3GPP TSG_CN#7 **NP-000076**

ETSI SMG3 Plenary Meeting #7,
Madrid, Spain
13th – 15th March 2000

Agenda item: **5.2.3**

Source: **TSG_N WG2**

Title: **CRs to 3G Work Item Security**

Introduction:

This document contains **"21"** CRs on **Work Item Security,** that have been agreed by **TSG_N WG2,** and are forwarded to **TSG_N Plenary** meeting #7 for approval.

TDoc	SPEC	CR	REV	CAT	Rel	Old vers	New vers	SUBJECT
N2B000331	03.03	A038		C	R98	7.3.1		Modification of section 6.2 to enhance IMEI security
N2B000332	03.03	A039		C	R97	6.4.1		Modification of section 6.2 to enhance IMEI security
N2B000333	03.03	A040		C	R96	5.2.0		Modification of section 6.2 to enhance IMEI security
N2B000334	03.03	A041		C	Ph2	4.9.0		Modification of section 6.2 to enhance IMEI security
N2B000341	23.003	015	3	B	R99	3.3.0		Introduction of Encrypted MSI
N2B000335	23.003	017	1	C	R99	3.3.0		Modification of section 6.2 to enhance IMEI security
N2B000347	23.008	022	1	B	R99	3.2.0		Introduction of Enhanced User Identity Confidentiality
N2B000340	23.012	003	3	B	R99	3.1.0		Introduction of Enhanced User Identity Confidentiality
N2B000190	23.012	004		B	R99	3.1.0		Addition of Current Security Context to Send_Identification_PVLR
N2B000421	23.018	036	3	B	R99	3.3.0		Introduction of Enhanced User Identity Confidentiality
N2B000067	29.002	089			R99	3.3.0		Security interworking between release 99 and pre-99 MSC/VLRs
N2B000447	29.002	092	4	B	R99	3.3.1		Introduction of Enhanced User Identity Confidentiality
N2B000191	29.002	099		B	R99	3.3.0		Addition of Current Security Context to Send_Identification_PVLR
N2B000330	29.002	103	1	B	R99	3.3.0		Addition of UMTS security to MAP B interface
N2B000244	29.002	104		F	R99	3.3.0		Re-Synchronisation Info
N2B000446	29.060	080	2	C	R99	3.3.0		GTP Security
N2B000449	29.060	082	1	B	R99	3.3.0		Introduction of EUIC
N2B000380	29.002	102	2	F	R99	3.3.1		Clarification on Authentication Info Retrieval
N2B000454	29.002	110	1	B	R99	3.3.1		Introduction of Authentication Failure Report
N2B000315	23.018	049		B	R99	3.3.0		Introduction of Authentication Failure Report
N2B000316	23.012	005		B	R99	3.1.0		Introduction of Authentication Failure Report

3GPP/SMG TSG CN2B#4?
Milan, Italy, 14th –16th Feb. 2000

Document *N2B000331*
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

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03.03	**CR**	**A038**	Current Version:	7.3.1

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

For submission to: CN#07	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑	for information		non-strategic	X	

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: N2 **Date:** 07.02.00

Subject: Modification of section 6.2 to enhance IMEI security

Work item: Security

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

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

Release:

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

Reason for change: The security of the IMEI is not sufficiently given by the present specification. Therefore GSM 02.16 was modified. GSM 03.03 needs to be aligned with GSM 02.16. The modification is reflected in this CR.

This CR contains the wording agreed at SMG #30 (Document P-99-776).

Clauses affected: Section 6.2.1 and 6.2.2

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: Category C3
Figures 9, 10 and 11 were not changed

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

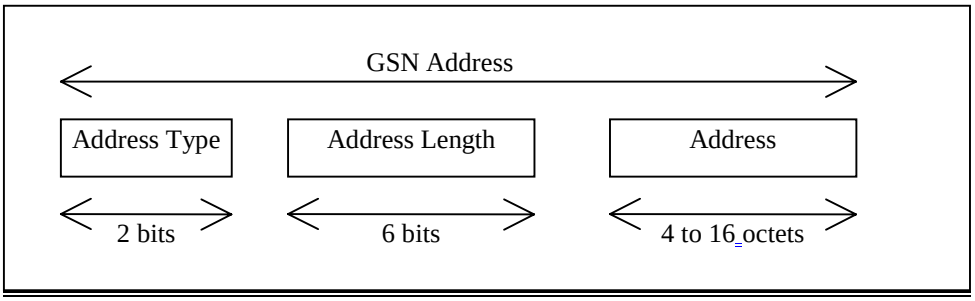


Figure 9: Structure of GSN Address

The GSN Address is composed of the following elements:

1. The Address Type which is a fixed length code (of 2 bits) identifying the type of address that is used in the Address field.

2. Address Length which is a fixed length code (of 6 bits) identifying the length of the Address field.

3. Address is a variable length field with either an IPv4 address or an IPv6 address.

Address Type 0 and Address Length 4 are used when Address is an IPv4 address.

Address Type 1 and Address Length 16 are used when Address is an IPv6 address.

The IP v4 address structure is defined in RFC 791.

The IP v6 address structure is defined in RFC 1883.

5.2 Identification of HLR for HLR restoration application

HLR may also be identified by one or several "HLR id(s)", consisting of the leading digits of the IMSI (MCC + MNC + leading digits of MSIN).

6 International Mobile Station Equipment Identity and Software Version Number

6.1 General

Below the structure and allocation principles of the International Mobile station Equipment Identity and Software Version Number (IMEISV) and the International Mobile station Equipment Identity (IMEI) are defined.

The Mobile Station Equipment is uniquely defined by the IMEI or the IMEISV.

6.2 Composition of IMEI and IMEISV

6.2.1 Composition of IMEI

The International Mobile station Equipment Identity (IMEI) is composed as shown in figure 10.

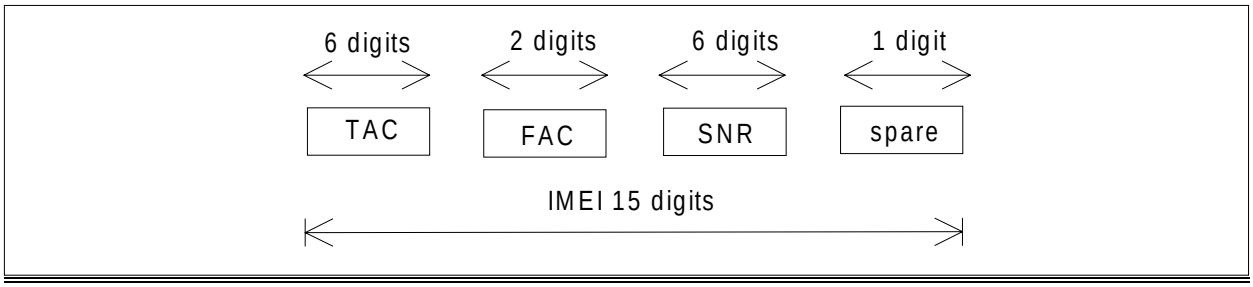


Figure 10: Structure of IMEI

The IMEI is composed of the following elements (each element shall consist of decimal digits only):

- Type Approval Code (TAC). Its length is 6 digits;
- Final Assembly Code (FAC) identifies the place of manufacture/final assembly. Its length is 2 digits;
- Serial Number (SNR) is an individual serial number uniquely identifying each equipment within each TAC and FAC. Its length is 6 digits.
- Spare digit: this digit shall be zero, when transmitted by the MS.

The TAC, FAC and SNR shall not be changed after the ME's final production process. These shall resist tampering, i.e. manipulation and change, by any means (e.g. physical, electrical and software) (see TS GSM 02.16).

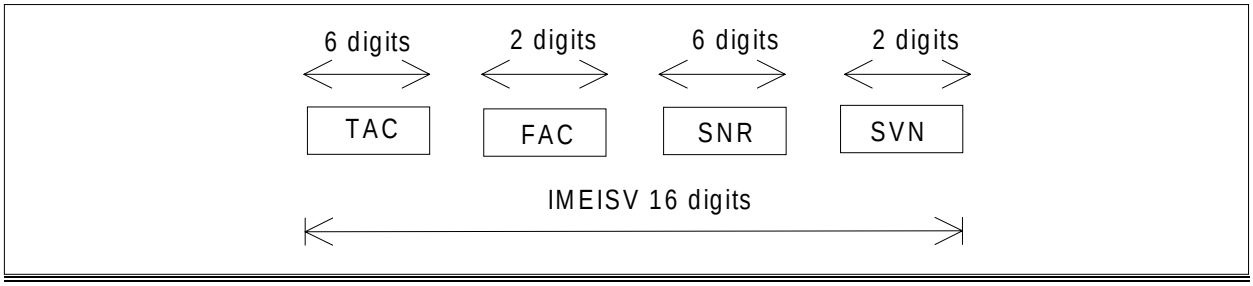
Note: This requirement is valid for new GSM Phase 2 and Release 96, 97 and 98 MEs type approved after 1st June 2002.

In addition, the agreed time after which no equipment is first placed on the market without improved IMEI security functionality as specified is considered as the very latest date. It is understood that typically requirements should be satisfied one year earlier.

~~The TAC, FAC and SNR shall be physically protected against unauthorized change (see GSM 02.09).~~

6.2.2 Composition of IMEISV

The International Mobile station Equipment Identity and Software Version Number (IMEISV) is composed as shown in figure 11.



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- Software Version Number (SVN) identifies the software version number of the mobile equipment. Its length is 2 digits.

