepareHO-Arg,
   PrepareHO-Res,
   PrepareSubsequentHO-Arg,

   -- authentication management types
   SendAuthenticationInfoArg,
   SendAuthenticationInfoRes,

```

```
    -- security management types
    EquipmentStatus,
    Kc,

    -- subscriber management types
    InsertSubscriberDataArg,
    InsertSubscriberDataRes,
    DeleteSubscriberDataArg,
    DeleteSubscriberDataRes,
    SubscriberData,
    ODB-Data,
    SubscriberStatus,
    ZoneCodeList,
    maxNumOfZoneCodes,
    O-CSI,
    D-CSI,
    O-BcsmCamelTDPCriteriaList,
    T-BCSM-CAMEL-TDP-CriteriaList,
    SS-CSI,
    ServiceKey,
    DefaultCallHandling,
    CamelCapabilityHandling,
    BasicServiceCriteria,
    SupportedCamelPhases,
    maxNumOfCamelTDPData,
    CUG-Index,
    CUG-Interlock,
    InterCUG-Restrictions,
    IntraCUG-Options,
    IST-AlertTimerValue,
    T-CSI,
    T-BcsmTriggerDetectionPoint,

    -- fault recovery types
    ResetArg,
    RestoreDataArg,
    RestoreDataRes,

    -- subscriber information enquiry types
    ProvideSubscriberInfoArg,
    ProvideSubscriberInfoRes,
    SubscriberInfo,
    LocationInformation,
    SubscriberState,

    -- any time information enquiry types
    AnyTimeInterrogationArg,
    AnyTimeInterrogationRes,

    -- any time information handling types
    AnyTimeSubscriptionInterrogationArg,
    AnyTimeSubscriptionInterrogationRes,
    AnyTimeModificationArg,
    AnyTimeModificationRes,

    -- subscriber data modification notification types
    NoteSubscriberDataModifiedArg,
    NoteSubscriberDataModifiedRes,

    -- gprs location information retrieval types
    SendRoutingInfoForGprsArg,
    SendRoutingInfoForGprsRes,

    -- failure reporting types
    FailureReportArg,
    FailureReportRes,

    -- gprs notification types
    NoteMsPresentForGprsArg,
    NoteMsPresentForGprsRes,

    -- Mobility Management types
    NoteMM-EventArg,
    NoteMM-EventRes



;

```

```
IMPORTS
   maxNumOfSS,
   SS-SubscriptionOption,
   SS-List,
   SS-ForBS-Code,
   Password
FROM MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version6 (6)}

   SS-Code
FROM MAP-SS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version6 (6)}

   Ext-BearerServiceCode
FROM MAP-BS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-BS-Code (20) version6 (6)}

   Ext-TeleserviceCode
FROM MAP-TS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-TS-Code (19) version6 (6)}


   AddressString,
   ISDN-AddressString,
   ISDN-SubaddressString,
   ExternalSignalInfo,
   IMSI,
   TMSI,
   TEMSI,
   HLR-List,
   LMSI,
   Identity,
   GlobalCellId,
   CellIdOrLAI,
   Ext-BasicServiceCode,
   NAEA-PreferredCI,
   EMLPP-Info,
   SubscriberIdentity,
   AgeOfLocationInformation,
   LCSClientExternalID,
   LCSClientInternalID



FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}

   AbsentSubscriberDiagnosticSM
FROM MAP-ER-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ER-DataTypes (17) version6 (6)}


;


-- location registration types

UpdateLocationArg ::= SEQUENCE {
    imsi                                IMSI,

    msc-Number                          [1] ISDN-AddressString,
    vlr-Number                          ISDN-AddressString,
    lmsi                                [10] LMSI OPTIONAL,
    extensionContainer                  ExtensionContainer              OPTIONAL,
    ... ,
    vlr-Capability                      [6] VLR-Capability              OPTIONAL }
```

```
VLR-Capability ::= SEQUENCE{
    supportedCamelPhases                [0] SupportedCamelPhases          OPTIONAL,
    extensionContainer                  ExtensionContainer                OPTIONAL,
    ... ,
    solsaSupportIndicator               [2] NULL                          OPTIONAL,
    istSupportIndicator                 [1] IST-SupportIndicator          OPTIONAL,
    superChargerSupportedInServingNetworkEntity   [3] SuperChargerInfo    OPTIONAL }

SuperChargerInfo ::= CHOICE {
    sendSubscriberData                  [0] NULL,
    subscriberDataStored                [1] AgeIndicator }

AgeIndicator ::= OCTET STRING (SIZE (1..6))
    -- The internal structure of this parameter is implementation specific.


IST-SupportIndicator ::=  ENUMERATED {
    basicISTSupported                   (0),
    istCommandSupported                 (1), ...}
-- exception handling:
-- reception of values > 1 shall be mapped to ' istCommandSupported '


UpdateLocationRes ::= SEQUENCE {
    hlr-Number                          ISDN-AddressString,

    extensionContainer                  ExtensionContainer                OPTIONAL,
    ... }

CancelLocationArg ::= [3] SEQUENCE {
    identity                            Identity,
    cancellationType                    CancellationType                  OPTIONAL,
    extensionContainer                  ExtensionContainer                OPTIONAL,
    ...}


CancellationType ::= ENUMERATED {
    updateProcedure                     (0),
    subscriptionWithdraw                (1),
    ...}
    -- The HLR shall not send values other than listed above


CancelLocationRes ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                OPTIONAL,
    ...}

PurgeMS-Arg ::= [3] SEQUENCE {
    imsi                                IMSI,
    vlr-Number                          [0] ISDN-AddressString            OPTIONAL,
    sgsn-Number                         [1]  ISDN-AddressString           OPTIONAL,
    extensionContainer                  ExtensionContainer                OPTIONAL,
    ...}

PurgeMS-Res ::= SEQUENCE {
    freezeTMSI                          [0]  NULL                         OPTIONAL,
    freezeP-TMSI                        [1]  NULL                         OPTIONAL,
    extensionContainer                  ExtensionContainer                OPTIONAL,
    ...}

SendIdentificationArg ::= SEQUENCE {
    tmsi                                TMSI,
    numberOfRequestedVectors            NumberOfRequestedVectors,
    segmentationProhibited              NULL                              OPTIONAL,
    -- if segmentation is prohibited the previous VLR shall not send the result
    -- within a TC-CONTINUE message.
    extensionContainer                  ExtensionContainer                OPTIONAL,
    ...}
```

```
SendIdentificationRes ::= [3] SEQUENCE {
    imsi                                IMSI                                OPTIONAL,
    -- IMSI must be present if SendIdentificationRes is not segmented.
    -- If the TC-Continue segmentation option is taken the IMSI must be
    -- present in one segmented transmission of SendIdentificationRes.
    temsi                               TEMSI                               OPTIONAL,
    authenticationSetList               AuthenticationSetList               OPTIONAL,
    extensionContainer                  [2] ExtensionContainer              OPTIONAL,
    ...}

AuthenticationSetList ::= CHOICE {
    tripletList                         [0] TripletList,
    quintupletList                      [1] QuintupletList }

TripletList ::= SEQUENCE SIZE (1..5) OF
                                        AuthenticationTriplet

QuintupletList ::= SEQUENCE SIZE (1..5) OF
                                        AuthenticationQuintuplet

AuthenticationTriplet ::= SEQUENCE {
    rand                                RAND,
    sres                                SRES,
    kc                                  Kc,
    ...}

AuthenticationQuintuplet ::= SEQUENCE {
    rand                                RAND,
    xres                                XRES,
    ck                                  CK,
    ik                                  IK,
    autn                                AUTN,
    ...}

RAND ::= OCTET STRING (SIZE (16))

SRES ::= OCTET STRING (SIZE (4))

Kc ::= OCTET STRING (SIZE (8))

XRES ::= OCTET STRING (SIZE (4..16))

CK ::= OCTET STRING (SIZE (16))

IK ::= OCTET STRING (SIZE (16))

AUTN ::= OCTET STRING (SIZE (14..18))

AUTS ::= OCTET STRING (SIZE (12..16))

-- gprs location registration types

UpdateGprsLocationArg ::= SEQUENCE {
    imsi                                IMSI,
    sgsn-Number                         ISDN-AddressString,
    sgsn-Address                        GSN-Address,
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ... ,
    sgsn-Capability                     [0] SGSN-Capability                 OPTIONAL }

SGSN-Capability ::= SEQUENCE{
    solsaSupportIndicator               NULL                                OPTIONAL,
    extensionContainer                  [1] ExtensionContainer              OPTIONAL,
    ... ,
    superChargerSupportedInServingNetworkEntity   [2] SuperChargerInfo      OPTIONAL ,
    gprsEnhancementsSupportIndicator    [3] NULL                            OPTIONAL,
    supportedCamelPhases                [4] SupportedCamelPhases            OPTIONAL }

GSN-Address ::= OCTET STRING (SIZE (5..17))
    -- Octets are coded according to TS GSM 03.03

UpdateGprsLocationRes ::= SEQUENCE {
    hlr-Number                          ISDN-AddressString,
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...}
```

```
-- handover types

PrepareHO-Arg ::= SEQUENCE {
     targetCellId                         GlobalCellId                         OPTIONAL,
     ho-NumberNotRequired                 NULL                                 OPTIONAL,
     bss-APDU                             ExternalSignalInfo                   OPTIONAL,
     ...}

PrepareHO-Res ::= SEQUENCE {
     handoverNumber                       ISDN-AddressString                   OPTIONAL,
     bss-APDU                             ExternalSignalInfo                   OPTIONAL,
     ...}

PrepareSubsequentHO-Arg ::= SEQUENCE {
     targetCellId                         GlobalCellId,
     targetMSC-Number                     ISDN-AddressString,
     bss-APDU                             ExternalSignalInfo,
     ...}

-- authentication management types

SendAuthenticationInfoArg ::= SEQUENCE {
     imsi                                 [0] IMSI,
     numberOfRequestedVectors             NumberOfRequestedVectors,
     segmentationProhibited               NULL                                 OPTIONAL,
     -- if segmentation is prohibited the HLR shall not send the result within
     -- a TC-CONTINUE message.
     immediateResponsePreferred           [1] NULL                              OPTIONAL,
     -- if present, the HLR may send an immediate response with the available authentication
     -- vectors (see § 8.5.2 for more information).
     re-synchronisationInfo               Re-synchronisationInfo               OPTIONAL,
     extensionContainer                   [2] ExtensionContainer               OPTIONAL,
     ...}

NumberOfRequestedVectors ::= INTEGER (1..5)

Re-synchronisationInfo ::= SEQUENCE {
     rand                                 RAND,
     rand-ms                              RAND,
     auts                                 AUTS,
     ...}

SendAuthenticationInfoRes ::= [3] SEQUENCE {
     authenticationSetList                AuthenticationSetList                OPTIONAL,
     extensionContainer                   ExtensionContainer                   OPTIONAL,
     ...}


-- security management types

EquipmentStatus ::= ENUMERATED {
     whiteListed  (0),
     blackListed  (1),
     greyListed  (2)}


-- subscriber management types
```

```
InsertSubscriberDataArg ::= SEQUENCE {
    imsi                                [0] IMSI                                OPTIONAL,
    COMPONENTS OF                       SubscriberData,
    extensionContainer                  [14] ExtensionContainer                 OPTIONAL,
    ... ,
    naea-PreferredCI                    [15] NAEA-PreferredCI                   OPTIONAL,
    -- naea-PreferredCI is included at the discretion of the HLR operator.
    gprsSubscriptionData                [16] GPRSSubscriptionData               OPTIONAL,
    roamingRestrictedInSgsnDueToUnsupportedFeature [23]                         NULL
                                                                                OPTIONAL,
    networkAccessMode                   [24] NetworkAccessMode                  OPTIONAL,
    lsaInformation                      [25] LSAInformation                     OPTIONAL,
    lmu-Indicator                       [21] NULL                               OPTIONAL,
    lcsInformation                      [22] LCSInformation                     OPTIONAL,
   istAlertTimer                        [26] IST-AlertTimerValue                OPTIONAL,
   superChargerSupportedInHLR           [27] AgeIndicator                       OPTIONAL
     }
    -- If the Network Access Mode parameter is sent, it shall be present only in
    -- the first sequence if the seqmentation is used

IST-AlertTimerValue ::= INTEGER (15..255)

LCSInformation ::= SEQUENCE {
    gmlc-List [0]                       GMLC-List OPTIONAL,
    lcs-PrivacyExceptionList            [1]  LCS-PrivacyExceptionList     OPTIONAL,
    molr-List                           [2]  MOLR-List                    OPTIONAL,
...}

GMLC-List ::= SEQUENCE SIZE (1..maxNumOfGMLC) OF
                                        ISDN-AddressString
    -- if segmentation is used, the complete GMLC-List shall be sent in one segment

maxNumOfGMLC  INTEGER ::= 5


NetworkAccessMode ::= ENUMERATED {
    bothMSCAndSGSN                      (0),
    onlyMSC                             (1),
    onlySGSN                            (2),
    ...}
    -- if unknown values are received in NetworkAccessMode
    -- they shall be discarded.

GPRSDataList ::= SEQUENCE SIZE (1..maxNumOfPDP-Contexts) OF
                                        PDP-Context

maxNumOfPDP-Contexts  INTEGER ::= 50

PDP-Context ::= SEQUENCE {
    pdp-ContextId                       ContextId,
    pdp-Type                            [16] PDP-Type,
    pdp-Address                         [17] PDP-Address                OPTIONAL,
    qos-Subscribed                      [18] QoS-Subscribed,
    vplmnAddressAllowed                 [19] NULL OPTIONAL,
    apn                                 [20] APN  ,
    extensionContainer                  [21] ExtensionContainer         OPTIONAL,
    ... ,
    ext-QoS-Subscribed                  [0] Ext-QoS-Subscribed          OPTIONAL }
    -- qos-Subscribed shall be discarded if ext-QoS-Subscribed is received and supported

ContextId ::= INTEGER (1..maxNumOfPDP-Contexts)


GPRSSubscriptionData ::= SEQUENCE {
    completeDataListIncluded            NULL                                OPTIONAL,

         -- If segmentation is used, completeDataListIncluded may only be present in the
         -- first segment.
    gprsDataList                        [1]  GPRSDataList,
    extensionContainer                  [2] ExtensionContainer              OPTIONAL,
    ... ,
    sgsn-CAMEL-SubscriptionInfo         [3] SGSN-CAMEL-SubscriptionInfo     OPTIONAL }
```

```
SGSN-CAMEL-SubscriptionInfo ::= SEQUENCE {
     gprs-CSI                          [0]  GPRS-CSI                    OPTIONAL,
     sms-CSI                           [1]  SMS-CSI                     OPTIONAL,
     extensionContainer                [2]  ExtensionContainer          OPTIONAL,
     ...}

GPRS-CSI ::= SEQUENCE {
     gprs-CamelTDPDataList             [0] GPRS-CamelTDPDataList,
     camelCapabilityHandling           [1] CamelCapabilityHandling,
     extensionContainer                [2] ExtensionContainer           OPTIONAL,
     notificationToCSE                 [3]  NULL                        OPTIONAL,
     csiActive                         [4]  NULL                        OPTIONAL,
     ...}
--   notificationToCSE and csiActive shall not be present when GPRS-CSI is sent to SGSN.
--   They may only be included in ATSI/ATM Ack message.