Regarding updates of the IMEISV: The TAC, FAC and SNR shall not be changed after the ME's final production process. These shall resist tampering, i.e. manipulation and change, by any means (e.g. physical, electrical and software) (see TS GSM 02.16)~~the TAC, FAC and SNR shall be physically protected against unauthorized change (see GSM 02.09)~~; i.e. only the SVN part of the IMEISV can be modified.

Note: This requirement is valid for new GSM Phase 2 and Release 96, 97 and 98 MEs type approved after 1st June 2002.

In addition, the agreed time after which no equipment is first placed on the market without improved IMEI security functionality as specified is considered as the very latest date. It is understood that typically requirements should be satisfied one year earlier.

3GPP/SMG TSG CN2B#4?
Milan, Italy, 14th –16th Feb. 2000

Document *N2B000332*
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03.03	**CR**	**A039**	Current Version:	6.4.1

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

For submission to: CN#07	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑	for information		non-strategic	X	

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: N2 **Date:** 07.02.00

Subject: Modification of section 6.2 to enhance IMEI security

Work item: Security

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

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

Release:

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

Reason for change: The security of the IMEI is not sufficiently given by the present specification. Therefore GSM 02.16 was modified. GSM 03.03 needs to be aligned with GSM 02.16. The modification is reflected in this CR.

This CR contains the wording agreed at SMG #30 (Document P-99-776).

Clauses affected: Section 6.2.1 and 6.2.2

Other specs affected:

Other 3G core specifications	[ ]	→ List of CRs:
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O&M specifications	[ ]	→ List of CRs:

Other comments: Category C3
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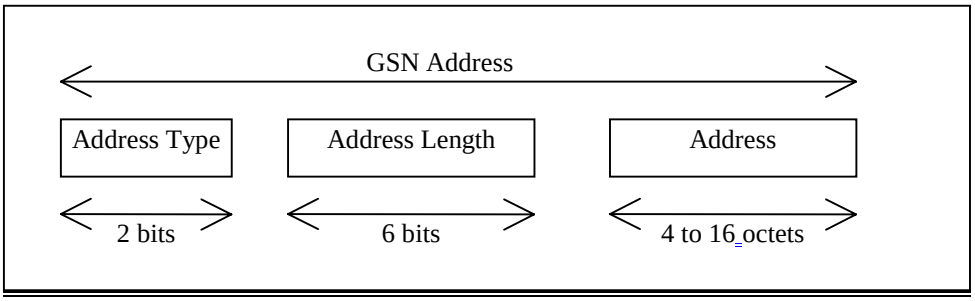

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The IP v4 address structure is defined in RFC 791.

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HLR may also be identified by one or several "HLR id(s)", consisting of the leading digits of the IMSI (MCC + MNC + leading digits of MSIN).

6 International Mobile Station Equipment Identity and Software Version Number

6.1 General

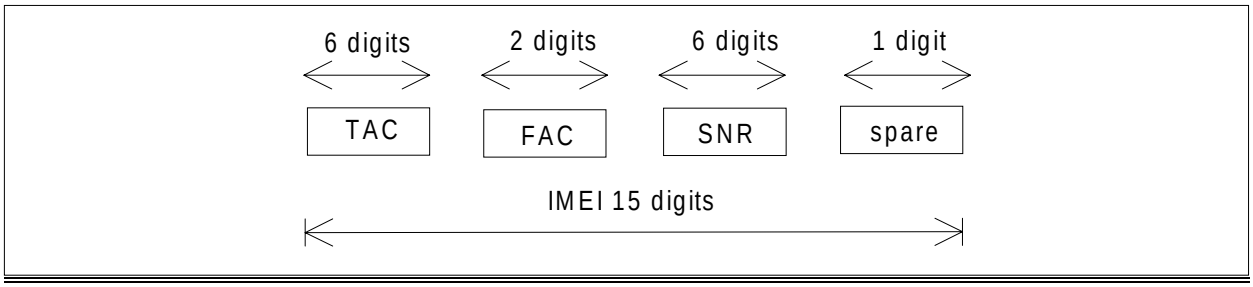
Below the structure and allocation principles of the International Mobile station Equipment Identity and Software Version Number (IMEISV) and the International Mobile station Equipment Identity (IMEI) are defined.

The Mobile Station Equipment is uniquely defined by the IMEI or the IMEISV.

6.2 Composition of IMEI and IMEISV

6.2.1 Composition of IMEI

The International Mobile station Equipment Identity (IMEI) is composed as shown in figure 10.



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- Spare digit: this digit shall be zero, when transmitted by the MS.

The TAC, FAC and SNR shall not be changed after the ME's final production process. These shall resist tampering, i.e. manipulation and change, by any means (e.g. physical, electrical and software) (see TS GSM 02.16).

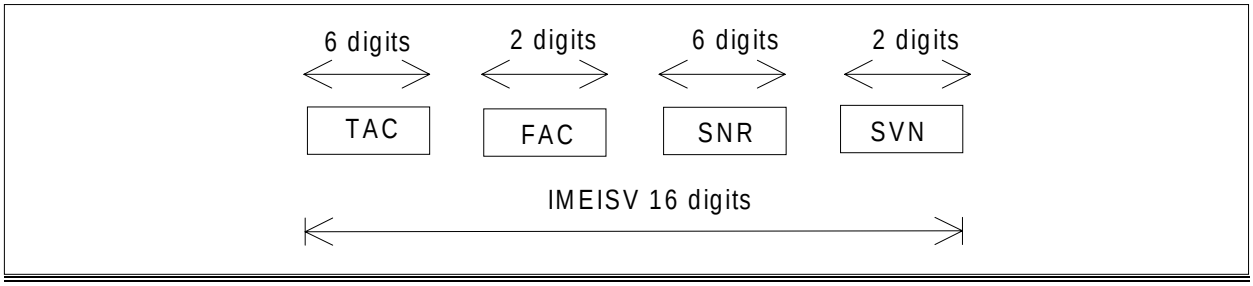
Note: This requirement is valid for new GSM Phase 2 and Release 96 and 97 MEs type approved after 1st June 2002.

In addition, the agreed time after which no equipment is first placed on the market without improved IMEI security functionality as specified is considered as the very latest date. It is understood that typically requirements should be satisfied one year earlier.

~~The TAC, FAC and SNR shall be physically protected against unauthorized change (see GSM 02.09).~~

6.2.2 Composition of IMEISV

The International Mobile station Equipment Identity and Software Version Number (IMEISV) is composed as shown in figure 11.



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- Final Assembly Code (FAC) identifies the place of manufacture/final assembly. Its length is 2 digits;
- Serial Number (SNR) is an individual serial number uniquely identifying each equipment within each TAC and FAC. Its length is 6 digits.
- Software Version Number (SVN) identifies the software version number of the mobile equipment. Its length is 2 digits.

Regarding updates of the IMEISV: The TAC, FAC and SNR shall not be changed after the ME's final production process. These shall resist tampering, i.e. manipulation and change, by any means (e.g. physical, electrical and software) (see TS GSM 02.16)~~the TAC, FAC and SNR shall be physically protected against unauthorized change (see GSM 02.09)~~; i.e. only the SVN part of the IMEISV can be modified.

Note: This requirement is valid for new GSM Phase 2 and Release 96 and 97 MEs type approved after 1st June 2002.

In addition, the agreed time after which no equipment is first placed on the market without improved IMEI security functionality as specified is considered as the very latest date. It is understood that typically requirements should be satisfied one year earlier.

3GPP/SMG TSG CN2B#4?
Milan, Italy, 14th –16th Feb. 2000

Document *N2B00033*
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03.03	**CR**	**A040**	Current Version:	5.2.0

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

For submission to:	CN#07	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic	X	

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: Mannesmann Mobilfunk GmbH **Date:** 07.02.00

Subject: Modification of section 6.2 to enhance IMEI security

Work item: Security

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

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

Release:

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

Reason for change: The security of the IMEI is not sufficiently given by the present specification. Therefore GSM 02.16 was modified. GSM 03.03 needs to be aligned with GSM 02.16. The modification is reflected in this CR.

This CR contains the wording agreed at SMG #30 (Document P-99-776).

Clauses affected: Section 6.2.1 and 6.2.2

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: Category C3

4.4 Location Number

A location number is a number which defines a specific location within a GSM PLMN. The Location number is formatted according to CCITT Recommendation E.164, as shown in figure 7. The country code (CC) and national destination code (NDC) fields of the location number are those which define the GSM PLMN of which the location is part.

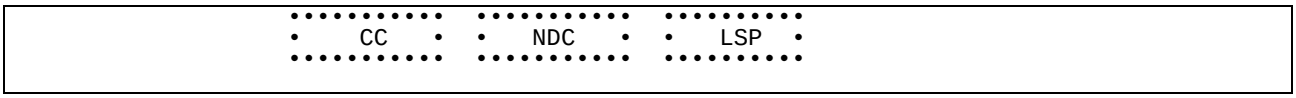

Figure 7: Location Number Structure

The structure of the locally significant part (LSP) of the location number is a matter for agreement between the PLMN operator and the national numbering authority in the PLMN's country. It is desirable that the location number can be interpreted without the need for detailed knowledge of the internal structure of the PLMN; the LSP should therefore include the national destination code in the national numbering plan for the fixed network which defines the geographic area in which the location lies.

The set of location numbers for a GSM PLMN must be chosen so that a location number can be distinguished from the MSISDN of a subscriber of the PLMN. This will allow the PLMN to trap attempts by users to dial a location number.

5 Identification of MSCs and location registers

5.1 Identification for routing purpose

MSCs and location registers are identified by international PSTN/ISDN numbers and/or Signalling Point Codes ("entity number", ie. "HLR number", "VLR number", "MSC number") in each GSM PLMN.

5.2 Identification of HLR for HLR restoration application

HLR may also be identified by one or several "HLR id(s)", consisting of the leading digits of the IMSI (MCC + MNC + leading digits of MSIN).

6 International mobile station equipment identity and software version number

6.1 General

Below the structure and allocation principles of the International Mobile station Equipment Identity and Software Version Number (IMEISV) and the International Mobile Station Equipment Identity (IMEI) are defined.

The Mobile Station Equipment is uniquely defined by the IMEI or the IMEISV.

6.2 Composition of IMEI and IMEISV

6.2.1 Composition of IMEI

The International Mobile station Equipment Identity (IMEI) is composed as shown in figure 8.

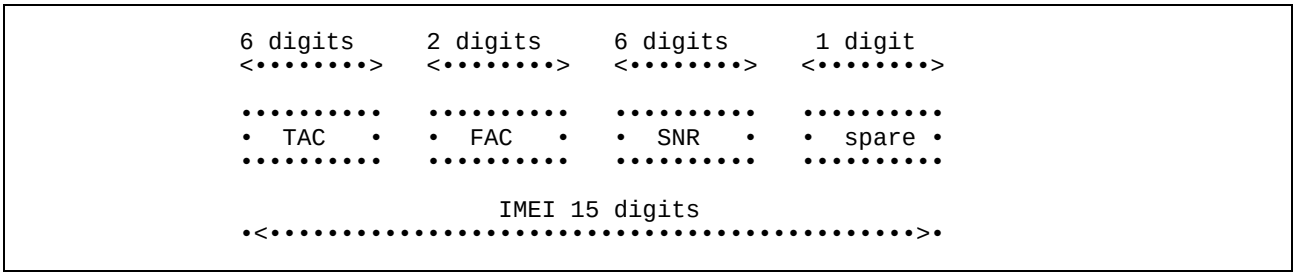

Figure 8: Structure of IMEI

The IMEI is composed of the following elements (each element shall consist of decimal digits only):

- Type Approval Code (TAC). Its length is 6 digits;

- Final Assembly Code (FAC) identifies the place of manufacture/final assembly. Its length is 2 digits;

- Serial Number (SNR) is an individual serial number uniquely identifying each equipment within each TAC and FAC. Its length is 6 digits.

- Spare digit: this digit shall be zero, when transmitted by the Mobile Station.

The TAC, FAC and SNR shall not be changed after the ME's final production process. These shall resist tampering, i.e. manipulation and change, by any means (e.g. physical, electrical and software) (see TS GSM 02.16).

Note: This requirement is valid for new GSM Phase 2 and Release 96 MEs type approved after 1st June 2002.

In addition, the agreed time after which no equipment is first placed on the market without improved IMEI security functionality as specified is considered as the very latest date. It is understood that typically requirements should be satisfied one year earlier.

~~The TAC, FAC and SNR shall be pysikally protected against unauthorized change (see GSM 02.09).~~

6.2.2 Composition of IMEISV

The International Mobile station Equipment Identity and Software Version Number (IMEISV) is composed as shown in figure 9.

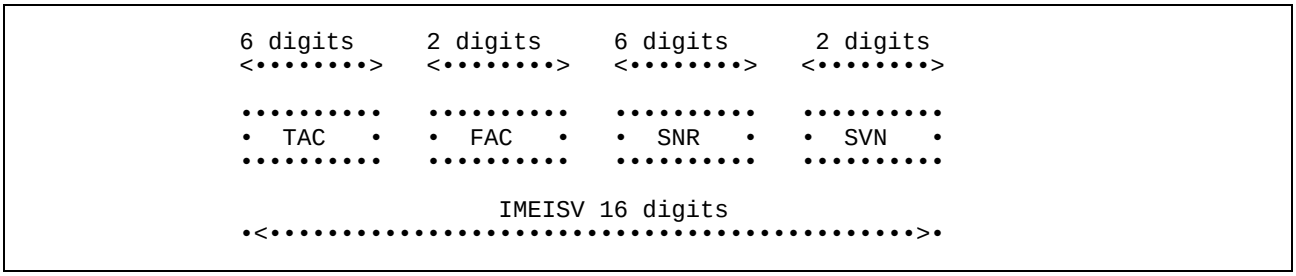

Figure 9: Structure of IMEISV

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- Software Version Number (SVN) identifies the software version number of the mobile equipment. Its length is 2 digits.

Regarding updates of the IMEISV: The TAC, FAC and SNR shall not be changed after the ME's final production process. These shall resist tampering, i.e. manipulation and change, by any means (e.g. physical, electrical and software) (see TS GSM 02.16) ~~the TAC, FAC and SNR shall be physically protected against unauthorized change (see GSM 02.09)~~; i.e. only the SVN part of the IMEISV can be modified.

Note: This requirement is valid for new GSM Phase 2 and Release 96 MEs type approved after 1st June 2002.

In addition, the agreed time after which no equipment is first placed on the market without improved IMEI security functionality as specified is considered as the very latest date. It is understood that typically requirements should be satisfied one year earlier.

6.3 Allocation principles

The Type Approval Code (TAC) is issued by a central body.

The place of final assembly (FAC) is encoded by the manufacturer.

Manufacturers shall allocate individual serial numbers (SNR) in a sequential order.

For a given ME, the combination of TAC, FAC and SNR used in the IMEI shall duplicate the combination of TAC, FAC and SNR used in the IMEISV.

The Software Version Number is allocated by the manufacturer after authorisation by the type approval authority. SVN value 99 is reserved for future use.

3GPP/SMG TSG CN2B#4?
Milan, Italy, 14th –16th Feb. 2000

Document *N2B000334*
e.g. for 3GPP use the format TP-99xxx
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CHANGE REQUEST

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03.03	**CR**	**A041**	Current Version:	4.9.0

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

For submission to:	CN#07	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic	X	

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: N2 **Date:** 07.02.00

Subject: Modification of section 6.2 to enhance IMEI security

Work item: Securiry

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F	Correction	
A	Corresponds to a correction in an earlier release	
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Release:

Phase 2	X
Release 96	
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Reason for change: The security of the IMEI is not sufficiently given by the present specification. Therefore GSM 02.16 was modified. GSM 03.03 needs to be aligned with GSM 02.16. The modification is reflected in this CR.

This CR contains the wording agreed at SMG #30 (Document P-99-776).

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BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments: Category C3

4.4 Location Number

A location number is a number which defines a specific location within a GSM PLMN. The Location number is formatted according to CCITT Recommendation E.164, as shown in figure 7. The country code (CC) and national destination code (NDC) fields of the location number are those which define the GSM PLMN of which the location is part.

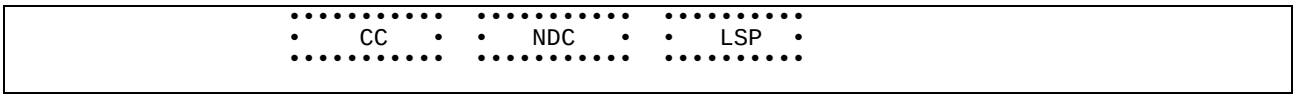

Figure 7: Location Number Structure

The structure of the locally significant part (LSP) of the location number is a matter for agreement between the PLMN operator and the national numbering authority in the PLMN's country. It is desirable that the location number can be interpreted without the need for detailed knowledge of the internal structure of the PLMN; the LSP should therefore include the national destination code in the national numbering plan for the fixed network which defines the geographic area in which the location lies.

The set of location numbers for a GSM PLMN must be chosen so that a location number can be distinguished from the MSISDN of a subscriber of the PLMN. This will allow the PLMN to trap attempts by users to dial a location number.

5 Identification of MSCs and location registers

5.1 Identification for routing purpose

MSCs and location registers are identified by international PSTN/ISDN numbers and/or Signalling Point Codes ("entity number", ie. "HLR number", "VLR number", "MSC number") in each GSM PLMN.

5.2 Identification of HLR for HLR restoration application

HLR may also be identified by one or several "HLR id(s)", consisting of the leading digits of the IMSI (MCC + MNC + leading digits of MSIN).

6 International mobile station equipment identity and software version number

6.1 General

Below the structure and allocation principles of the International Mobile station Equipment Identity and Software Version Number (IMEISV) and the International Mobile Station Equipment Identity (IMEI) are defined.

The Mobile Station Equipment is uniquely defined by the IMEI or the IMEISV.

6.2 Composition of IMEI and IMEISV

6.2.1 Composition of IMEI

The International Mobile station Equipment Identity (IMEI) is composed as shown in figure 8.

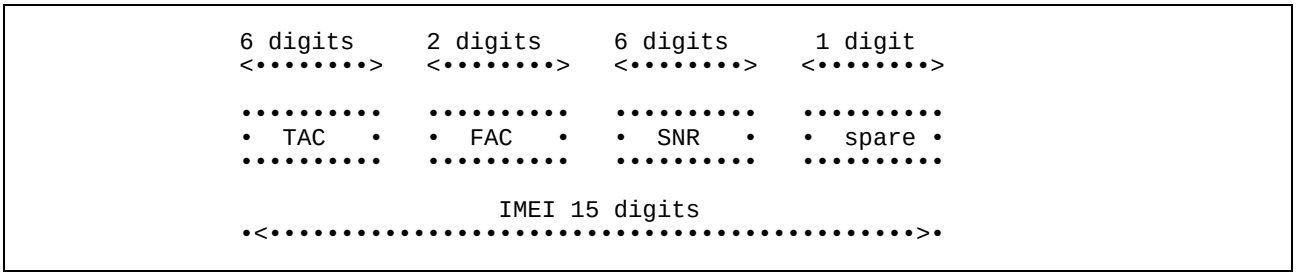

Figure 8: Structure of IMEI

The IMEI is composed of the following elements (each element shall consist of decimal digits only):

- Type Approval Code (TAC). Its length is 6 digits;

- Final Assembly Code (FAC) identifies the place of manufacture/final assembly. Its length is 2 digits;

- Serial Number (SNR) is an individual serial number uniquely identifying each equipment within each TAC and FAC. Its length is 6 digits.