GPRS-CamelTDPDataList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     GPRS-CamelTDPData
--   GPRS-CamelTDPDataList shall not contain more than one instance of
--   GPRS-CamelTDPData containing the same value for gprs-TriggerDetectionPoint.

GPRS-CamelTDPData ::= SEQUENCE {
     gprs-TriggerDetectionPoint        [0] GPRS-TriggerDetectionPoint,
     serviceKey                        [1] ServiceKey,
     gsmSCF-Address                    [2] ISDN-AddressString,
     defaultSessionHandling            [3] DefaultGPRS-Handling,
     extensionContainer                [4] ExtensionContainer           OPTIONAL,
     ...
     }

DefaultGPRS-Handling ::= ENUMERATED {
     continueTransaction (0) ,
     releaseTransaction (1) ,
     ...}
-- exception handling:
-- reception of values in range 2-31 shall be treated as "continueTransaction"
-- reception of values greater than 31 shall be treated as "releaseTransaction"

GPRS-TriggerDetectionPoint ::= ENUMERATED {
     attach                                (1),
     attachChangeOfPosition                (2),
     pdp-ContextEstablishment              (11),
     pdp-ContextEstablishmentAcknowledgement  (12),
     pdp-ContextChangeOfPosition           (14),
     ... }
-- exception handling:
-- For GPRS-CamelTDPData sequences containing this parameter with any
-- other value than the ones listed the receiver shall ignore the whole
-- GPRS-CamelTDPDatasequence.


APN ::=  OCTET STRING (SIZE (2..63))
         -- Octets are coded according to TS GSM 03.03


PDP-Type ::= OCTET STRING (SIZE (2))
-- Octets are coded according to TS GSM 09.60


PDP-Address ::= OCTET STRING (SIZE (1..16))
-- Octets are coded according to TS GSM 09.60

-- The possible size values are:
-- 1-7 octets  X.25 address type
--  4  octets  IPv4 address type
-- 16  octets  Ipv6 address type


QoS-Subscribed ::= OCTET STRING (SIZE (3))
     -- Octets are coded according to TS GSM 04.08.

Ext-QoS-Subscribed ::= OCTET STRING (SIZE (3..15))
     -- Octets are coded according to 3G TS 24.008.
```

```
LSAOnlyAccessIndicator ::= ENUMERATED {
    accessOutsideLSAsAllowed  (0),
    accessOutsideLSAsRestricted (1)}

LSADataList ::= SEQUENCE SIZE (1..maxNumOfLSAs) OF
                                    LSAData

maxNumOfLSAs  INTEGER ::= 20

LSAData ::= SEQUENCE {
    lsaIdentity                     [0] LSAIdentity,
    lsaPriority                     [1] LSAPriority,
    lsaActiveModeIndicator          [2] NULL                        OPTIONAL,
    lsaActiveModeSupportIndicator   [3] NULL                        OPTIONAL,
    extensionContainer              [4] ExtensionContainer          OPTIONAL,
    ...}

LSAInformation ::= SEQUENCE {
    completeDataListIncluded            NULL                        OPTIONAL,

        -- If segmentation is used, completeDataListIncluded may only be present in the
        -- first segment.
    lsaOnlyAccessIndicator          [1]  LSAOnlyAccessIndicator     OPTIONAL,
    lsaDataList                     [2]  LSADataList                OPTIONAL,
    extensionContainer              [3] ExtensionContainer          OPTIONAL,
    ...}

LSAIdentity ::= OCTET STRING (SIZE (3))
-- Octets are coded according to TS GSM 03.03

LSAPriority ::= OCTET STRING (SIZE (1))
-- Octets are coded according to TS GSM 08.08


SubscriberData ::= SEQUENCE {
    msisdn                          [1] ISDN-AddressString          OPTIONAL,
    category                        [2] Category                    OPTIONAL,
    subscriberStatus                [3] SubscriberStatus            OPTIONAL,
    bearerServiceList               [4] BearerServiceList           OPTIONAL,
    -- The exception handling for reception of unsupported / not allocated
    -- bearerServiceCodes is defined in section 6.8.1
    teleserviceList                 [6] TeleserviceList             OPTIONAL,
    -- The exception handling for reception of unsupported / not allocated
    -- teleserviceCodes is defined in section 6.8.1
    provisionedSS                   [7] Ext-SS-InfoList             OPTIONAL,
    odb-Data                        [8] ODB-Data                    OPTIONAL,
    roamingRestrictionDueToUnsupportedFeature  [9] NULL             OPTIONAL,
    regionalSubscriptionData        [10] ZoneCodeList               OPTIONAL,
    vbsSubscriptionData             [11] VBSDataList                OPTIONAL,
    vgcsSubscriptionData            [12] VGCSDataList               OPTIONAL,
    vlrCamelSubscriptionInfo        [13] VlrCamelSubscriptionInfo   OPTIONAL
    }

Category ::= OCTET STRING (SIZE (1))
    -- The internal structure is defined in CCITT Rec Q.763.

SubscriberStatus ::= ENUMERATED {
    serviceGranted  (0),
    operatorDeterminedBarring  (1)}

BearerServiceList ::= SEQUENCE SIZE (1..maxNumOfBearerServices) OF
                                    Ext-BearerServiceCode

maxNumOfBearerServices  INTEGER ::= 50

TeleserviceList ::= SEQUENCE SIZE (1..maxNumOfTeleservices) OF
                                    Ext-TeleserviceCode

maxNumOfTeleservices  INTEGER ::= 20

ODB-Data ::= SEQUENCE {
    odb-GeneralData                 ODB-GeneralData,
    odb-HPLMN-Data                  ODB-HPLMN-Data                  OPTIONAL,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
ODB-GeneralData ::= BIT STRING {
     allOG-CallsBarred  (0),
     internationalOGCallsBarred  (1),
     internationalOGCallsNotToHPLMN-CountryBarred  (2),
     interzonalOGCallsBarred (6),
     interzonalOGCallsNotToHPLMN-CountryBarred (7),
     interzonalOGCallsAndInternationalOGCallsNotToHPLMN-CountryBarred (8),
     premiumRateInformationOGCallsBarred  (3),
     premiumRateEntertainementOGCallsBarred  (4),
     ss-AccessBarred  (5),
     allECT-Barred (9),
     chargeableECT-Barred (10),
     internationalECT-Barred (11),
     interzonalECT-Barred (12),
     doublyChargeableECT-Barred (13),
     multipleECT-Barred (14)} (SIZE (15..32))
     -- exception handling: reception of unknown bit assignments in the
     -- ODB-GeneralData type shall be treated like unsupported ODB-GeneralData

ODB-HPLMN-Data ::= BIT STRING {
     plmn-SpecificBarringType1  (0),
     plmn-SpecificBarringType2  (1),
     plmn-SpecificBarringType3  (2),
     plmn-SpecificBarringType4  (3)} (SIZE (4..32))
     -- exception handling: reception of unknown bit assignments in the
     -- ODB-HPLMN-Data type shall be treated like unsupported ODB-HPLMN-Data

Ext-SS-InfoList ::= SEQUENCE SIZE (1..maxNumOfSS) OF
                                        Ext-SS-Info

Ext-SS-Info ::= CHOICE {
     forwardingInfo                     [0] Ext-ForwInfo,
     callBarringInfo                    [1] Ext-CallBarInfo,
     cug-Info                           [2] CUG-Info,
     ss-Data                            [3] Ext-SS-Data,
     emlpp-Info                         [4] EMLPP-Info}


Ext-ForwInfo ::= SEQUENCE {
     ss-Code                            SS-Code,
     forwardingFeatureList              Ext-ForwFeatureList,
     extensionContainer                 [0] ExtensionContainer          OPTIONAL,
     ...}

Ext-ForwFeatureList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
                                        Ext-ForwFeature

Ext-ForwFeature ::= SEQUENCE {
     basicService                       Ext-BasicServiceCode            OPTIONAL,
     ss-Status [4] Ext-SS-Status,
     forwardedToNumber                  [5] ISDN-AddressString          OPTIONAL,
     -- When this data type is sent from an HLR which supports CAMEL Phase 2
     -- to a VLR that supports CAMEL Phase 2 the VLR shall not check the
     -- format of the number
     forwardedToSubaddress              [8] ISDN-SubaddressString       OPTIONAL,
     forwardingOptions                  [6] Ext-ForwOptions             OPTIONAL,
     noReplyConditionTime               [7] Ext-NoRepCondTime           OPTIONAL,
     extensionContainer                 [9] ExtensionContainer          OPTIONAL,
     ...}

Ext-SS-Status ::= OCTET STRING (SIZE (1..5))

     -- OCTET 1:
     --
     -- bits 8765: 0000 (unused)
     -- bits 4321: Used to convey the "P bit","R bit","A bit" and "Q bit",
     --            representing supplementary service state information
     --            as defined in TS GSM 03.11

     -- bit 4: "Q bit"

     -- bit 3: "P bit"

     -- bit 2: "R bit"

     -- bit 1: "A bit"

     -- OCTETS 2-5: reserved for future use. They shall be discarded if
```

```
    -- received and not understood.
```

```
Ext-ForwOptions ::= OCTET STRING (SIZE (1..5))

    -- OCTET 1:

    --  bit 8: notification to forwarding party
    --   0  no notification
    --   1  notification

    --  bit 7: redirecting presentation
    --   0 no presentation
    --   1  presentation

    --  bit 6: notification to calling party
    --   0  no notification
    --   1  notification

    --  bit 5: 0 (unused)

    --  bits 43: forwarding reason
    --   00  ms not reachable
    --   01  ms busy
    --   10  no reply
    --   11  unconditional

    -- bits 21: 00 (unused)

    -- OCTETS 2-5: reserved for future use. They shall be discarded if
    -- received and not understood.
```

```
Ext-NoRepCondTime ::= INTEGER (1..100)
    -- Only values 5-30 are used.
    -- Values in the ranges 1-4 and 31-100 are reserved for future use
    -- If received:
    --       values 1-4 shall be mapped on to value 5
    --       values 31-100 shall be mapped on to value 30
```

```
Ext-CallBarInfo ::= SEQUENCE {
    ss-Code                         SS-Code,
    callBarringFeatureList          Ext-CallBarFeatureList,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
Ext-CallBarFeatureList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
                                    Ext-CallBarringFeature
```

```
Ext-CallBarringFeature ::= SEQUENCE {
    basicService                    Ext-BasicServiceCode            OPTIONAL,
    ss-Status [4] Ext-SS-Status,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
CUG-Info ::= SEQUENCE {
    cug-SubscriptionList            CUG-SubscriptionList,
    cug-FeatureList                 CUG-FeatureList                 OPTIONAL,
    extensionContainer              [0] ExtensionContainer          OPTIONAL,
    ...}
```

```
CUG-SubscriptionList ::= SEQUENCE SIZE (0..maxNumOfCUG) OF
                                    CUG-Subscription
```

```
CUG-Subscription ::= SEQUENCE {
    cug-Index CUG-Index,
    cug-Interlock                   CUG-Interlock,
    intraCUG-Options                IntraCUG-Options,
    basicServiceGroupList           Ext-BasicServiceGroupList       OPTIONAL,
    extensionContainer              [0] ExtensionContainer          OPTIONAL,
    ...}
```

```
CUG-Index ::= INTEGER (0..32767)
    -- The internal structure is defined in ETS 300 138.
```

```
CUG-Interlock ::= OCTET STRING (SIZE (4))
```

```
IntraCUG-Options ::= ENUMERATED {
     noCUG-Restrictions  (0),
     cugIC-CallBarred  (1),
     cugOG-CallBarred  (2)}

maxNumOfCUG  INTEGER ::= 10

CUG-FeatureList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
                                        CUG-Feature

Ext-BasicServiceGroupList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups)           OF
                                        Ext-BasicServiceCode

maxNumOfExt-BasicServiceGroups  INTEGER ::= 32

CUG-Feature ::= SEQUENCE {
     basicService                       Ext-BasicServiceCode             OPTIONAL,
     preferentialCUG-Indicator          CUG-Index OPTIONAL,
     interCUG-Restrictions              InterCUG-Restrictions,
     extensionContainer                 ExtensionContainer               OPTIONAL,
     ...}

InterCUG-Restrictions ::= OCTET STRING (SIZE (1))

     -- bits 876543: 000000 (unused)
     -- Exception handling:
     -- bits 876543 shall be ignored if received and not understood

     -- bits 21
     --   00  CUG only facilities
     --   01  CUG with outgoing access
     --   10  CUG with incoming access
     --   11  CUG with both outgoing and incoming access

Ext-SS-Data ::= SEQUENCE {
     ss-Code                            SS-Code,
     ss-Status [4] Ext-SS-Status,
     ss-SubscriptionOption              SS-SubscriptionOption            OPTIONAL,
     basicServiceGroupList              Ext-BasicServiceGroupList        OPTIONAL,
     extensionContainer                 [5] ExtensionContainer           OPTIONAL,
     ...}

LCS-PrivacyExceptionList ::= SEQUENCE SIZE (1..maxNumOfPrivacyClass) OF
                                        LCS-PrivacyClass

maxNumOfPrivacyClass  INTEGER ::= 4

LCS-PrivacyClass ::= SEQUENCE {
     ss-Code                            SS-Code,
     ss-Status                          Ext-SS-Status,
     privacyVerificationByMSuser        [0] NULL                         OPTIONAL,
     -- privacyVerificationByMSUser is expected only for SS-code = callunrelated
     externalClientList                 [1] ExternalClientList           OPTIONAL,
     -- externalClientList is expected only for SS-code = callunrelated
     plmnClientList                     [2] PLMNClientList               OPTIONAL,
     -- plmnClientList is expected only for SS-code - plmn
     extensionContainer                 [3] ExtensionContainer           OPTIONAL,
-- if segmentation is used, the complete LCS-PrivacyClass shall be sent in one segment
     ...}