- Spare digit: this digit shall be zero, when transmitted by the Mobile Station.

The TAC, FAC and SNR shall not be changed after the ME's final production process. These shall resist tampering, i.e. manipulation and change, by any means (e.g. physical, electrical and software) (see TS GSM 02.16).

Note: This requirement is valid for new GSM Phase 2 MEs type approved after 1st June 2002.

In addition, the agreed time after which no equipment is first placed on the market without improved IMEI security functionality as specified is considered as the very latest date. It is understood that typically requirements should be satisfied one year earlier.

~~The TAC, FAC and SNR shall be pysikally protected against unauthorized change (see GSM 02.09).~~

6.2.2 Composition of IMEISV

The International Mobile station Equipment Identity and Software Version Number (IMEISV) is composed as shown in figure 9.

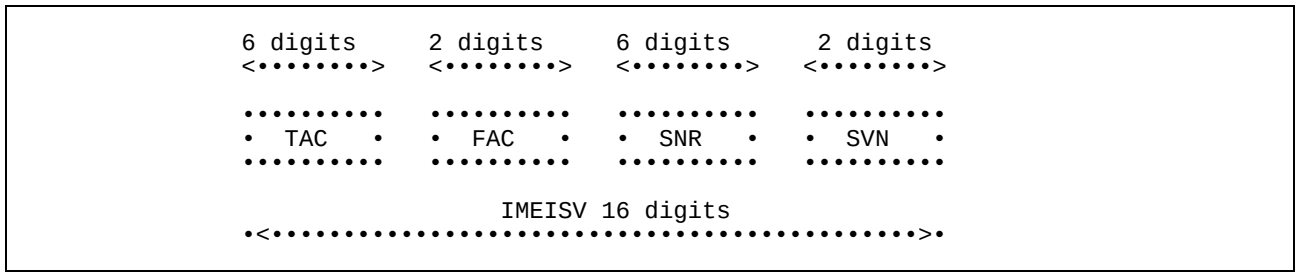

Figure 9: Structure of IMEISV

The IMEISV is composed of the following elements (each element shall consist of decimal digits only):

- Type Approval Code (TAC). Its length is 6 digits;

- Final Assembly Code (FAC) identifies the place of manufacture/final assembly. Its length is 2 digits;

- Serial Number (SNR) is an individual serial number uniquely identifying each equipment within each TAC and FAC. Its length is 6 digits.

- Software Version Number (SVN) identifies the software version number of the mobile equipment. Its length is 2 digits.

Regarding updates of the IMEISV: The TAC, FAC and SNR shall not be changed after the ME's final production process. These shall resist tampering, i.e. manipulation and change, by any means (e.g. physical, electrical and software) (see TS GSM 02.16) ~~the TAC, FAC and SNR shall be physically protected against unauthorized change (see GSM 02.09)~~; i.e. only the SVN part of the IMEISV can be modified.

Note: This requirement is valid for new GSM Phase 2 MEs type approved after 1st June 2002.

In addition, the agreed time after which no equipment is first placed on the market without improved IMEI security functionality as specified is considered as the very latest date. It is understood that typically requirements should be satisfied one year earlier.

6.3 Allocation principles

The Type Approval Code (TAC) is issued by a central body.

The place of final assembly (FAC) is encoded by the manufacturer.

Manufacturers shall allocate individual serial numbers (SNR) in a sequential order.

For a given ME, the combination of TAC, FAC and SNR used in the IMEI shall duplicate the combination of TAC, FAC and SNR used in the IMEISV.

The Software Version Number is allocated by the manufacturer after authorisation by the type approval authority. SVN value 99 is reserved for future use.

3GPP/SMG TSG CN2B#4
Milan, Italy, 14th –16th Feb. 2000

Document N2B000335
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

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23.003	**CR**	**017r1**	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:	CN#07	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic	X	

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: N2 **Date:** 07.02.00

Subject: Modification of section 6.2 to enhance IMEI security

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			Release 97	
C	Functional modification of feature	X		Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: The security of the IMEI is not sufficiently given by the present specification. Therefore 3G TS 22.016 was modified. 3G TS 23.003 needs to be aligned with 3G TS 22.016. The modification is reflected in this CR.

This CR contains the wording agreed at SMG #30 (Document P-99-776).

Clauses affected: Section 6.2.1 and 6.2.2

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: These changes were also valid for GSM 03.03 R98, R97, R96 and Phase2.
Figures 9, 10 and 11 were not changed


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

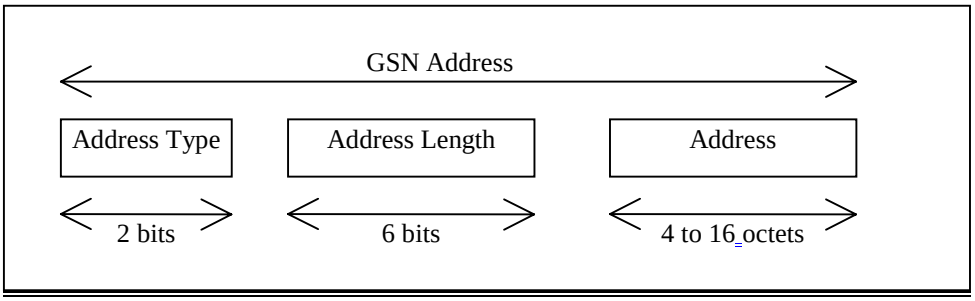

Figure 9: Structure of GSN Address

The GSN Address is composed of the following elements:

1. The Address Type which is a fixed length code (of 2 bits) identifying the type of address that is used in the Address field.

2. Address Length which is a fixed length code (of 6 bits) identifying the length of the Address field.

3. Address is a variable length field with either an IPv4 address or an IPv6 address.

Address Type 0 and Address Length 4 are used when Address is an IPv4 address.

Address Type 1 and Address Length 16 are used when Address is an IPv6 address.

The IP v4 address structure is defined in RFC 791.

The IP v6 address structure is defined in RFC 1883.

5.2 Identification of HLR for HLR restoration application

HLR may also be identified by one or several "HLR id(s)", consisting of the leading digits of the IMSI (MCC + MNC + leading digits of MSIN).

6 International Mobile Station Equipment Identity and Software Version Number

6.1 General

Below the structure and allocation principles of the International Mobile station Equipment Identity and Software Version Number (IMEISV) and the International Mobile station Equipment Identity (IMEI) are defined.

The Mobile Station Equipment is uniquely defined by the IMEI or the IMEISV.

6.2 Composition of IMEI and IMEISV

6.2.1 Composition of IMEI

The International Mobile station Equipment Identity (IMEI) is composed as shown in figure 10.

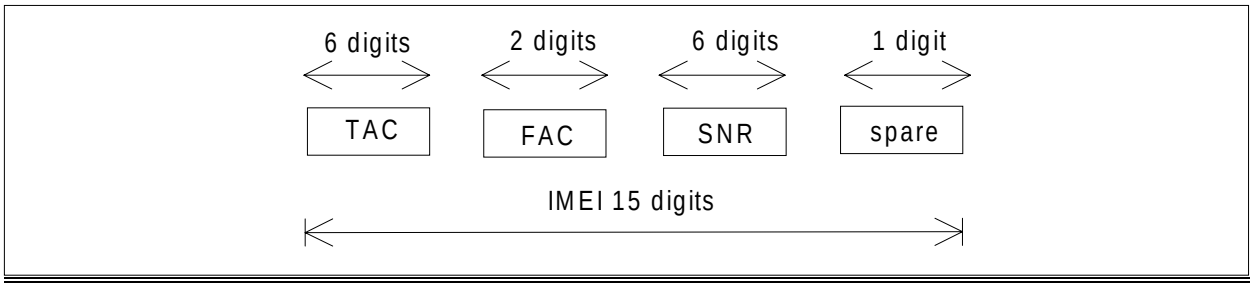

Figure 10: Structure of IMEI

The IMEI is composed of the following elements (each element shall consist of decimal digits only):

- Type Approval Code (TAC). Its length is 6 digits;
- Final Assembly Code (FAC) identifies the place of manufacture/final assembly. Its length is 2 digits;
- Serial Number (SNR) is an individual serial number uniquely identifying each equipment within each TAC and FAC. Its length is 6 digits.
- Spare digit: this digit shall be zero, when transmitted by the MS.

The TAC, FAC and SNR shall not be changed after the ME's final production process. These shall resist tampering, i.e. manipulation and change, by any means (e.g. physical, electrical and software) (see TS GSM 02.16).

Note: This requirement is valid for new GSM Phase 2 and Release 96, 97, 98, 99 and UMTS Release 99 MEs type approved after 1st June 2002.

In addition, the agreed time after which no equipment is first placed on the market without improved IMEI security functionality as specified is considered as the very latest date. It is understood that typically requirements should be satisfied one year earlier.

~~The TAC, FAC and SNR shall be physically protected against unauthorized change (see GSM 02.09).~~

6.2.2 Composition of IMEISV

The International Mobile station Equipment Identity and Software Version Number (IMEISV) is composed as shown in figure 11.

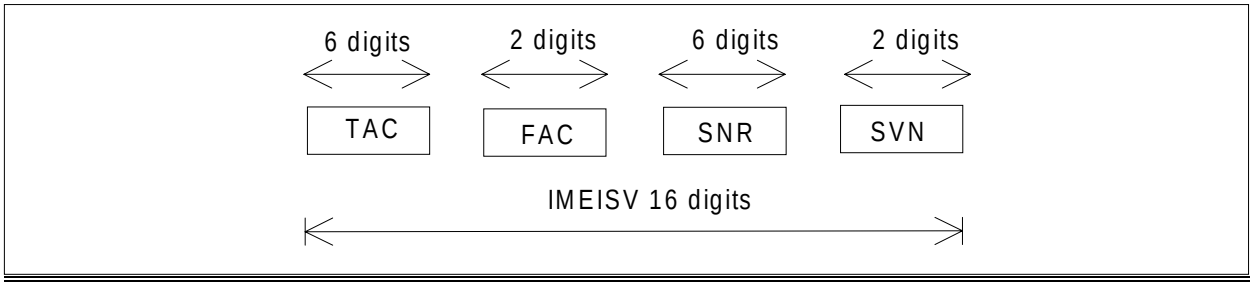

Figure 11: Structure of IMEISV

The IMEISV is composed of the following elements (each element shall consist of decimal digits only):

- Type Approval Code (TAC). Its length is 6 digits;

- Final Assembly Code (FAC) identifies the place of manufacture/final assembly. Its length is 2 digits;
- Serial Number (SNR) is an individual serial number uniquely identifying each equipment within each TAC and FAC. Its length is 6 digits.
- Software Version Number (SVN) identifies the software version number of the mobile equipment. Its length is 2 digits.

Regarding updates of the IMEISV: The TAC, FAC and SNR shall not be changed after the ME's final production process. These shall resist tampering, i.e. manipulation and change, by any means (e.g. physical, electrical and software) (see TS GSM 02.16)~~the TAC, FAC and SNR shall be physically protected against unauthorized change (see GSM 02.09)~~; i.e. only the SVN part of the IMEISV can be modified.

Note: This requirement is valid for new GSM Phase 2 and Release 96, 97, 98, R99 and UMTS Release 99 MEs type approved after 1st June 2002.

In addition, the agreed time after which no equipment is first placed on the market without improved IMEI security functionality as specified is considered as the very latest date. It is understood that typically requirements should be satisfied one year earlier.

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

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or for SMG, use the format P-99-xxx

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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:	CN#07	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic	X	

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: N2 **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		**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: 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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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.

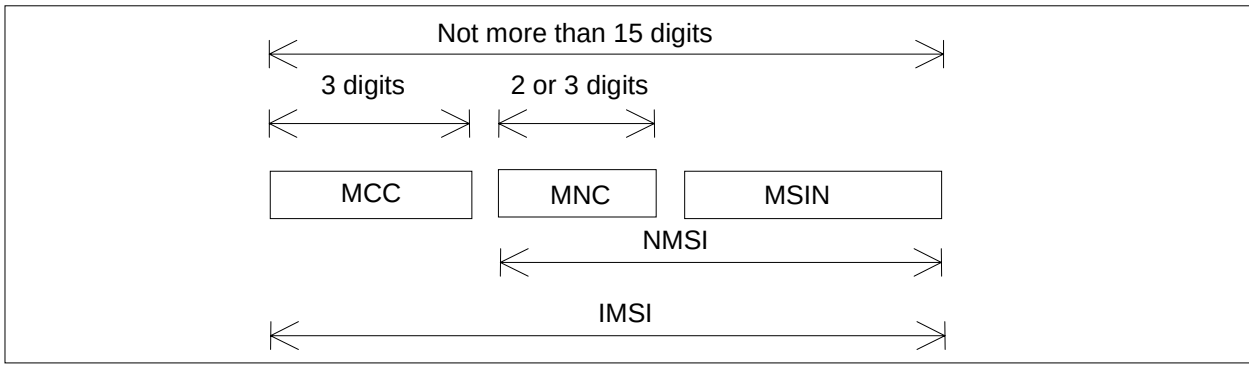

Figure 1: Structure of IMSI

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.

2.7~~5~~ Structure of LMSI

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

2.8~~6~~ 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);

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

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CHANGE REQUEST

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23.008	**CR**	**022r1**	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: CN#07	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑	for information		non-strategic	X	

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: N2 **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:

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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	2.1.98	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.

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Milan, Italy, 14 - 16 February 2000

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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:	CN#07	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic	X	

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: N2 **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:

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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.

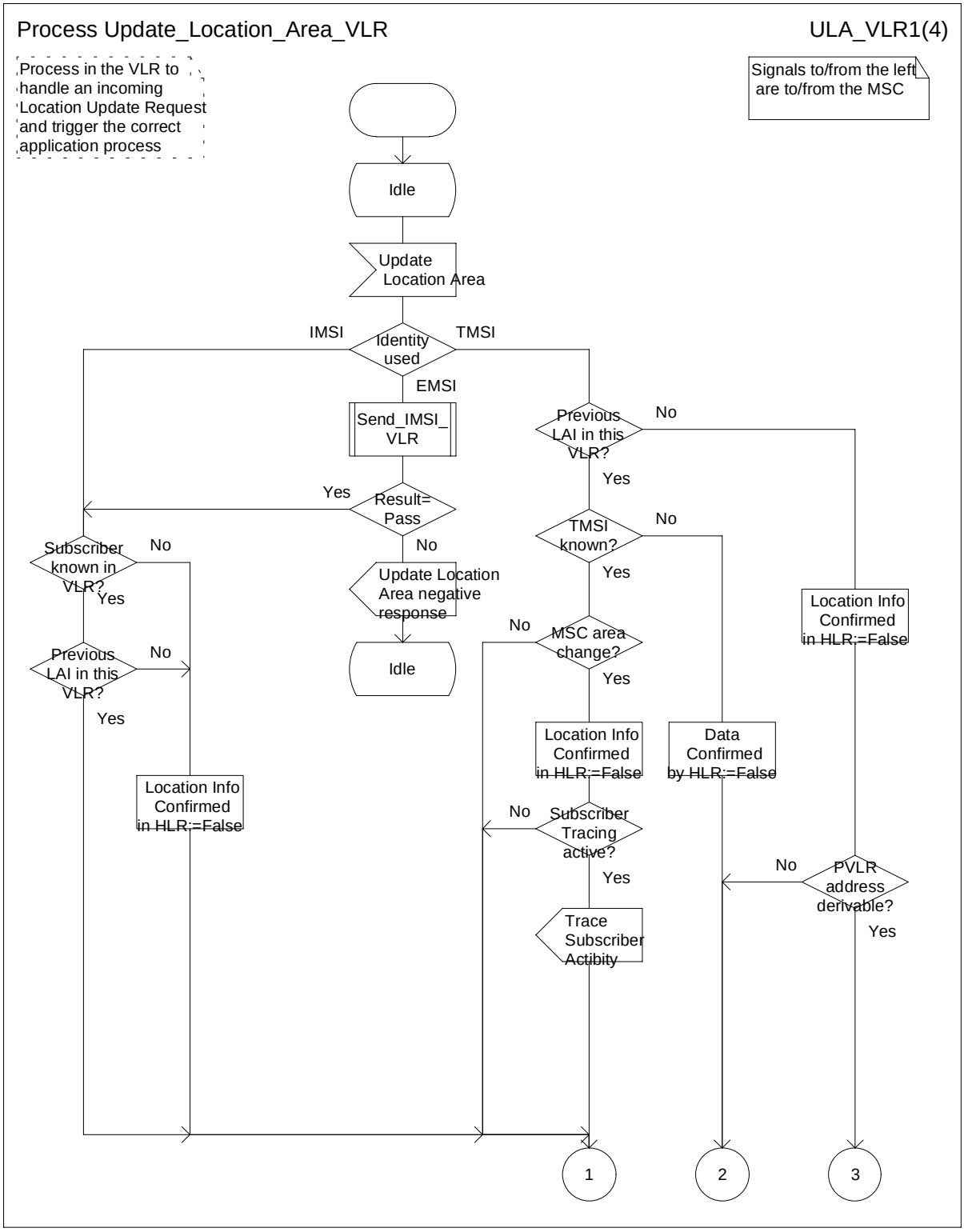
3.6.1.4 Mobile subscriber purging procedure

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
Previous LAI in this VLR?
No
Yes
Result= Pass
Yes
No
TMSI known?
No
Yes
Subscriber known in VLR?
No
Yes
Update Location Area negative response
Location Info Confirmed in HLR:=False
No
MSC area change?
Yes
Idle
Previous LAI in this VLR?
No
Yes
Location Info Confirmed in HLR:=False
Data Confirmed by HLR:=False
Location Info Confirmed in HLR:=False
No
Subscriber Tracing active?
No
PVLR address derivable?
Yes
Yes
Trace Subscriber Actibity
1
2
3