ExternalClientList ::= SEQUENCE SIZE (0..maxNumOfExternalClient) OF
                                        ExternalClient

maxNumOfExternalClient  INTEGER ::= 5

PLMNClientList ::= SEQUENCE SIZE (1..maxNumOfPLMNClient) OF
                                        LCSClientInternalID

maxNumOfPLMNClient  INTEGER ::= 5
```

```
ExternalClient ::= SEQUENCE {
     clientIdentity                      LCSClientExternalID,
     gmlc-Restriction                    [0] GMLC-Restriction              OPTIONAL,
     notificationToMSUser                [1] NotificationToMSUser          OPTIONAL,
     extensionContainer                  [2] ExtensionContainer            OPTIONAL,
     ... }

GMLC-Restriction ::= ENUMERATED {
     gmlc-List                           (0),
     home-Country                        (1)}

NotificationToMSUser ::= ENUMERATED {
     notification                        (0),
     notificationWithPrivacyVerification (1)}

MOLR-List ::= SEQUENCE SIZE (1..maxNumOfMOLR-Class) OF
                                         MOLR-Class

maxNumOfMOLR-Class  INTEGER ::= 3

MOLR-Class ::= SEQUENCE {
     ss-Code                             SS-Code,
     ss-Status                           Ext-SS-Status,
     extensionContainer                  [0] ExtensionContainer            OPTIONAL,
     ...}

ZoneCodeList ::= SEQUENCE SIZE (1..maxNumOfZoneCodes)
                                         OF ZoneCode

ZoneCode ::= OCTET STRING (SIZE (2))
     -- internal structure is defined in TS GSM 03.03

maxNumOfZoneCodes  INTEGER ::= 10

InsertSubscriberDataRes ::= SEQUENCE {
     teleserviceList                     [1] TeleserviceList               OPTIONAL,
     bearerServiceList                   [2] BearerServiceList             OPTIONAL,
     ss-List                             [3] SS-List                       OPTIONAL,
     odb-GeneralData                     [4] ODB-GeneralData               OPTIONAL,
     regionalSubscriptionResponse        [5]
               RegionalSubscriptionResponse        OPTIONAL,
     supportedCamelPhases                [6] SupportedCamelPhases          OPTIONAL,
     extensionContainer                  [7] ExtensionContainer            OPTIONAL,
     ...}

RegionalSubscriptionResponse ::= ENUMERATED {
     networkNode-AreaRestricted          (0),
     tooManyZoneCodes                    (1),
     zoneCodesConflict                   (2),
     regionalSubscNotSupported           (3)}

DeleteSubscriberDataArg ::= SEQUENCE {
     imsi                                [0] IMSI,
     basicServiceList                    [1] BasicServiceList              OPTIONAL,
     -- The exception handling for reception of unsupported/not allocated
     -- basicServiceCodes is defined in section 6.8.2
     ss-List                             [2] SS-List                       OPTIONAL,
     roamingRestrictionDueToUnsupportedFeature [4] NULL                    OPTIONAL,
     regionalSubscriptionIdentifier      [5] ZoneCode                      OPTIONAL,
     vbsGroupIndication                  [7] NULL                          OPTIONAL,
     vgcsGroupIndication                 [8] NULL   OPTIONAL,
     camelSubscriptionInfoWithdraw       [9] NULL   OPTIONAL,
     extensionContainer                  [6] ExtensionContainer OPTIONAL,
     ...,
     gprsSubscriptionDataWithdraw        [10] GPRSSubscriptionDataWithdraw OPTIONAL,
     roamingRestrictedInSgsnDueToUnsuppportedFeature [11] NULL             OPTIONAL,
     lsaInformationWithdraw              [12] LSAInformationWithdraw       OPTIONAL,
     gmlc-ListWithdraw                   [13] NULL                         OPTIONAL,
     istInformationWithdraw              [14] NULL                         OPTIONAL }

GPRSSubscriptionDataWithdraw ::= CHOICE {
     allGPRSData                         NULL,
     contextIdList                       ContextIdList}

ContextIdList ::= SEQUENCE SIZE (1..maxNumOfPDP-Contexts) OF
                                         ContextId
```

```
LSAInformationWithdraw ::= CHOICE {
    allLSAData                          NULL,
    lsaIdentityList                     LSAIdentityList }

LSAIdentityList ::= SEQUENCE SIZE (1..maxNumOfLSAs) OF
                                        LSAIdentity

BasicServiceList ::= SEQUENCE SIZE (1..maxNumOfBasicServices) OF
                                        Ext-BasicServiceCode

maxNumOfBasicServices  INTEGER ::= 70

DeleteSubscriberDataRes ::= SEQUENCE {
    regionalSubscriptionResponse        [0]
                                        RegionalSubscriptionResponse      OPTIONAL,
    extensionContainer                  ExtensionContainer                OPTIONAL,
    ...}

VlrCamelSubscriptionInfo ::= SEQUENCE {
    o-CSI                               [0] O-CSI                         OPTIONAL,
    extensionContainer                  [1] ExtensionContainer            OPTIONAL,
    ...,
    ss-CSI                              [2]  SS-CSI                       OPTIONAL,
    o-BcsmCamelTDP-CriteriaList         [4] O-BcsmCamelTDPCriteriaList    OPTIONAL,
    tif-CSI                             [3]  NULL                         OPTIONAL,
    m-CSI                               [5]  M-CSI                        OPTIONAL,
    sms-CSI                             [6]  SMS-CSI                      OPTIONAL,
    vt-CSI                              [7]  T-CSI                        OPTIONAL,
    t-BCSM-CAMEL-TDP-CriteriaList       [8]  T-BCSM-CAMEL-TDP-CriteriaList OPTIONAL,
    d-CSI                               [9]  D-CSI                        OPTIONAL
    }

D-CSI ::= SEQUENCE {
    dp-AnalysedInfoCriteriaList         DP-AnalysedInfoCriteriaList,
    camelCapabilityHandling             CamelCapabilityHandling,
    extensionContainer                  ExtensionContainer                OPTIONAL,
    ...}

DP-AnalysedInfoCriteriaList  ::= SEQUENCE SIZE (1..maxNumOfDP-AnalysedInfoCriteria) OF
                                        DP-AnalysedInfoCriterium

maxNumOfDP-AnalysedInfoCriteria INTEGER ::= 10

DP-AnalysedInfoCriterium ::= SEQUENCE {
    dialledNumber                       ISDN-AddressString,
    serviceKey                          ServiceKey,
    gsmSCF-Address                      ISDN-AddressString,
    defaultCallHandling                 DefaultCallHandling,
    extensionContainer                  ExtensionContainer                OPTIONAL,
    ...}

SS-CSI ::= SEQUENCE {
    ss-CamelData                        SS-CamelData,
    extensionContainer                  ExtensionContainer                OPTIONAL,
    ...}

SS-CamelData  ::= SEQUENCE {
    ss-EventList                        SS-EventList,
    gsmSCF-Address                      ISDN-AddressString,
    extensionContainer                  [0] ExtensionContainer            OPTIONAL,
    ... ,
    notificationToCSE                   [1]  NULL                         OPTIONAL,
    csiActive                           [2]  NULL                         OPTIONAL
    }
--  notificationToCSE and csiActive shall not be present when SS-CSI is sent to VLR.
--  They may only be included in ATSI/ATM Ack message.

SS-EventList  ::= SEQUENCE SIZE (1..maxNumOfCamelSSEvents) OF SS-Code
    -- Actions for the following SS-Code values are defined in CAMEL Phase 3:
    -- ect                              SS-Code ::= '00110001'B
    -- multiPTY                         SS-Code ::= '01010001'B
    -- cd                               SS-Code ::= '00100100'B
    -- ccbs                             SS-Code ::= '01000100'B
    -- all other SS codes shall be ignored

maxNumOfCamelSSEvents INTEGER ::= 10
```

```
O-CSI ::= SEQUENCE {
     o-BcsmCamelTDPDataList              O-BcsmCamelTDPDataList,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...,
     camelCapabilityHandling             [0] CamelCapabilityHandling       OPTIONAL,
     notificationToCSE                   [1]  NULL                         OPTIONAL,
     csiActive                           [2]  NULL                         OPTIONAL
     }
--   notificationtoCSE and csiActive shall not be present when O-CSI is sent to VLR/GMSC.
--   They may only be included in ATSI/ATM Ack message.
```

```
O-BcsmCamelTDPDataList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     O-BcsmCamelTDPData
     -- O-BcsmCamelTDPDataList shall not contain more than one instance of
     -- O-BcsmCamelTDPData containing the same value for o-BcsmTriggerDetectionPoint.
     -- For CAMEL Phase 2, this means that only one instance of O-BcsmCamelTDPData is allowed
     -- with o-BcsmTriggerDetectionPoint being equal to DP2.
```

```
maxNumOfCamelTDPData  INTEGER ::= 10
```

```
O-BcsmCamelTDPData ::= SEQUENCE {
     o-BcsmTriggerDetectionPoint         O-BcsmTriggerDetectionPoint,
     serviceKey                          ServiceKey,
     gsmSCF-Address                      [0] ISDN-AddressString,
     defaultCallHandling                 [1] DefaultCallHandling,
     extensionContainer                  [2] ExtensionContainer            OPTIONAL,
     ...
     }
```

```
ServiceKey ::= INTEGER (0..2147483647)
```

```
O-BcsmTriggerDetectionPoint ::= ENUMERATED {
     collectedInfo (2),
     ... ,
     routeSelectFailure (4) }
-- exception handling:
-- For O-BcsmCamelTDPData sequences containing this parameter with any
-- other value than the ones listed the receiver shall ignore the whole
-- O-BcsmCamelTDPDatasequence.
-- For O-BcsmCamelTDP-Criteria sequences containing this parameter with any
-- other value than the ones listed the receiver shall ignore the whole
-- O-BcsmCamelTDP-Criteria sequence.
```

```
O-BcsmCamelTDPCriteriaList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     O-BcsmCamelTDP-Criteria
```

```
T-BCSM-CAMEL-TDP-CriteriaList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     T-BCSM-CAMEL-TDP-Criteria
```

```
O-BcsmCamelTDP-Criteria ::= SEQUENCE {
     o-BcsmTriggerDetectionPoint         O-BcsmTriggerDetectionPoint,
     destinationNumberCriteria           [0] DestinationNumberCriteria     OPTIONAL,
     basicServiceCriteria                [1] BasicServiceCriteria          OPTIONAL,
     callTypeCriteria                    [2] CallTypeCriteria              OPTIONAL,
     ... ,
     o-CauseValueCriteria                [3] O-CauseValueCriteria          OPTIONAL,
     extensionContainer                  [4] ExtensionContainer            OPTIONAL }
```

```
T-BCSM-CAMEL-TDP-Criteria ::= SEQUENCE {
     t-BCSM-TriggerDetectionPoint        T-BcsmTriggerDetectionPoint,
     basicServiceCriteria                [0] BasicServiceCriteria          OPTIONAL,
     t-CauseValueCriteria                [1] T-CauseValueCriteria          OPTIONAL,
     ... }
```

```
DestinationNumberCriteria  ::= SEQUENCE {
     matchType                           [0] MatchType,
     destinationNumberList               [1] DestinationNumberList         OPTIONAL,
     destinationNumberLengthList         [2] DestinationNumberLengthList   OPTIONAL,
     -- one or both of destinationNumberList and destinationNumberLengthList
     -- shall be present
     ... }
```

```
DestinationNumberList  ::= SEQUENCE SIZE (1..maxNumOfCamelDestinationNumbers) OF
                                         ISDN-AddressString
-- The receiving entity shall not check the format of a number in
-- the dialled number list
```

```
DestinationNumberLengthList  ::= SEQUENCE SIZE (1..maxNumOfCamelDestinationNumberLengths) OF
                                        INTEGER(1..maxNumOfISDN-AddressDigits)

BasicServiceCriteria   ::= SEQUENCE SIZE(1..maxNumOfCamelBasicServiceCriteria) OF
     Ext-BasicServiceCode

maxNumOfISDN-AddressDigits  INTEGER ::= 15

maxNumOfCamelDestinationNumbers  INTEGER ::= 10

maxNumOfCamelDestinationNumberLengths  INTEGER ::= 3

maxNumOfCamelBasicServiceCriteria  INTEGER ::= 5

CallTypeCriteria       ::= ENUMERATED {
     forwarded                          (0),
     notForwarded                       (1)}

MatchType       ::= ENUMERATED {
     inhibiting                         (0),
     enabling                           (1)}

O-CauseValueCriteria   ::= SEQUENCE SIZE(1..maxNumOfCAMEL-O-CauseValueCriteria) OF
     CauseValue

T-CauseValueCriteria   ::= SEQUENCE SIZE(1..maxNumOfCAMEL-T-CauseValueCriteria) OF
     CauseValue

maxNumOfCAMEL-O-CauseValueCriteria  INTEGER ::= 5

maxNumOfCAMEL-T-CauseValueCriteria  INTEGER ::= 5

CauseValue ::= OCTET STRING (SIZE(1))
-- Type extracted from Cause parameter in ITU-T Recommendation Q.763.
-- For the use of cause value refer to ITU-T Recommendation Q.850.


DefaultCallHandling ::= ENUMERATED {
     continueCall (0) ,
     releaseCall (1) ,
     ...}
-- exception handling:
-- reception of values in range 2-31 shall be treated as "continueCall"
-- reception of values greater than 31 shall be treated as "releaseCall"

CamelCapabilityHandling ::= INTEGER(1..16)
-- value 1 = CAMEL phase 1,
-- value 2 = CAMEL phase 2,
-- value 3 = CAMEL Phase 3:
-- reception of values greater than 3 shall be treated as CAMEL phase 3.

SupportedCamelPhases ::= BIT STRING {
     phase1 (0),
     phase2 (1) ,
     phase3 (2) } (SIZE (1..16))
-- A node shall mark in the BIT STRING all CAMEL Phases it supports.
-- Other values than listed above shall be discarded.

SMS-CSI ::= SEQUENCE {
     sms-CAMEL-TDP-DataList             [0] SMS-CAMEL-TDP-DataList,
     camelCapabilityHandling            [1] CamelCapabilityHandling       ,
     extensionContainer                 [2] ExtensionContainer            OPTIONAL,
     notificationToCSE                  [3] NULL                          OPTIONAL,
     csiActive                          [4] NULL                          OPTIONAL,
     ...}
--   notificationToCSE and csiActive shall not be present when SMS-CSI is sent to VLR/SGSN.
--   They may only be included in ATSI/ATM Ack message.