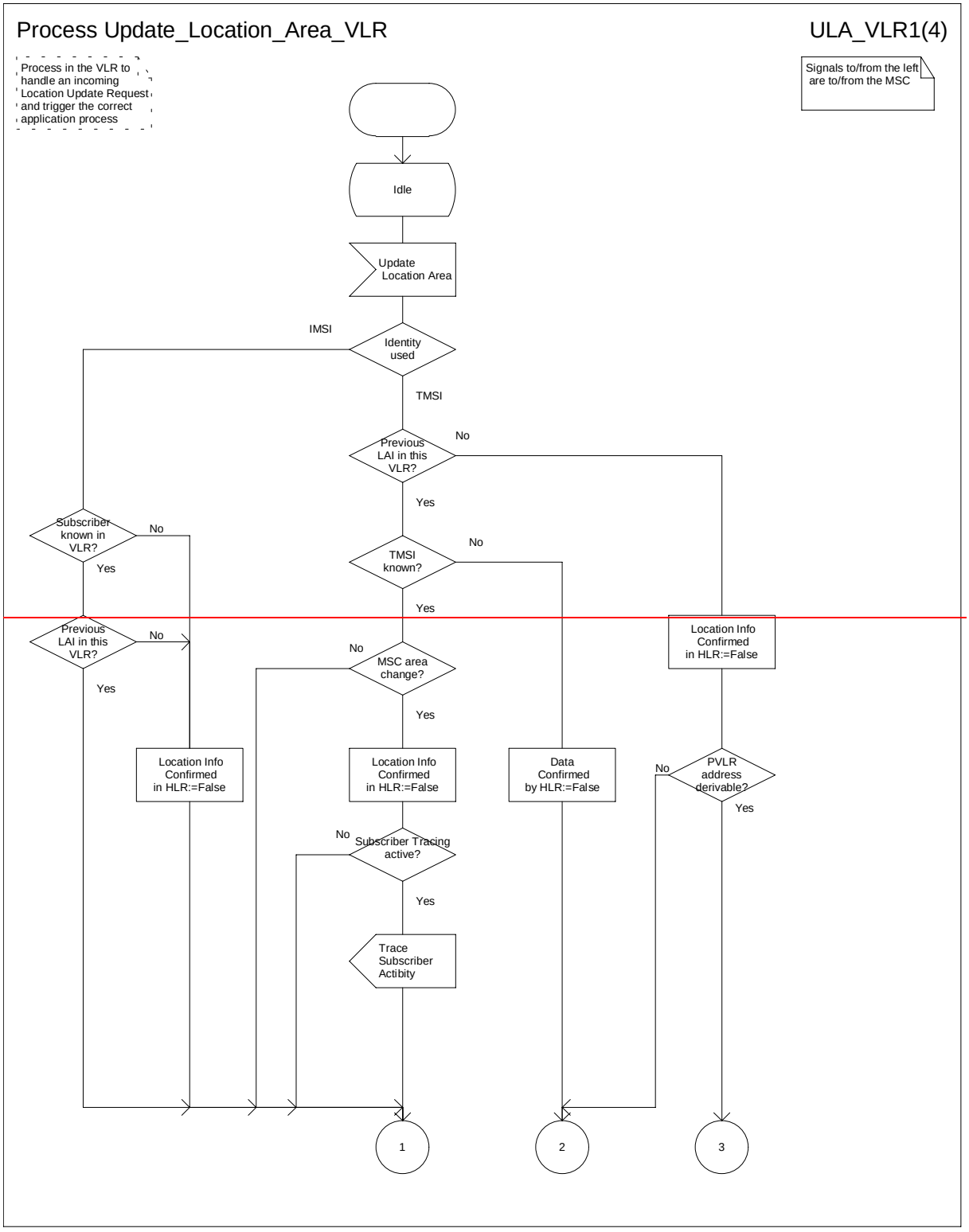


Figure 4.1.2.1 (sheet 1 of 4): Process Update_Location_Area_VLR

4.1.2.9 Procedure Send_IMSI_VLR

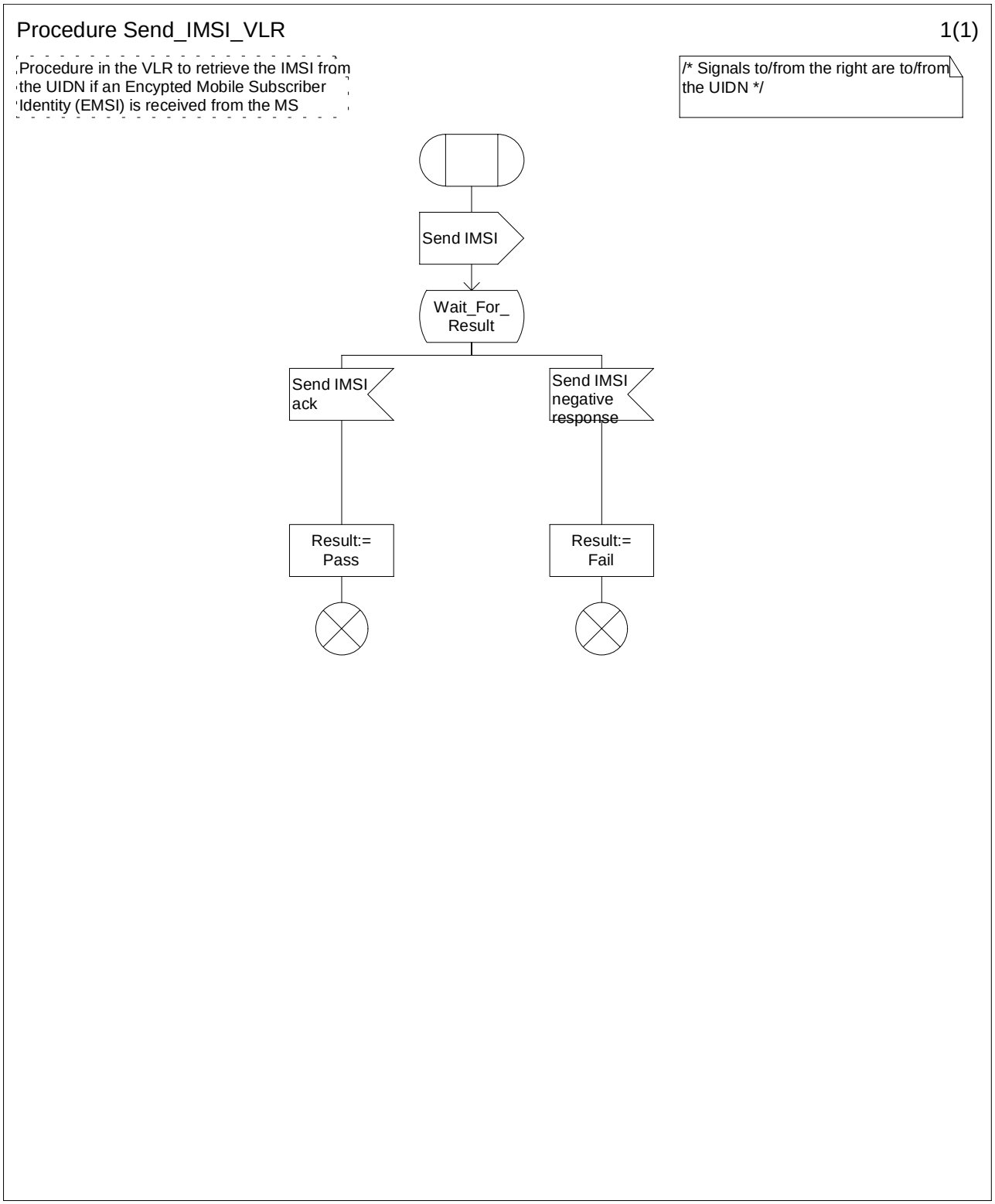


Figure 4.1.2.9: Procedure Send_IMSI_VLR

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23.012	CR	004	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:	CN #07	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic	X	

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: N2 **Date:** 02.02.2000

Subject: Addition of Current Security Context Data to Send_Identification_PVLR

Work item: UMTS 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: In TS 33.102 v3.3.1, subclause 6.3.4, the current security context data is required to be transferred from VLRo to VLRn (resp. from SGSNo to SGSNn). Figure 4.1.2.7 was edited to include a new check box “Send Current Security Context?” and the appropriate positive action “Set Current Security Context”

Clauses affected: 4.1.2.7

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: Revision marks not visible

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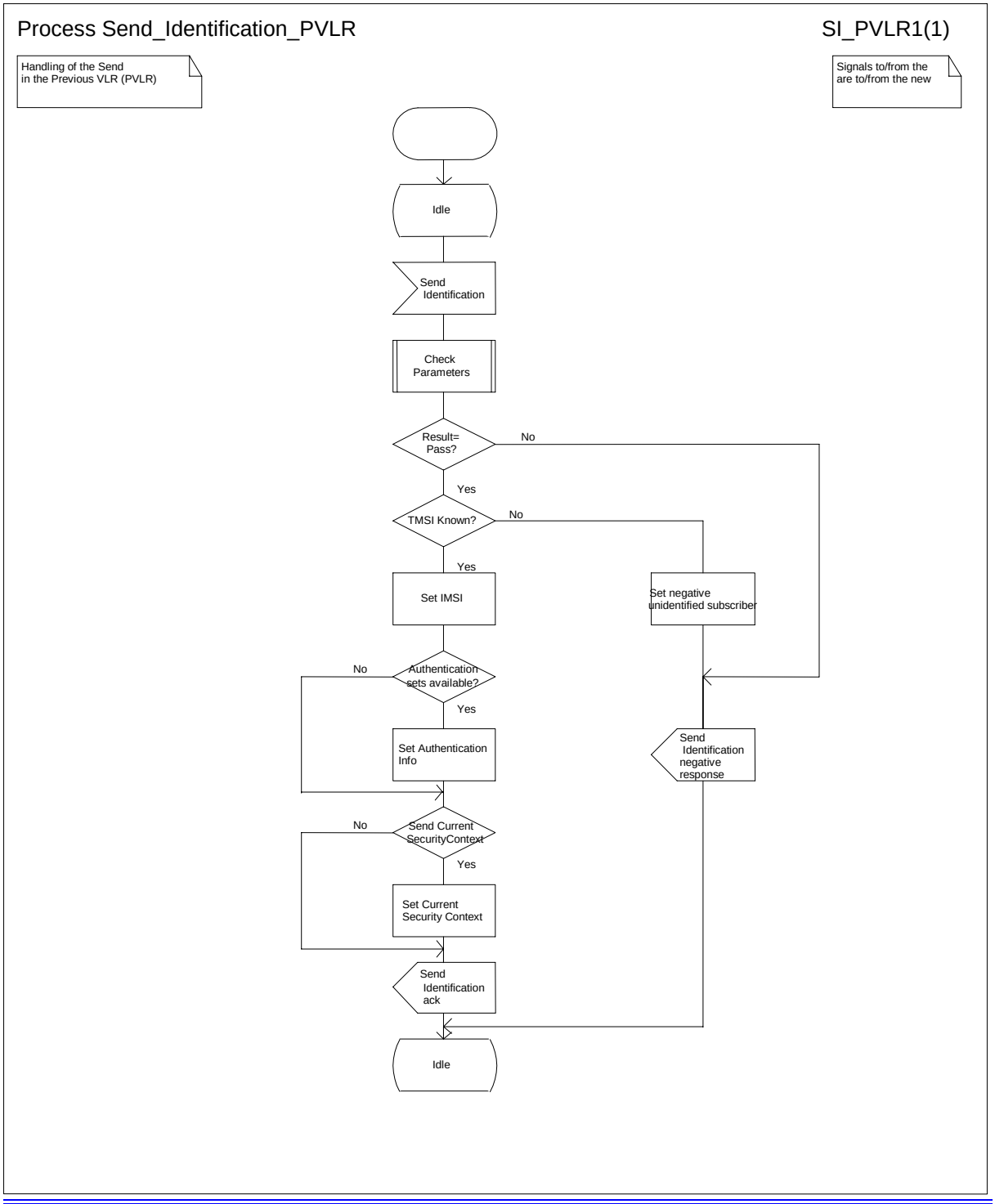
4.1.2.7 Process Send_Identification_PVLR