SMS-CAMEL-TDP-DataList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     SMS-CAMEL-TDP-Data
--   SMS-CAMEL-TDP-DataList shall not contain more than one instance of
--   SMS-CAMEL-TDP-Data containing the same value for sms-TriggerDetectionPoint.
```

```
SMS-CAMEL-TDP-Data ::= SEQUENCE {
     sms-TriggerDetectionPoint          [0] SMS-TriggerDetectionPoint,
     serviceKey                         [1] ServiceKey,
     gsmSCF-Address                     [2] ISDN-AddressString,
     defaultSMS-Handling                [3] DefaultSMS-Handling,
     extensionContainer                 [4] ExtensionContainer          OPTIONAL,
     ...
     }

SMS-TriggerDetectionPoint ::= ENUMERATED {
     sms-CollectedInfo (1),
     ... }
--   exception handling:
--   For SMS-CAMEL-TDP-Data sequences containing this parameter with any
--   other value than the ones listed the receiver shall ignore the whole
--   SMS-CAMEL-TDP-Data sequence.

DefaultSMS-Handling ::= ENUMERATED {
     continueTransaction (0) ,
     releaseTransaction (1) ,
     ...}
--   exception handling:
--   reception of values in range 2-31 shall be treated as "continueTransaction"
--   reception of values greater than 31 shall be treated as "releaseTransaction"

M-CSI ::= SEQUENCE {
     mobilityTriggers                   MobilityTriggers,
     serviceKey                         ServiceKey,
     gsmSCF-Address                     [0]  ISDN-AddressString,
     extensionContainer                 [1]  ExtensionContainer         OPTIONAL,
     notificationToCSE                  [2] NULL                        OPTIONAL,
     csiActive                          [3] NULL                        OPTIONAL,
     ...}
--   notificationToCSE and csiActive shall not be present when M-CSI is sent to VLR.
--   They may only be included in ATSI/ATM Ack message.

MobilityTriggers  ::= SEQUENCE SIZE (1..maxNumOfMobilityTriggers) OF
     MM-Code

maxNumOfMobilityTriggers INTEGER ::= 10

MM-Code ::= OCTET STRING (SIZE (1))
--   This type is used to indicate a Mobility Management event.
--   Actions for the following M-Code values are defined in CAMEL Phase 3:
--
--   Location-update-in-same-VLR        MM-Code ::= '00000000'B
--   Location-update-to-other-VLR       MM-Code ::= '00000001'B
--   IMSI-Attach                        MM-Code ::= '00000010'B
--   MS-initiated-IMSI-Detach           MM-Code ::= '00000011'B
--   Network-initiated-IMSI-Detach      MM-Code ::= '00000100'B
--
--   If any other MM-code is received in M-CSI, then that MM-code shall be
--   ignored.

T-CSI ::= SEQUENCE {
     t-BcsmCamelTDPDataList             T-BcsmCamelTDPDataList,
     extensionContainer                 ExtensionContainer              OPTIONAL,
     ...,
     camelCapabilityHandling            [0] CamelCapabilityHandling     OPTIONAL,
     notificationToCSE                  [1] NULL                        OPTIONAL,
     csi-Active                         [2] NULL                        OPTIONAL
     }
--   notificationToCSE and csi-Active shall not be present when T-CSI is sent to VLR/GMSC.
--   They may only be included in ATSI/ATM Ack message.

T-BcsmCamelTDPDataList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     T-BcsmCamelTDPData
--- T-BcsmCamelTDPDataList shall not contain more than one instance of
--- T-BcsmCamelTDPData containing the same value for t-BcsmTriggerDetectionPoint.
--- For CAMEL Phase 2, this means that only one instance of T-BcsmCamelTDPData is allowed
--- with t-BcsmTriggerDetectionPoint being equal to DP12.
--- For CAMEL Phase 3, more TDP's are allowed.
```

```
T-BcsmCamelTDPData ::= SEQUENCE {
    t-BcsmTriggerDetectionPoint         T-BcsmTriggerDetectionPoint,
    serviceKey                          ServiceKey,
    gsmSCF-Address                      [0] ISDN-AddressString,
    defaultCallHandling                 [1] DefaultCallHandling,
    extensionContainer                  [2] ExtensionContainer          OPTIONAL,
    ...}

T-BcsmTriggerDetectionPoint ::= ENUMERATED {
    termAttemptAuthorized (12),
    ... ,
    tBusy (13),
    tNoAnswer (14)}
-- exception handling:
-- For T-BcsmCamelTDPData sequences containing this parameter with any other
-- value than the ones listed above, the receiver shall ignore the whole
-- T-BcsmCamelTDPData sequence.


-- gprs location information retrieval types

SendRoutingInfoForGprsArg ::= SEQUENCE {
    imsi                                [0] IMSI,
    ggsn-Address                        [1] GSN-Address             OPTIONAL,
    ggsn-Number                         [2]  ISDN-AddressString,
    extensionContainer                  [3] ExtensionContainer      OPTIONAL,
    ...}

SendRoutingInfoForGprsRes ::= SEQUENCE {
    sgsn-Address                        [0] GSN-Address,
    ggsn-Address                        [1]  GSN-Address            OPTIONAL,
    mobileNotReachableReason            [2]  AbsentSubscriberDiagnosticSM    OPTIONAL,
    extensionContainer                  [3] ExtensionContainer      OPTIONAL,
    ...}

-- failure report types

FailureReportArg ::= SEQUENCE {
    imsi                                [0] IMSI,
    ggsn-Number                         [1] ISDN-AddressString      ,
    ggsn-Address                        [2] GSN-Address             OPTIONAL,
    extensionContainer                  [3] ExtensionContainer      OPTIONAL,
    ...}

FailureReportRes ::= SEQUENCE {
    ggsn-Address                        [0] GSN-Address             OPTIONAL,
    extensionContainer                  [1] ExtensionContainer      OPTIONAL,
    ...}

-- gprs notification types

NoteMsPresentForGprsArg ::= SEQUENCE {
    imsi                                [0] IMSI,
    sgsn-Address                        [1] GSN-Address,
    ggsn-Address                        [2] GSN-Address             OPTIONAL,
    extensionContainer                  [3] ExtensionContainer      OPTIONAL,
    ...}

NoteMsPresentForGprsRes ::= SEQUENCE {
    extensionContainer                  [0] ExtensionContainer      OPTIONAL,
    ...}


-- fault recovery types

ResetArg ::= SEQUENCE {
    hlr-Number                      ISDN-AddressString,
    hlr-List                        HLR-List                        OPTIONAL,
    ...}

RestoreDataArg ::= SEQUENCE {
    imsi                            IMSI,
    lmsi                            LMSI                            OPTIONAL,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ... ,
    vlr-Capability                  [6] VLR-Capability              OPTIONAL }
```

```
RestoreDataRes ::= SEQUENCE {
    hlr-Number                      ISDN-AddressString,
    msNotReachable                  NULL                            OPTIONAL,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}

-- VBS/VGCS types
VBSDataList ::= SEQUENCE SIZE (1..maxNumOfVBSGroupIds) OF
                                    VoiceBroadcastData

VGCSDataList ::= SEQUENCE SIZE (1..maxNumOfVGCSGroupIds) OF
                                    VoiceGroupCallData

maxNumOfVBSGroupIds  INTEGER ::= 50

maxNumOfVGCSGroupIds  INTEGER ::= 50

VoiceGroupCallData  ::= SEQUENCE {
    groupId                         GroupId,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}

VoiceBroadcastData ::= SEQUENCE {
    groupid                         GroupId,
    broadcastInitEntitlement        NULL                            OPTIONAL,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}

GroupId  ::= OCTET STRING (SIZE (3))
    -- Refers to the Group Identification as specified in GSM TS 03.03
    -- and 03.68/ 03.69

-- provide subscriber info types

ProvideSubscriberInfoArg ::= SEQUENCE {
    imsi     [0] IMSI,
    lmsi     [1] LMSI               OPTIONAL,
    requestedInfo                   [2] RequestedInfo,
    extensionContainer              [3] ExtensionContainer          OPTIONAL,
    ...}

ProvideSubscriberInfoRes ::= SEQUENCE {
    subscriberInfo                  SubscriberInfo,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}

SubscriberInfo ::= SEQUENCE {
    locationInformation             [0] LocationInformation         OPTIONAL,
    subscriberState                 [1] SubscriberState             OPTIONAL,
    extensionContainer              [2] ExtensionContainer          OPTIONAL,
    ...}

RequestedInfo ::= SEQUENCE {
    locationInformation             [0] NULL                        OPTIONAL,
    subscriberState                 [1] NULL                        OPTIONAL,
    extensionContainer              [2] ExtensionContainer          OPTIONAL,
    ...}

LocationInformation ::= SEQUENCE {
    ageOfLocationInformation        AgeOfLocationInformation        OPTIONAL,
    geographicalInformation         [0] GeographicalInformation     OPTIONAL,
    vlr-number                      [1] ISDN-AddressString          OPTIONAL,
    locationNumber                  [2] LocationNumber              OPTIONAL,
    cellIdOrLAI                     [3] CellIdOrLAI                 OPTIONAL,
    extensionContainer              [4] ExtensionContainer          OPTIONAL,
    ... ,
    selectedLSA-Id                  [5] LSAIdentity                 OPTIONAL,
    msc-Number                      [6] ISDN-AddressString          OPTIONAL,
    geodeticInformation             [7] GeodeticInformation         OPTIONAL }
```

```
GeographicalInformation ::= OCTET STRING (SIZE (8))
--   Refers to geographical Information defined in GSM 03.32.
--   Only the description of an ellipsoid point with uncertainty circle
--   as specified in GSM 03.32 is allowed to be used
--   The internal structure according to GSM 03.32 is as follows:
--        Type of shape (ellipsoid point with uncertainty circle)          1 octet
--        Degrees of Latitude                                              3 octets
--        Degrees of Longitude                                             3 octets
--        Uncertainty code                                                 1 octet
```

```
GeodeticInformation ::= OCTET STRING (SIZE (10))
--   Refers to Calling Geodetic Location defined in Q.763 (1999).
--   Only the description of an ellipsoid point with uncertainty circle
--   as specified in Q.763 (1999) is allowed to be used
--   The internal structure according to Q.763 (1999) is as follows:
--        Screening and presentation indicators                            1 octet
--        Type of shape (ellipsoid point with uncertainty circle)          1 octet
--        Degrees of Latitude                                              3 octets
--        Degrees of Longitude                                             3 octets
--        Uncertainty code                                                 1 octet
--        Confidence                                                       1 octet
```

```
LocationNumber ::= OCTET STRING (SIZE (2..10))
     -- the internal structure is defined in CCITT Rec Q.763
```

```
SubscriberState ::= CHOICE {
     assumedIdle                    [0] NULL,
     camelBusy [1] NULL,
     netDetNotReachable             NotReachableReason,
     notProvidedFromVLR             [2] NULL}
```

```
NotReachableReason ::= ENUMERATED {
     msPurged (0),
     imsiDetached (1),
     restrictedArea (2),
     notRegistered (3)}
```

```
-- any time interrogation info types
```

```
AnyTimeInterrogationArg ::= SEQUENCE {
     subscriberIdentity             [0] SubscriberIdentity,
     requestedInfo                  [1] RequestedInfo,
     gsmSCF-Address                 [3] ISDN-AddressString,
     extensionContainer             [2] ExtensionContainer          OPTIONAL,
     ...}
```

```
AnyTimeInterrogationRes ::= SEQUENCE {
     subscriberInfo                 SubscriberInfo,
     extensionContainer             ExtensionContainer              OPTIONAL,
     ...}
```

```
-- any time information handling types
```

```
AnyTimeSubscriptionInterrogationArg ::= SEQUENCE {
     subscriberIdentity             [0] SubscriberIdentity,
     requestedSubscriptionInfo      [1] RequestedSubscriptionInfo,
     gsmSCF-Address                 [2] ISDN-AddressString,
     extensionContainer             [3] ExtensionContainer          OPTIONAL,
     ...}
```

```
AnyTimeSubscriptionInterrogationRes ::= SEQUENCE {
     callForwardingData             [1] CallForwardingData          OPTIONAL,
     callBarringData                [2] CallBarringData             OPTIONAL,
     odb-Info                       [3] ODB-Info                    OPTIONAL,
     camel-SubscriptionInfo         [4] CAMEL-SubscriptionInfo      OPTIONAL,
     supportedVLR-CAMEL-Phases      [5] SupportedCamelPhases        OPTIONAL,
     supportedSGSN-CAMEL-Phases     [6] SupportedCamelPhases        OPTIONAL,
     extensionContainer             [7] ExtensionContainer          OPTIONAL,
     ...}
```

```
RequestedSubscriptionInfo ::= SEQUENCE {
     requestedSS-Info                    [1] SS-ForBS-Code                  OPTIONAL,
     odb                                 [2] NULL                           OPTIONAL,
     requestedCAMEL-SubscriptionInfo     [3] RequestedCAMEL-SubscriptionInfo   OPTIONAL,
     supportedVLR-CAMEL-Phases           [4] NULL                           OPTIONAL,
     supportedSGSN-CAMEL-Phases          [5] NULL                           OPTIONAL,
     extensionContainer                  [6] ExtensionContainer             OPTIONAL,
     ...}
```

```
RequestedCAMEL-SubscriptionInfo ::= ENUMERATED {
     o-CSI                               (0),
     t-CSI                               (1),
     vt-CSI                              (2),
     tif-CSI                             (3),
     gprs-CSI                            (4),
     sms-CSI                             (5),
     ss-CSI                              (6),
     m-CSI                               (7),
     d-csi                               (8)}
```

```
CallForwardingData ::= SEQUENCE {
     forwardingFeatureList               Ext-ForwFeatureList,
     notificationToCSE                   NULL                               OPTIONAL,
     extensionContainer                  [0] ExtensionContainer             OPTIONAL,
     ...}
```

```
CallBarringData ::= SEQUENCE {
     callBarringFeatureList              Ext-CallBarFeatureList,
     password                            Password,
     wrongPasswordAttemptsCounter        WrongPasswordAttemptsCounter,
     notificationToCSE                   NULL                               OPTIONAL,
     extensionContainer                  ExtensionContainer                 OPTIONAL,
     ...}
```

```
WrongPasswordAttemptsCounter ::= INTEGER (0..4)
```

```
ODB-Info ::= SEQUENCE {
     odb-Data                            ODB-Data,
     notificationToCSE                   NULL                               OPTIONAL,
     extensionContainer                  ExtensionContainer                 OPTIONAL,
     ...}
```

```
CAMEL-SubscriptionInfo ::= SEQUENCE {
     o-CSI                               [0]  O-CSI                         OPTIONAL,
     o-BcsmCamelTDP-CriteriaList         [1]  O-BcsmCamelTDPCriteriaList    OPTIONAL,
     t-CSI                               [2]  T-CSI                         OPTIONAL,
     t-BCSM-CAMEL-TDP-CriteriaList       [3]  T-BCSM-CAMEL-TDP-CriteriaList OPTIONAL,
     vt-CSI                              [4]  T-CSI                         OPTIONAL,
     vt-BCSM-CAMEL-TDP-CriteriaList      [5]  T-BCSM-CAMEL-TDP-CriteriaList OPTIONAL,
     tif-CSI                             [6]  NULL                          OPTIONAL,
     tif-CSI-NotificationToCSE           [7]  NULL                          OPTIONAL,
     gprs-CSI                            [8]  GPRS-CSI                      OPTIONAL,
     sms-CSI                             [9]  SMS-CSI                       OPTIONAL,
     ss-CSI                              [10] SS-CSI                        OPTIONAL,
     m-CSI                               [11] M-CSI                         OPTIONAL,
     extensionContainer                  [12] ExtensionContainer            OPTIONAL,
     ...}
```

```
AnyTimeModificationArg ::= SEQUENCE {
     subscriberIdentity                  [0]  SubscriberIdentity,
     gsmSCF-Address                      [1]  ISDN-AddressString,
     modificationRequestFor-SS-Info      [2]  ModificationRequestFor-SS-Info OPTIONAL,
     modificationRequestFor-CSI          [3]  ModificationRequestFor-CSI    OPTIONAL,
     extensionContainer                  [4]  ExtensionContainer            OPTIONAL,
     ...}
```

```
AnyTimeModificationRes ::= SEQUENCE {
     ss-InfoFor-CSE                      [0]  Ext-SS-InfoFor-CSE            OPTIONAL,
     camel-SubscriptionInfo              [1]  CAMEL-SubscriptionInfo        OPTIONAL,
     extensionContainer                  [2]  ExtensionContainer            OPTIONAL,
     ...}
```

```
ModificationRequestFor-SS-Info ::= SEQUENCE {
     ss-Code                              [0]  SS-Code,
     basicService                         [1]  Ext-BasicServiceCode          OPTIONAL,
     ss-Status                            [2]  Ext-SS-Status                 OPTIONAL,
     forwardedToNumber                    [3]  AddressString                 OPTIONAL,
     forwardedToSubaddress                [4]  ISDN-SubaddressString         OPTIONAL,
     noReplyConditionTime                 [5]  Ext-NoRepCondTime             OPTIONAL,
     modifyNotificationToCSE              [6]  ModificationInstruction       OPTIONAL,
     extensionContainer                   [7]  ExtensionContainer            OPTIONAL,
     ...}

ModificationRequestFor-CSI ::= SEQUENCE {
     requestedCamelSubscriptionInfo       [0]  RequestedCAMEL-SubscriptionInfo OPTIONAL,
     modifyNotificationToCSE              [1]  ModificationInstruction       OPTIONAL,
     modifyCSI-State                      [2]  ModificationInstruction       OPTIONAL,
     extensionContainer                   [3]  ExtensionContainer            OPTIONAL,
     ...}

ModificationInstruction ::= ENUMERATED {
     deactivate                           (0),
     activate                             (1)}

-- subscriber data modification notification types

NoteSubscriberDataModifiedArg ::= SEQUENCE {
     imsi                                 IMSI,
     msisdn                               ISDN-AddressString,
     typeOfModification                   TypeOfModification,
     extensionContainer                   ExtensionContainer                 OPTIONAL,
     ...}

NoteSubscriberDataModifiedRes ::= SEQUENCE {
     extensionContainer                   ExtensionContainer                 OPTIONAL,
     ...}

TypeOfModification ::= ENUMERATED {
     callForwardingSS-Data                (0),
     callBarringSS-Data                   (1),
     operatorDeterminedBarringData        (2),
     camelSubscriptionInformation         (3),
     ...}
-- exception handling:
-- reception of other values shall be treated as unexpected data


-- mobility management event notificatioon info types

NoteMM-EventArg::= SEQUENCE {
     serviceKey                           ServiceKey,
     eventMet                             [0]  MM-Code,
     imsi                                 [1]  IMSI,
     msisdn                               [2]  ISDN-AddressString,
     locationInformation                  [3]  LocationInformation           OPTIONAL,
     lsaIdentity                          [4]  LSAIdentity                   OPTIONAL,
     supportedCAMELPhases                 [5]  SupportedCamelPhases          OPTIONAL,
     extensionContainer                   [6]  ExtensionContainer            OPTIONAL,
     ...}

NoteMM-EventRes ::= SEQUENCE {
     extensionContainer                   ExtensionContainer                 OPTIONAL,
     ...}

Ext-SS-InfoFor-CSE ::= CHOICE {
     forwardingInfoFor-CSE                [0] Ext-ForwardingInfoFor-CSE,
     callBarringInfoFor-CSE               [1] Ext-CallBarringInfoFor-CSE
     }

Ext-ForwardingInfoFor-CSE ::= SEQUENCE {
     ss-Code                              [0]  SS-Code,
     forwardingFeatureList                [1]  Ext-ForwFeatureList,
     notificationToCSE                    [2]  NULL,
     extensionContainer                   [3]  ExtensionContainer            OPTIONAL,
     ...}
```

```
Ext-CallBarringInfoFor-CSE ::= SEQUENCE {
     ss-Code                              [0]  SS-Code,
     callBarringFeatureList               [1]  Ext-CallBarFeatureList,
     password                             [2]  Password,
     wrongPasswordAttemptsCounter         [3]  WrongPasswordAttemptsCounter,
     notificationToCSE                    [4]  NULL,
     extensionContainer                   [5]  ExtensionContainer           OPTIONAL,
     ...}

END
```

****** Next Modified Section******

17.6.2 Operation and Maintenance Operations

```
MAP-OperationAndMaintenanceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-OperationAndMaintenanceOperations (6)
   version6 (6)}

DEFINITIONS

::=

BEGIN

EXPORTS
   ActivateTraceMode,
   DeactivateTraceMode,
   SendIMSI
;

IMPORTS
   OPERATION
FROM TCAPMessages {
   ccitt recommendation q 773 modules (2) messages (1) version2 (2)}

   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   FacilityNotSupported,
   UnknownSubscriber,
   UnidentifiedSubscriber,
   TracingBufferFull
FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version6 (6)}

   ActivateTraceModeArg,
   ActivateTraceModeRes,
   DeactivateTraceModeArg,
   DeactivateTraceModeRes
FROM MAP-OM-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-OM-DataTypes (12) version6 (6)}
;


ActivateTraceMode ::= OPERATION                                          --Timer m
     ARGUMENT
          activateTraceModeArg            ActivateTraceModeArg
     RESULT
          activateTraceModeRes            ActivateTraceModeRes
          -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          FacilityNotSupported,
          UnidentifiedSubscriber,
          TracingBufferFull}
```

```
DeactivateTraceMode ::= OPERATION                                          --Timer m
    ARGUMENT
         deactivateTraceModeArg          DeactivateTraceModeArg
    RESULT
         deactivateTraceModeRes          DeactivateTraceModeRes
         -- optional
    ERRORS {
         SystemFailure,
         DataMissing,
         UnexpectedDataValue,
         FacilityNotSupported,
         UnidentifiedSubscriber}

SendIMSI ::= OPERATION                                                     --Timer m
    ARGUMENT
         sendIMSI-Arg                    SendIMSI-Arg
    RESULT
         sendIMSI-Res                    SendIMSI-Res
    ERRORS {
         SystemFailure
         DataMissing,
         UnexpectedDataValue,
         UnknownSubscriber}

END
```

****** Next Modified Section******

17.7.2 Operation and maintenance data types

```
MAP-OM-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-OM-DataTypes (12) version6 (6)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   ActivateTraceModeArg,
   ActivateTraceModeRes,
   DeactivateTraceModeArg,
   DeactivateTraceModeRes
;

IMPORTS
   AddressString,
   IMSI,
   EMSI,
   TEMSI

FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}


;


ActivateTraceModeArg ::= SEQUENCE {
     imsi                            [0] IMSI                          OPTIONAL,
     traceReference                  [1] TraceReference,
     traceType [2] TraceType,
     omc-Id                          [3] AddressString                 OPTIONAL,
     extensionContainer              [4] ExtensionContainer            OPTIONAL,
     ...}

TraceReference ::= OCTET STRING (SIZE (1..2))
```

```
TraceType ::= INTEGER
    (0..255)
    -- Trace types are fully defined in TS GSM 12.08.

ActivateTraceModeRes ::= SEQUENCE {
    extensionContainer                  [0] ExtensionContainer          OPTIONAL,
    ...}

DeactivateTraceModeArg ::= SEQUENCE {
    imsi                                [0] IMSI                        OPTIONAL,
    traceReference                      [1] TraceReference,
    extensionContainer                  [2] ExtensionContainer          OPTIONAL,
    ...}

DeactivateTraceModeRes ::= SEQUENCE {
    extensionContainer                  [0] ExtensionContainer          OPTIONAL,
    ...}

SendIMSI-Arg SEQUENCE {
    msisdn                              [0] ISDN-AddressString          OPTIONAL,
    emsi                                [1] EMSI                        OPTIONAL,
    extensionContainer                  [2] ExtensionContainer          OPTIONAL,
    ...}
SendIMSI-Res SEQUENCE {
    imsi                                [0] IMSI                        OPTIONAL,
    temsi                               [1] TEMSI                       OPTIONAL,
    extensionContainer                  [2] ExtensionContainer          OPTIONAL,
    ...}
END
```

****** Next Modified Section******

17.7.8 Common data types

```
MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS

   -- general data types and values
   AddressString,
   ISDN-AddressString,
   maxISDN-AddressLength,
   ISDN-SubaddressString,
   ExternalSignalInfo,
   Ext-ExternalSignalInfo,
   SignalInfo,
   maxSignalInfoLength,
   AlertingPattern,

   -- data types for numbering and identification
   IMSI,
   TMSI,
   EMSI,
   TEMSI,
   Identity,
   SubscriberId,
   IMEI,
   HLR-List,
   LMSI,
   GlobalCellId,
   NetworkResource,
   NAEA-PreferredCI,
   NAEA-CIC,
   ASCI-CallReference,
   SubscriberIdentity,

```

```
    -- data types for CAMEL
    CellIdOrLAI,

    -- data types for subscriber management
    BasicServiceCode,
    Ext-BasicServiceCode,
    EMLPP-Info,
    EMLPP-Priority,

    -- data types for geographic location
    AgeOfLocationInformation,
    LCSClientExternalID,
    LCSClientInternalID
;

IMPORTS
    TeleserviceCode,
    Ext-TeleserviceCode
FROM MAP-TS-Code {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-TS-Code (19) version6 (6)}

    BearerServiceCode,
    Ext-BearerServiceCode
FROM MAP-BS-Code {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-BS-Code (20) version6 (6)}

    ExtensionContainer
FROM MAP-ExtensionDataTypes {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}
;


-- general data types

TBCD-STRING ::= OCTET STRING
     -- This type (Telephony Binary Coded Decimal String) is used to
     -- represent several digits from 0 through 9, *, #, a, b, c, two
     -- digits per octet, each digit encoded 0000 to 1001 (0 to 9),
     -- 1010 (*), 1011 (#), 1100 (a), 1101 (b) or 1110 (c); 1111 used
     -- as filler when there is an odd number of digits.

     -- bits 8765 of octet n encoding digit 2n
     -- bits 4321 of octet n encoding digit 2(n-1) +1
```

```
AddressString ::= OCTET STRING (SIZE (1..maxAddressLength))
     -- This type is used to represent a number for addressing
     -- purposes. It is composed of
     --   a)   one octet for nature of address, and numbering plan
     --        indicator.
     --   b)   digits of an address encoded as TBCD-String.

     -- a)     The first octet includes a one bit extension indicator, a
     --        3 bits nature of address indicator and a 4 bits numbering
     --        plan indicator, encoded as follows:

     -- bit 8: 1  (no extension)

     -- bits 765: nature of address indicator
     --   000  unknown
     --   001  international number
     --   010  national significant number
     --   011  network specific number
     --   100  subscriber number
     --   101  reserved
     --   110  abbreviated number
     --   111  reserved for extension

     -- bits 4321: numbering plan indicator
     --   0000  unknown
     --   0001  ISDN/Telephony Numbering Plan (Rec CCITT E.164)
     --   0010  spare
     --   0011  data numbering plan (CCITT Rec X.121)
     --   0100  telex numbering plan (CCITT Rec F.69)
     --   0101  spare
     --   0110  land mobile numbering plan (CCITT Rec E.212)
     --   0111  spare
     --   1000  national numbering plan
     --   1001  private numbering plan
     --   1111  reserved for extension

     --   all other values are reserved.

     -- b)     The following octets representing digits of an address
     --        encoded as a TBCD-STRING.

maxAddressLength  INTEGER ::= 20

ISDN-AddressString ::=
              AddressString (SIZE (1..maxISDN-AddressLength))
     -- This type is used to represent ISDN numbers.

maxISDN-AddressLength  INTEGER ::= 9
```

```
ISDN-SubaddressString ::=
            OCTET STRING (SIZE (1..maxISDN-SubaddressLength))
    -- This type is used to represent ISDN subaddresses.
    -- It is composed of
    --   a)   one octet for type of subaddress and odd/even indicator.
    --   b)   20 octets for subaddress information.

    --   a)   The first octet includes a one bit extension indicator, a
    --        3 bits type of subaddress and a one bit odd/even indicator,
    --        encoded as follows:

    --   bit 8: 1  (no extension)

    --   bits 765: type of subaddress
    --        000  NSAP (X.213/ISO 8348 AD2)
    --        010  User Specified
    --        All other values are reserved

    --   bit 4: odd/even indicator
    --        0  even number of address signals
    --        1  odd number of address signals
    --        The odd/even indicator is used when the type of subaddress
    --        is "user specified" and the coding is BCD.

    --   bits 321: 000 (unused)

    --   b) Subaddress information.
    --   The NSAP X.213/ISO8348AD2 address shall be formatted as specified
    --   by octet 4 which contains the Authority and Format Identifier
    --   (AFI). The encoding is made according to the "preferred binary
    --   encoding" as defined in X.213/ISO834AD2. For the definition
    --   of this type of subaddress, see CCITT Rec I.334.