Process Send_Identification_PVLR
SI_PVLR1(1)
Handling of the Send in the Previous VLR (PVLR)
Signals to/from the are to/from the new
Idle
Send Identification
Check Parameters
Result= Pass?
No
Yes
TMSI Known?
No
Yes
Set IMSI
Set negative unidentified subscriber
No
Authentication sets available?
Yes
Set Authentication Info
Send Identification negative response
No
Send Current SecurityContext
Yes
Set Current Security Context
Send Identification ack
Idle

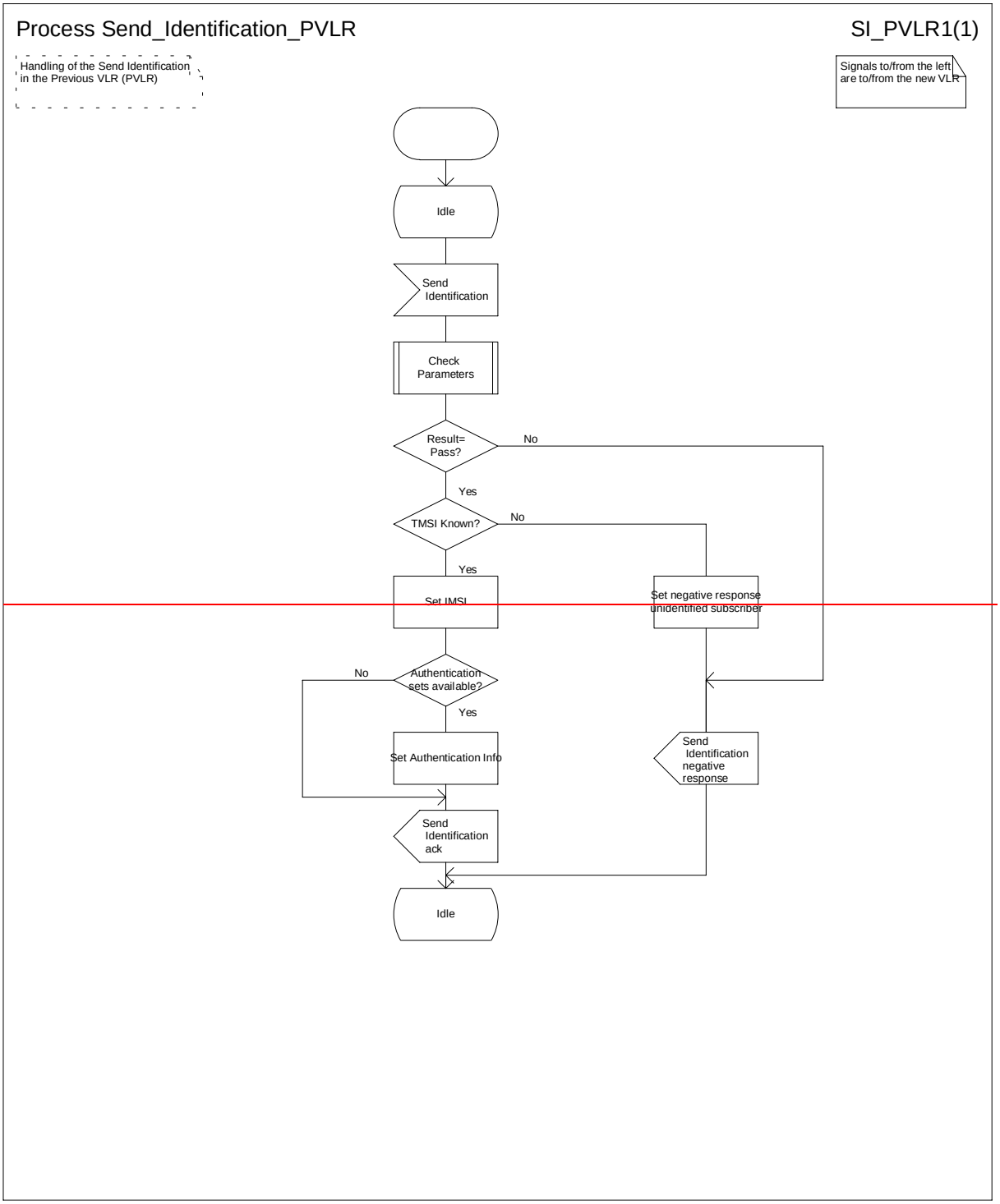


Figure 4.1.2.7 (sheet 1 of 1): Process Send_Identification_PVLR

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Milan, Italy, 14 - 16 February 2000

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CHANGE REQUEST

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23.012	**CR**	**005**	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: CN#07	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑	for information		non-strategic	X	

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: N2 **Date:** 14.02.00

Subject: Introduction of Authentication Failure Report

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 the Authentication Failure Report.

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:

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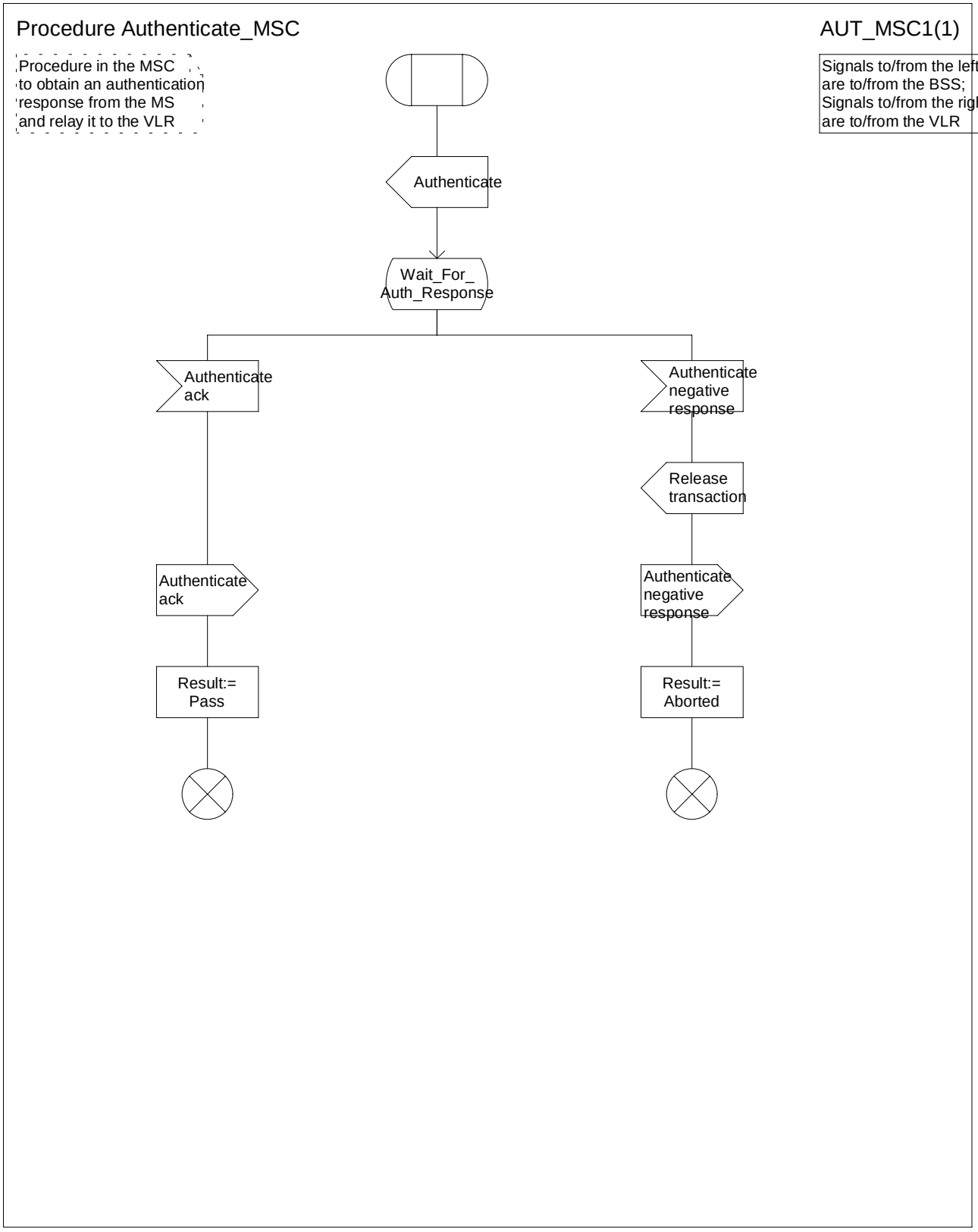