    --   For User-specific subaddress, this field is encoded according
    --   to the user specification, subject to a maximum length of 20
    --   octets. When interworking with X.25 networks BCD coding should
    --   be applied.

maxISDN-SubaddressLength  INTEGER ::= 21

ExternalSignalInfo ::= SEQUENCE {
    protocolId                      ProtocolId,
    signalInfo                      SignalInfo,
    -- Information about the internal structure is given in
    -- subclause 7.6.9.
    extensionContainer              ExtensionContainer              OPTIONAL,
    -- extensionContainer must not be used in version 2
    ...}

SignalInfo ::= OCTET STRING (SIZE (1..maxSignalInfoLength))

maxSignalInfoLength  INTEGER ::= 200
    -- This NamedValue represents the theoretical maximum number of
    -- octets which are available to carry a single data type,
    -- without requiring segmentation to cope with the network layer
    -- service. However, the actual maximum size available for a data
    -- type may be lower, especially when other information elements
    -- have to be included in the same component.

ProtocolId ::= ENUMERATED {
    gsm-0408  (1),
    gsm-0806  (2),
    gsm-BSSMAP  (3),
    -- Value 3 is reserved and must not be used
    ets-300102-1  (4)}

Ext-ExternalSignalInfo ::= SEQUENCE {
    ext-ProtocolId                  Ext-ProtocolId,
    signalInfo                      SignalInfo,
    -- Information about the internal structure is given in
    -- subclause 7.6.9.10
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
Ext-ProtocolId ::= ENUMERATED {
     ets-300356  (1),
     ...
      }
-- exception handling:
-- For Ext-ExternalSignalInfo sequences containing this parameter with any
-- other value than the ones listed the receiver shall ignore the whole
-- Ext-ExternalSignalInfo sequence.

AlertingPattern ::= OCTET STRING (SIZE (1) )
     -- This type is used to represent Alerting Pattern

     --   bits 8765 : 0000 (unused)

     --   bits 43 : type of Pattern
     --        00 level
     --        01 category
     --        10 category
     --        all other values are reserved.

     --   bits 21 : type of alerting

alertingLevel-0   AlertingPattern ::= '00000000'B
alertingLevel-1   AlertingPattern ::= '00000001'B
alertingLevel-2   AlertingPattern ::= '00000010'B
     -- all other values of Alerting level are reserved
     -- Alerting Levels are defined in GSM 02.07

alertingCategory-1   AlertingPattern ::= '00000100'B
alertingCategory-2   AlertingPattern ::= '00000101'B
alertingCategory-3   AlertingPattern ::= '00000110'B
alertingCategory-4   AlertingPattern ::= '00000111'B
alertingCategory-5   AlertingPattern ::= '00001000'B
     -- all other values of Alerting Category are reserved
     -- Alerting categories are defined in GSM 02.07


-- data types for numbering and identification

IMSI ::= TBCD-STRING (SIZE (3..8))
     -- digits of MCC, MNC, MSIN are concatenated in this order.

Identity ::= CHOICE {
     imsi                                IMSI,
     imsi-WithLMSI                       IMSI-WithLMSI}

IMSI-WithLMSI ::= SEQUENCE {
     imsi                                IMSI,
     lmsi                                LMSI,
     -- a special value 00000000 indicates that the LMSI is not in use
     ...}

ASCI-CallReference ::= TBCD-STRING (SIZE (1..8))
     -- digits of VGCS/VBC-area,Group-ID are concatenated in this order.


TMSI ::= OCTET STRING (SIZE (1..4))

EMSI ::= OCTET STRING (SIZE (1..12))

TEMSI ::= OCTET STRING (SIZE (1..8))

SubscriberId ::= CHOICE {
     imsi                                [0] IMSI,
     tmsi                                [1] TMSI}

IMEI ::= TBCD-STRING (SIZE (8))
     --   Refers to International Mobile Station Equipment Identity
     --   and Software Version Number (SVN) defined in TS GSM 03.03.
     --   If the SVN is not present the last octet shall contain the
     --   digit 0 and a filler.
     --   If present the SVN shall be included in the last octet.

HLR-Id ::= IMSI
     -- leading digits of IMSI, i.e. (MCC, MNC, leading digits of
     -- MSIN) forming HLR Id defined in TS GSM 03.03.
```

```
HLR-List ::= SEQUENCE SIZE (1..maxNumOfHLR-Id) OF
                                        HLR-Id

maxNumOfHLR-Id  INTEGER ::= 50

LMSI ::= OCTET STRING (SIZE (4))

GlobalCellId ::= OCTET STRING (SIZE (5..7))
     -- Refers to Cell Global Identification defined in TS GSM 03.03.
     -- The internal structure is defined as follows:
     -- octet 1 bits 4321                Mobile Country Code 1st digit
     --         bits 8765                Mobile Country Code 2nd digit
     -- octet 2 bits 4321                Mobile Country Code 3rd digit
     --         bits 8765                Mobile Network Code 3rd digit
     --                                  or filler (1111) for 2 digit MNCs
     -- octet 3 bits 4321                Mobile Network Code 1st digit
     --         bits 8765                Mobile Network Code 2nd digit
     -- octets 4 and 5                   Location Area Code according to TS GSM 04.08
     -- octets 6 and 7                   Cell Identity (CI) according to TS GSM 04.08

NetworkResource ::= ENUMERATED {
     plmn  (0),
     hlr  (1),
     vlr  (2),
     pvlr  (3),
     controllingMSC  (4),
     vmsc  (5),
     eir  (6),
     rss  (7)}

NAEA-PreferredCI ::= SEQUENCE {
     naea-PreferredCIC                  [0] NAEA-CIC,
     extensionContainer                 [1] ExtensionContainer          OPTIONAL,
     ...}

NAEA-CIC ::= OCTET STRING (SIZE (3))
     -- The internal structure is defined by the Carrier Identification
     -- parameter in ANSI T1.113.3. Carrier codes between “000” and “999” may
     -- be encoded as 3 digits using “000” to “999” or as 4 digits using
     -- “0000” to “0999”. Carrier codes between “1000” and “9999” are encoded
     -- using 4 digits.

SubscriberIdentity ::= CHOICE {
     imsi                               [0] IMSI,
     msisdn                             [1] ISDN-AddressString
     }

LCSClientExternalID ::= SEQUENCE {
     externalAddress                    [0] AddressString               OPTIONAL,
     extensionContainer                 [1] ExtensionContainer          OPTIONAL,
     ... }

LCSClientInternalID ::= ENUMERATED {
     broadcastService                   (0),
     o-andM-HPLMN                       (1),
     o-andM-VPLMN                       (2),
     anonymousLocation                  (3),
     targetMSsubscribedService          (4),
     ... }


-- data types for CAMEL

CellIdOrLAI ::= CHOICE {
     cellIdFixedLength                  [0] CellIdFixedLength,
     laiFixedLength                     [1] LAIFixedLength}
```

```
CellIdFixedLength ::= OCTET STRING (SIZE (7))
    -- Refers to Cell Global Identification defined in TS GSM 03.03.
    -- The internal structure is defined as follows:
    -- octet 1 bits 4321                Mobile Country Code 1st digit
    --         bits 8765                Mobile Country Code 2nd digit
    -- octet 2 bits 4321                Mobile Country Code 3rd digit
    --         bits 8765                Mobile Network Code 3rd digit
    --                                  or filler (1111) for 2 digit MNCs
    -- octet 3 bits 4321                Mobile Network Code 1st digit
    --         bits 8765                Mobile Network Code 2nd digit
    -- octets 4 and 5                   Location Area Code according to TS GSM 04.08
    -- octets 6 and 7                   Cell Identity (CI) according to TS GSM 04.08

LAIFixedLength ::= OCTET STRING (SIZE (5))
    -- Refers to Location Area Identification defined in TS GSM 03.03.
    -- The internal structure is defined as follows:
    -- octet 1 bits 4321                Mobile Country Code 1st digit
    --         bits 8765                Mobile Country Code 2nd digit
    -- octet 2 bits 4321                Mobile Country Code 3rd digit
    --         bits 8765                Mobile Network Code 3rd digit
    --                                  or filler (1111) for 2 digit MNCs
    -- octet 3 bits 4321                Mobile Network Code 1st digit
    --         bits 8765                Mobile Network Code 2nd digit
    -- octets 4 and 5                   Location Area Code according to TS GSM 04.08


-- data types for subscriber management

BasicServiceCode ::= CHOICE {
    bearerService                       [2] BearerServiceCode,
    teleservice                         [3] TeleserviceCode}

Ext-BasicServiceCode ::= CHOICE {
    ext-BearerService                   [2] Ext-BearerServiceCode,
    ext-Teleservice                     [3] Ext-TeleserviceCode}

EMLPP-Info ::= SEQUENCE {
    maximumentitledPriority             EMLPP-Priority,
    defaultPriority                     EMLPP-Priority,
    extensionContainer                  ExtensionContainer              OPTIONAL,
    ...}

EMLPP-Priority ::= INTEGER (0..15)
    -- The mapping from the values A,B,0,1,2,3,4 to the integer-value is
    -- specified as follows where A is the highest and 4 is the lowest
    -- priority level
    -- the integer values 7-15 are spare and shall be mapped to value 4

priorityLevelA                          EMLPP-Priority ::= 6
priorityLevelB                          EMLPP-Priority ::= 5
priorityLevel0                          EMLPP-Priority ::= 0
priorityLevel1                          EMLPP-Priority ::= 1
priorityLevel2                          EMLPP-Priority ::= 2
priorityLevel3                          EMLPP-Priority ::= 3
priorityLevel4                          EMLPP-Priority ::= 4


   -- data types for geographic location

AgeOfLocationInformation ::= INTEGER (0..32767)
-- the value represents the elapsed time in minutes since the last
-- network contact of the mobile station (i.e. the actuality of the
-- location information).
-- value “0” indicates that the MS is currently in contact with the
--           network
-- value “32767” indicates that the location information is at least
--               32767 minutes old

END
```

*** Next New Section***

25.6 Procedures for Enhanced User Identity Confidentiality

In the procedure for Enhanced User Identity Confidentiality the IMSI and the TEMSI of the subscriber is retrieved from the UIDN. The procedure is shown in figure 25.6/1.

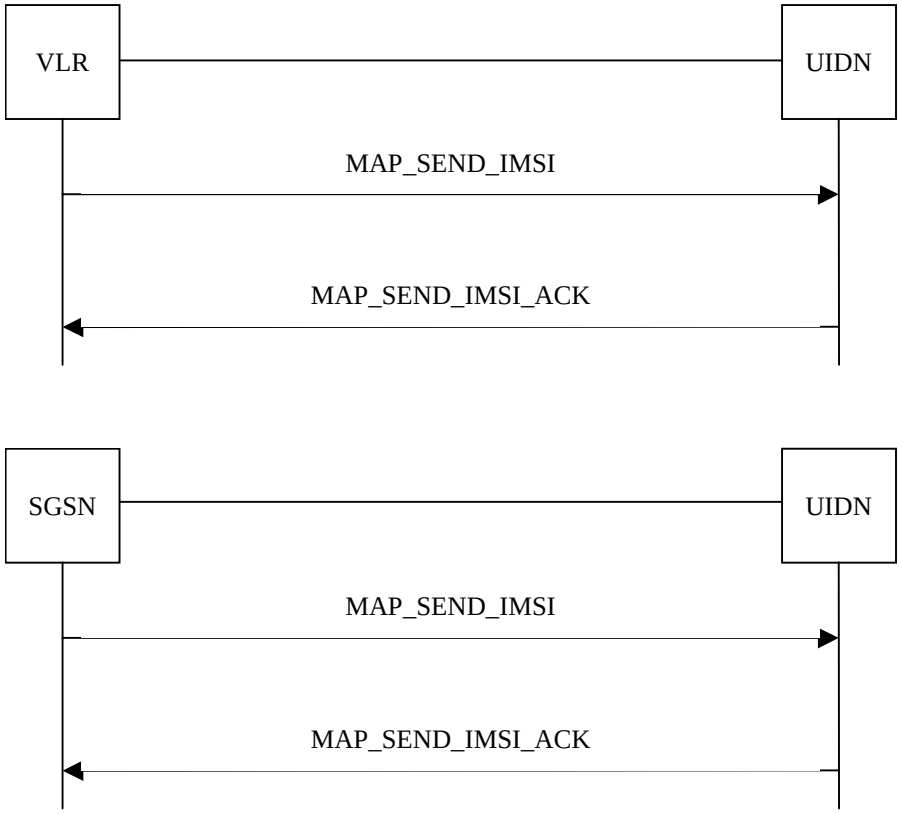

Figure 25.6/1: Message Flows to Enhanced User Identity Confidentiality

25.6.1 Enhanced user identity confidentiality procedure in the UIDN

Opening of the dialogue is described in the macro Receive_Open_Ind in subclause 25.1, with outcomes:

- procedure termination; or
- dialogue acceptance, with proceeding as below.

When receiving the MAP_SEND_IMSI indication, the UIDN will check the parameters and data in the primitive. Data errors are reported as an unexpected data value error or a data missing error depending on the nature of the error.

The UIDN will request decryption of the EMSI received in the MAP_SEND_IMSI indication from the decryption application. When the UIDN receives a SEND_IMSI response from the decryption application then it shall pass this to the requesting entity and close the MAP provider service.

The enhanced user identity confidentiality procedure in the HLR is shown in figure 25.6/2.

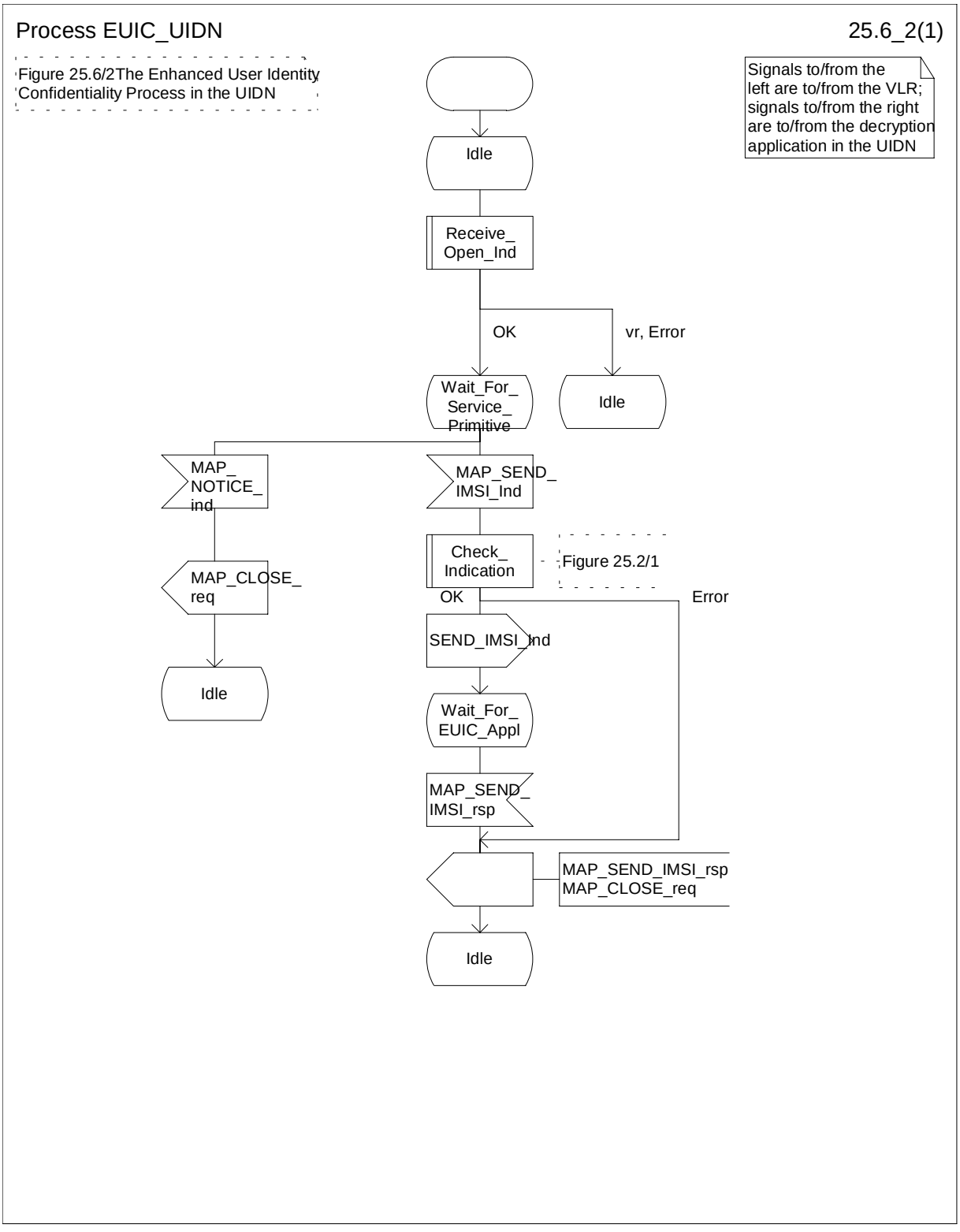

Figure 25.6/2: Process EUIC_HLR

25.6.2 Enhanced user identity confidentiality procedure in the VLR

When the Send IMSI request is received from the Location Management application, the VLR will send the MAP_SEND_IMSI request to the UIDN. The contents of the response is sent to the Location Management application.

The subscriber identity procedure in the VLR is shown in figure 25.6/3.

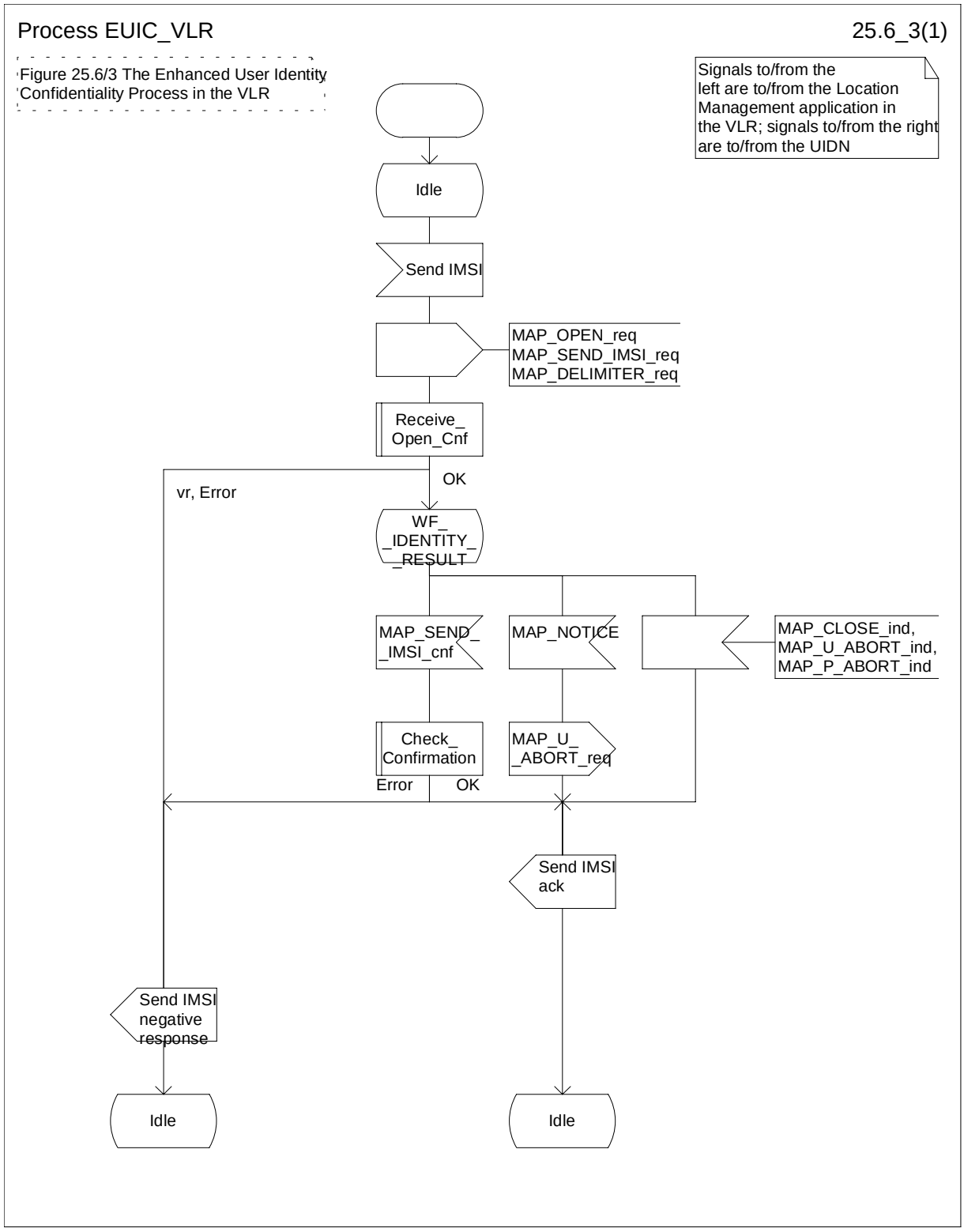

Figure 25.6/3: Process EUIC_VLR

25.6.2 Enhanced user identity confidentiality procedure in the SGSN

When the Send IMSI request is received from the Location Management application, the SGSN will send the MAP_SEND_IMSI request to the UIDN. The contents of the response is sent to the Location Management application.

The subscriber identity procedure in the VLR is shown in figure 25.6/4.

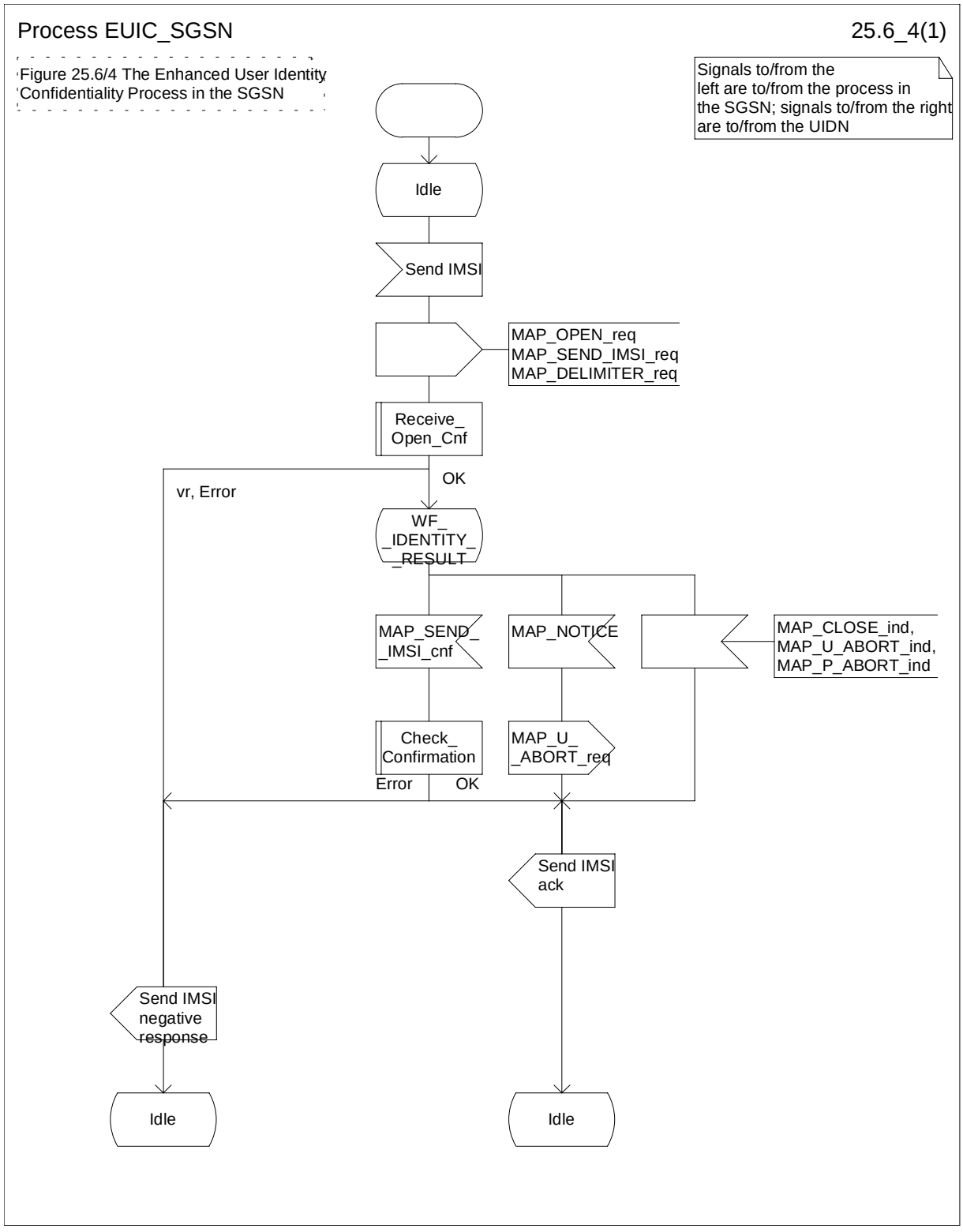

Figure 25.6/4: Process EUIC_SGSN

3GPP TSG CN WG2 SWG-B
Milan, Italy, 14 – 16 February 2000

Document *N2B000347*
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.

23.008	**CR**	**???r1**	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: *list expected approval meeting # here ↑*		for approval	X	strategic		*(for SMG use only)*
		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 [ ] Core Network [X]

Source: T-Mobil **Date:** 14.02.00

Subject: Introduction of the TEMSI

Work item: Security

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

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature	X		Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: This CR is necessary to introduce Enhanced User Identity Confidentiality according the WI security.

Clauses affected: new section 2.1.6

Other specs affected:

Other 3G core specifications		→ List of CRs:	23.002-???, 23.003-015, 23.012-003, 23.018-036, 23.060-???, 24.008-???, 25.331-???, 29.002-092, 31.102-???, 33.103-???, 33.105-???
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.

2.1.5 Packet-Temporary Mobile Subscriber Identity (P-TMSI)

Packet-Temporary Mobile Subscriber Identity (P-TMSI) is defined in GSM 03.03. Its usage is described in GSM 03.60. P-TMSI is accompanied by the P-TMSI Signature, see subclause 2.3.7.

The P-TMSI is temporary subscriber data and is conditionally stored in the SGSN.

2.1.6 Temporarily Encrypted Mobile Subscriber Identity (TEMSI)

Temporarily Encrypted Subscriber Identity (TEMSI) is defined in 3G TS 23.003.

The TEMSI is temporary subscriber data and is conditionally stored in the VLR and SGSN. For use of TEMSI see 3G TS 33.102.

2.1.7~~6~~ Temporary Link Layer Identifier (TLLI)

Temporary Link Layer Identifier (TLLI) is defined in GSM 03.03. It is derived from the P-TMSI by the MS and occurs in the variants Local TLLI and Foreign TLLI. The TLLI is temporary subscriber data and is conditionally stored in the SGSN. For use of TLLI see GSM 03.60.

2.1.8~~7~~ Random TLLI

Random TLLI is chosen randomly by the MS. It is defined in GSM 03.03. Random TLLI is short living temporary subscriber data and is conditionally stored in the SGSN. For use of Random TLLI see GSM 03.60.

A Random TLLI may be used if no valid P-TMSI is available.

2.1.9~~8~~ Local Mobile Station Identity (LMSI)

Local Mobile Station Identity (LMSI) is defined in GSM 03.03. The LMSI is temporary subscriber data. The LMSI may be stored in the VLR; if it is received in the HLR it must be stored there.

2.1.10~~9~~ International Mobile Equipment Identity (IMEI)

International Mobile Equipment Identity (IMEI) is defined in GSM 03.03. The IMEI is temporary subscriber data and is conditionally stored in the SGSN.

2.2 Data related to Mobile Station types

2.2.1 Mobile Station Category

Mobile Station Category has a structure identical to that of "Calling Party's Category" defined in ISUP (CCITT Recommendation Q.763).

The following values of category shall be supported:

- ordinary subscriber.

The category is assigned per IMSI.

Mobile Station Category is permanent subscriber data and is stored in HLR and VLR.

2.2.2 LMU Identifier

The LMU identifier is part of the subscriber data for a Type A LMU, when associated with an NSS based SMLC, and serves to distinguish a Type A LMU from a normal MS.

4 Accessing subscriber data

It shall be possible to retrieve or store subscriber data concerning a specific MS from the HLR by use of each of the following references:

- International Mobile Subscriber Identity (IMSI);
- Mobile Station ISDN Number (MSISDN)

It shall be possible to retrieve or store subscriber data concerning a specific MS from the VLR by use of each of the following references:

- International Mobile Subscriber Identity (IMSI);
- Temporary Mobile Subscriber Identity (TMSI).

It shall be possible to retrieve or store subscriber data concerning a specific MS from the SGSN by use of each of the following references:

- International Mobile Subscriber Identity (IMSI);
- Packet Temporary Mobile Subscriber identity (P-TMSI).

It shall be possible to retrieve or store subscriber data concerning a specific MS from the GGSN by use of the following reference:

- International Mobile Subscriber Identity (IMSI).

See clause 3 for explanation of M, C, T and P in table 1 and table 2.

Table 1: Overview of data stored for non-GPRS Network Access Mode

PARAMETER	SUBCLAUSE	HLR	VLR	TYPE	
IMSI	2.1.1.1	M	M	P	Note
Network Access Mode	2.1.1.2	M	-	P	Note
International MS ISDN number	2.1.2	M	M	P	
multinumbering MSISDNs	2.1.3	C	-	P	Note
Basic MSISDN indicator	2.1.3.1	C	-	P	
MSISDN-Alert indicator	2.1.3.2	C	-	P	
TMSI	2.1.4	-	C	T	
TEMSI	2.1.6	-	C	T	
LMSI	2.1.~~9~~8	C	C	T	Note
Mobile Station Category	2.2.1	M	M	P	
LMU Identifier	2.2.2	C	C	P	
RAND, SRES and Kc	2.3.1		C	T	
RAND, XRES, CK, IK and AUTN	2.3.2	M	C	T	
Ciphering Key Sequence Number	2.3.3	-	M	T	
MSRN	2.4.1	-	C	T	Note
Location Area Identity	2.4.2	-	M	T	
VLR number	2.4.5	M	-	T	Note
MSC number	2.4.6	M	C	T	
HLR number	2.4.7	-	C	T	
Subscription restriction	2.4.10	C	-	P	
RSZI lists	2.4.11.1	C	-	P	
Zone Code List	2.4.11.2	-	C	P	
MSC area restricted flag	2.4.12	M	-	T	
LA not allowed flag	2.4.13	-	M	T	
ODB-induced barring data	2.4.15.1	C	-	T	
Roaming restriction due to unsupported feature	2.4.15.2	M	M	T	
Cell ID	2.4.16	-	C	T	
LSA Identity	2.4.17.1	C	C	P	
LSA Priority	2.4.17.2	C	C	P	
LSA Only Access Indicator	2.4.17.3	C	C	P	
LSA Active Mode Indicator	2.4.17.4	C	C	P	
VPLMN Identifier	2.4.17.5	C	-	P	
Provision of bearer service	2.5.1	M	M	P	
Provision of teleservice	2.5.2	M	M	P	
BC allocation	2.5.3	C	C	P	
IMSI detached flag	2.7.1	-	C	T	
Confirmed by Radio Contact indicator	2.7.4.1	-	M	T	
Subscriber Data Confirmed by HLR indicator	2.7.4.2	-	M	T	
Location Information Confirmed in HLR indicator	2.7.4.3	-	M	T	
Check SS indicator	2.7.4.4	M	-	T	
MS purged for non-GPRS flag	2.7.5	M	-	T	
MNRR	2.7.7	C	-	T	
Subscriber status	2.8.1	C	C	P	
Barring of outgoing calls	2.8.2.1	C	C	P	
Barring of incoming calls	2.8.2.2	C	-	P	
Barring of roaming	2.8.2.3	C	-	P	
Barring of premium rate calls	2.8.2.4	C	C	P	
Barring of supplementary service management	2.8.2.5	C	C	P	
Barring of registration of call forwarding	2.8.2.6	C	-	P	
Barring of invocation of call transfer	2.8.2.7	C	C	P	
Operator determined barring PLMN-specific data	2.8.3	C	C	P	
Handover Number	2.9.1	-	C	T	
Messages Waiting Data	2.10.1	C	-	T	
Mobile Station Not Reachable Flag	2.10.2	C	M	T	
Memory Capacity Exceeded Flag	2.10.3	C	-	T	

(continued)

Table 1 (concluded): Overview of data stored for non-GPRS Network Access Mode

PARAMETER	SUBCLAUSE	HLR	VLR	TYPE	
Trace Reference	2.11.1	C	C	P	
Trace Type	2.11.2	C	C	P	
Operations Systems Identity	2.11.3	C	C	P	
HLR Trace Type	2.11.4	C	-	P	
MAP Error On Trace	2.11.5	C	-	T	
Trace Activated in VLR	2.11.6	C	C	T	
Foreign Subscriber Registered in VLR	2.11.7	-	C	P	Note
VGCS Group Membership List	2.12.1	C	C	P	
VBS Group Membership List	2.12.2	C	C	P	
Broadcast Call Initiation Allowed List	2.12.2.1	C	C	P	
Originating CAMEL Subscription Information (O-CSI)	2.14.1.1/3.1	C	C	P	
Terminating CAMEL Subscription Information (T-CSI)	2.14.1.2	C	-	P	
VMSC Terminating CAMEL Subscription Information (VT-CSI)	2.14.1.2/3.2	C	C	P	
Location Information/Subscriber state Information	2.14.1.3	C	-	P	
USSD CAMEL subscription information(U-CSI)	2.14.1.4	C	-	P	
SS invocation notification (SS-CSI)	2.14.1.5/3.2	C	C	P	
Translation information flag(TIF-CSI)	2.14.1.6/3.6	C	C	P	
Dialled service CAMEL Subscription Information (D-CSI)	2.14.1.10/3.6	C	C	P	
USSD General CAMEL service information (UG-CSI)	2.14.2	C	-	P	
O-CSI Negotiated CAMEL Capability Handling	2.14.2.1	C		P	
SS-CSI Negotiated CAMEL Capability Handling	2.14.2.1	C		P	
VT-CSI Negotiated CAMEL Capability Handling	2.14.2.1	C		P	
SMS-CSI VLR Negotiated CAMEL Capability Handling	2.14.2.1	C		P	
M-CSI Negotiated CAMEL Capability Handling	2.14.2.1	C		P	
VLR Supported CAMEL Phases	2.14.2.3	C		P	
IST Alert Timer	2.15.1	C	C	P	
Privacy Exception List	2.16.1.1	C	C	P	
GMLC Numbers	2.16.1.2	C	C	P	
MO-LR List	2.16.1.3	C	C	P	
Age Indicator	2.17.1	C	C	T	

Table 2: Overview of data used for GPRS Network Access Mode

PARAMETER	Subclause	HLR	VLR	SGSN	GGSN	TYPE	
IMSI	2.1.1.1	M	M	M	M	P	Note
Network Access Mode	2.1.1.2	M	-	C (a)	-	P	Note
International MS ISDN number	2.1.2	M	M	M	-	T	
multinumbering MSISDNs	2.1.3	C	-	-	-	T	Note
Basic MSISDN indicator	2.1.3.1	C	-	-	-	T	.
MSISDN-Alert indicator	2.1.3.2	C	-	-	-	T	
P-TMSI	2.1.5	-	-	C	-	T	Note
TEMSI	2.1.6	-	C	C	-	T	
TLLI	2.1.76	-	-	C	-	T	
Random TLLI	2.1.87	-	-	C	-	T	Note
IMEI	2.1.109	-	-	C	-	T	
RAND/SRES and Kc	2.3.1		-	C	-	T	
RAND, XRES, CK, IK, AUTN	2.3.2	M	-	C	-	T	
Ciphering Key Sequence Number	2.3.3	-	-	M	-	T	
Selected Ciphering Algorithm	2.3.5	-	-	M	-	T	
Current Kc	2.3.6	-	-	M	-	T	
P-TMSI Signature	2.3.7	-	-	C	-	T	
Routing Area Identity	2.4.3	-	-	M	-	T	
Cell Global Identification	2.4.4	-	-	C	-	T	
VLR Number	2.4.5	M	-	C (Gs)	-	T	
SGSN Number	2.4.8.1	M	C (Gs)	-	-	T	Note
GGSN Number	2.4.8.2	©	-	-	-	P	Note
RSZI Lists	2.4.11.1	C	-	-	-	P	
Zone Code List	2.4.11.2	-	-	C	-	P	
LA not allowed flag	2.4.13	-	-	M	-	T	
SGSN area restricted flag	2.4.14	M	-	-	-	T	
Roaming Restriction in the SGSN ..	2.4.15.2	M	-	M	-	T	
Cell ID	2.4.16	-	-	C	-	T	
LSA Identity	2.4.17.1	C	C	C	-	P	
LSA Priority	2.4.17.2	C	C	C	-	P	
LSA Only Access Indicator	2.4.17.3	C	C	C	-	P	
LSA Active Mode Indicator	2.4.17.4	C	C	C	-	P	
VPLMN Identifier	2.4.17.5	C	-	-	-	P	
Provision of teleservice	2.5.2	C	-	C	-	P	
Transfer of SM option	2.5.4	M	-	-	-	P	
MNRG	2.7.2	M	-	M	M	T	
MM State	2.7.3	-	-	M	-	T	
Subscriber Data Confirmed by HLR Indicator	2.7.4.2	-	-	M	-	T	
Location Info Confirmed by HLR Indicator	2.7.4.3	-	-	M	-	T	
MS purged for GPRS flag	2.7.6	M	-	-	-	T	
MNRR	2.7.7	C	-	-	-	T	
Subscriber Status	2.8.1	C	-	C	-	P	
Barring of outgoing calls	2.8.2.1	C	-	C	-	P	
Barring of roaming	2.8.2.3	C	-	C	-	P	
ODB PLMN-specific data	2.8.3	C	-	C	-	P	
Trace Activated in SGSN	2.11.7	C	-	C	-	P	
PDP Type	2.13.1	C	-	C	M	P	
PDP Address	2.13.2	C	-	C	M	P	
NSAPI	2.13.3	-	-	C	C	T	
PDP State	2.13.4	-	-	C	-	T	
New SGSN Address	2.13.5	-	-	C	-	T	
Access Point Name	2.13.6	C	-	C	C	P/T	Note
GGSN Address in Use	2.13.7	-	-	C	-	T	
VPLMN Address Allowed	2.13.8	C	-	C	-	P	
Dynamic Address	2.13.9	-	-	-	C	T	
SGSN Address	2.13.10	-	-	-	M	T	
GGSN-list	2.13.11	M	-	-	-	T	

(continued)

Table 2 (concluded): Overview of data used for GPRS Network Access Mode

PARAMETER	Subclause	HLR	VLR	SGSN	GGSN	TYPE
Quality of Service Subscribed	2.13.12	C	-	C	-	P
Quality of Service Requested	2.13.13	-	-	C	-	T
Quality of Service Negotiated	2.13.14	-	-	C	M	T
SND	2.13.15	-	-	C	C	T
SNU	2.13.16	-	-	C	C	T
DRX Parameters	2.13.17	-	-	M	-	T
Compression	2.13.18	-	-	C	-	T
NGAF	2.13.19	-	-	C (Gs)	-	T
Classmark	2.13.20	-	-	M	-	T
TID	2.13.21	-	-	C	C	T
Radio Priority	2.13.22	-	-	C	-	T
Radio Priority SMS	2.13.23	-	-	C	-	T
Short Message Service CAMEL Subscription Information (SMS-CSI)	2.14.4.1/1.8	C	-	C	-	P
GPRS CAMEL Subscription Information (GPRS-CSI)	2.14.4.2/1.9	C	-	C	-	C
SMS-CSI SGSN Negotiated CAMEL Capability Handling	2.14.2.1	C	-	-	-	P
GPRS-CSI Negotiated CAMEL Capability Handling	2.14.2.1	C	-	-	-	P
SGSN Supported CAMEL Phases	2.14.2.3	C	-	-	-	P
Age Indicator	2.16.1	C	-	C	-	T

NOTE: The HLR column indicates only GPRS related use, i.e. if the HLR uses a parameter in non-GPRS Network Access Mode but not in GPRS Network Access Mode, it is not mentioned in this table 2.
(Gs): The VLR column is applicable if Gs interface is installed. It only indicates GPRS related data to be stored and is only relevant to GPRS subscribers registered in VLR.

a): This parameter is relevant in the SGSN only when the Gs interface is installed.

NOTE: For special condition of storage see in the clauses 2.x.y referred-to.
See clause 3 for explanation of M,C,T and P in table 2.

3GPP TSG CN WG2 **TDoc 3GPP N2B000388**
Milan, ITALY
14-16 February 2000

Source: **T-Mobil**

From: **TSG CN WG2** [1)]
To: **TSG SA WG3**

Subject: **Proposed LS on comments to Enhanced User Identity Confidentiality**

TSG CN WG2 have further progressed the work on the Security Work Item "Enhanced User Identity Confidentiality". The following comments were collected during the discussion:

1. When reading the current text in 3G TS 33.102 on Enhanced User Identity Confidentiality it is not clear whether the support of this feature is optional or mandatory for certain network entities. It is TSG CN WG2 working assumption that the support of Enhanced User Identity Confidentiality is mandatory for 3G MSC/VLR and SGSN.

   TSG SA WG3 is asked to confirm this view and to update the description in 3G TS 33.102 accordingly.

2. Based on received contributions and their working assumptions on the content of the stage 2, N2 agreed the changes to introduce the new concept of the Temporarily Encrypted Mobile Subscriber Identity (TEMSI) to core specifications in the responsibility of TSG CN WG2. The introduction of the TEMSI shall prevent paging of a MS with its non-encrypted IMSI. However a case was identified where the IMSI has to be used, mobile terminated call handling if no subscriber data are available in the VLR and mobile terminated call handling after VLR restart.

   There are currently no solutions available to cope with this case. TSG SA WG3 is therefore asked to verify whether this introduces an unexpected large gap in the security concept for Enhanced User Identity Confidentiality.

3. Due to the distributed allocation of TEMSI to 3G subscribers (a VLR is served by several UIDNs) there is a certain probability of a double allocation of TEMSI for subscribers registered in one VLR. This may lead to unsuccessful mobile terminated call handling for those subscribers.

   TSG SA WG3 is asked to consider this disadvantage of the TEMSI concept.

CN2 advise SA3 that if SA3 decide to make changes to the stage 2 which cause it to depart significantly from CN2´s working assumption then there is a risk that stable stage 3 specifications will not be available for the TSG #7 plenaries. Smaller scale changes to the stage 2 could be tracked at an ad hoc meeting which we plan to hold on 2 & 3 March. SA3 are cordially invited to participate in this meeting.

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