Figure 4.1.1.2 (sheet 1 of 1): Procedure Authenticate_MSC

Figure 4.1.2.2 (sheet 1 of 2): Procedure Authenticate_VLR

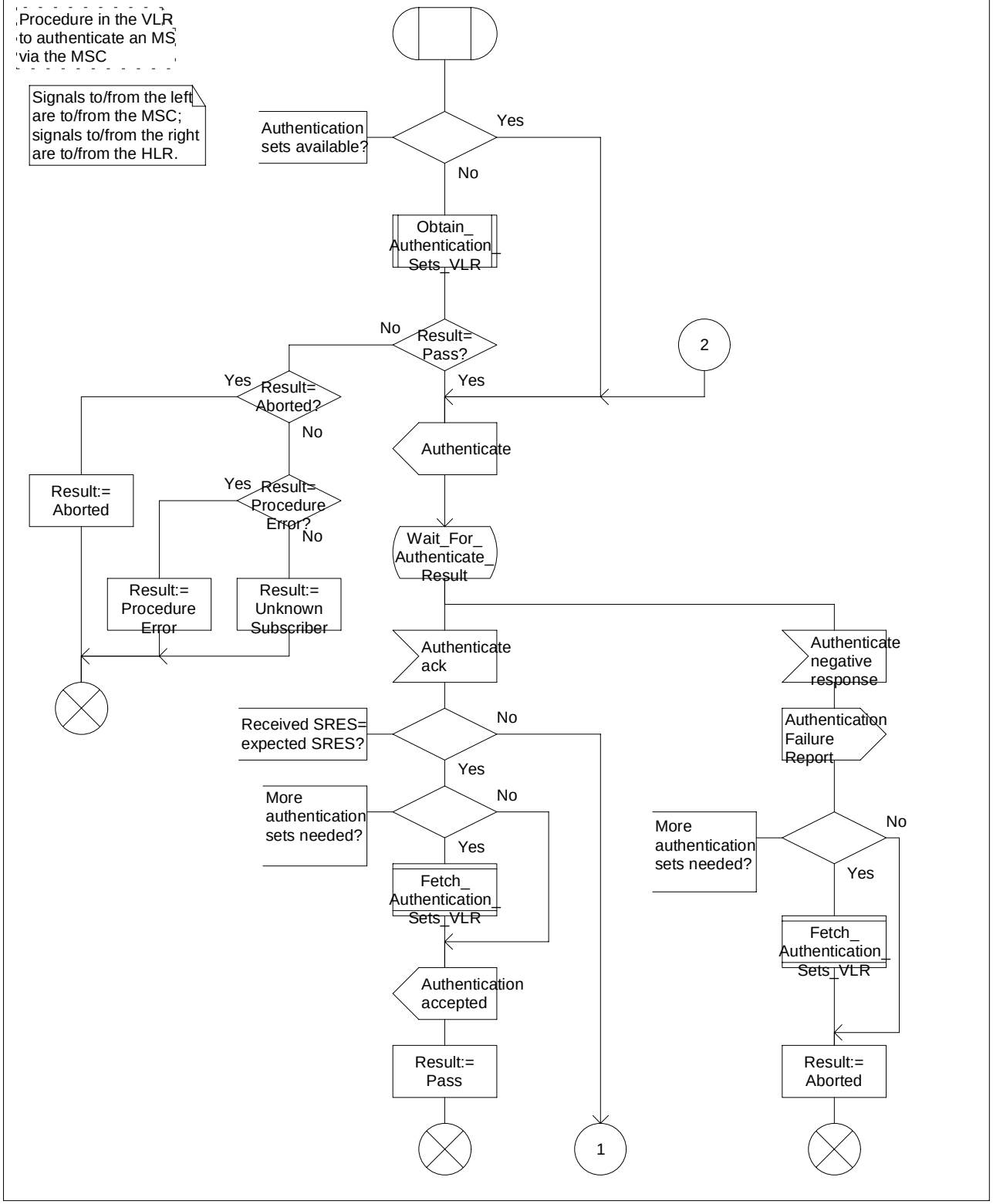
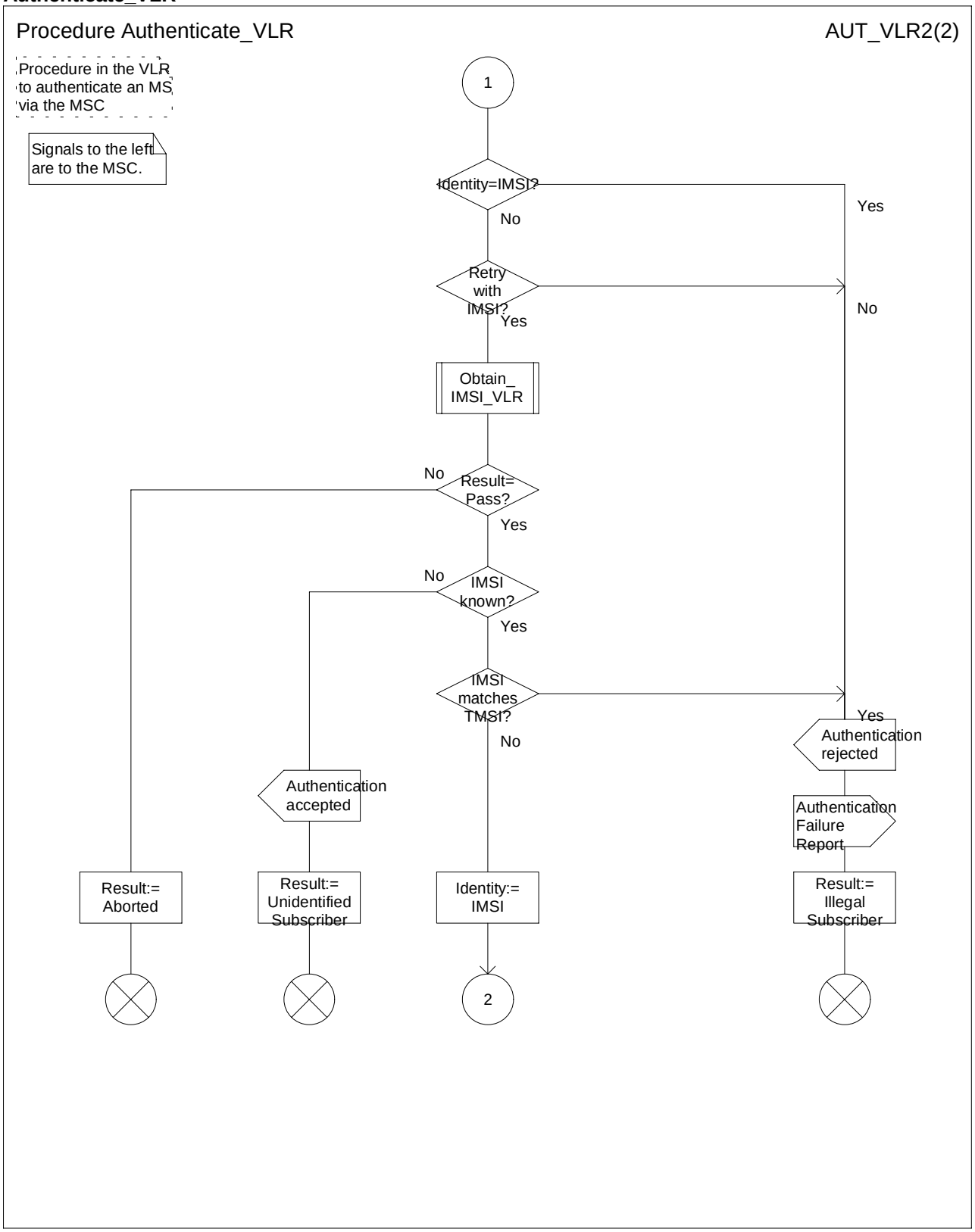

Procedure in the VLR to authenticate an MS via the MSC
Signals to/from the left are to/from the MSC; signals to/from the right are to/from the HLR.
Authentication sets available?
Yes
No
Obtain_ Authentication_ Sets_VLR
Result= Pass?
No
Yes
2
Result= Aborted?
Yes
No
Result:= Aborted
Result= Procedure Error?
Yes
No
Result:= Procedure Error
Result:= Unknown Subscriber
Authenticate
Wait_For_ Authenticate_ Result
Authenticate ack
Authenticate negative response
Received SRES= expected SRES?
No
Yes
More authentication sets needed?
No
Yes
Fetch_ Authentication_ Sets_VLR
Authentication accepted
Result:= Pass
1
Authentication Failure Report
More authentication sets needed?
No
Yes
Fetch_ Authentication_ Sets_VLR
Result:= Aborted

Figure 4.1.2.2 (sheet 2 of 2): Procedure

Authenticate_VLR



3GPP TSG CN WG2 SWG-B
Kista, Sweden, 02 - 03 March 2000

Document N2B000421
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.

23.018	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:	CN#07	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic	X	

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: N2 **Date:** 01.03.00

Subject: Introduction of Enhanced User Identity Confidentiality

Work item: Security

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

			Release:	
F	Correction		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: 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: Revision 2 of this CR was already approved during the Milano meeting, however due to comments received after approval a further revision was necessary.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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

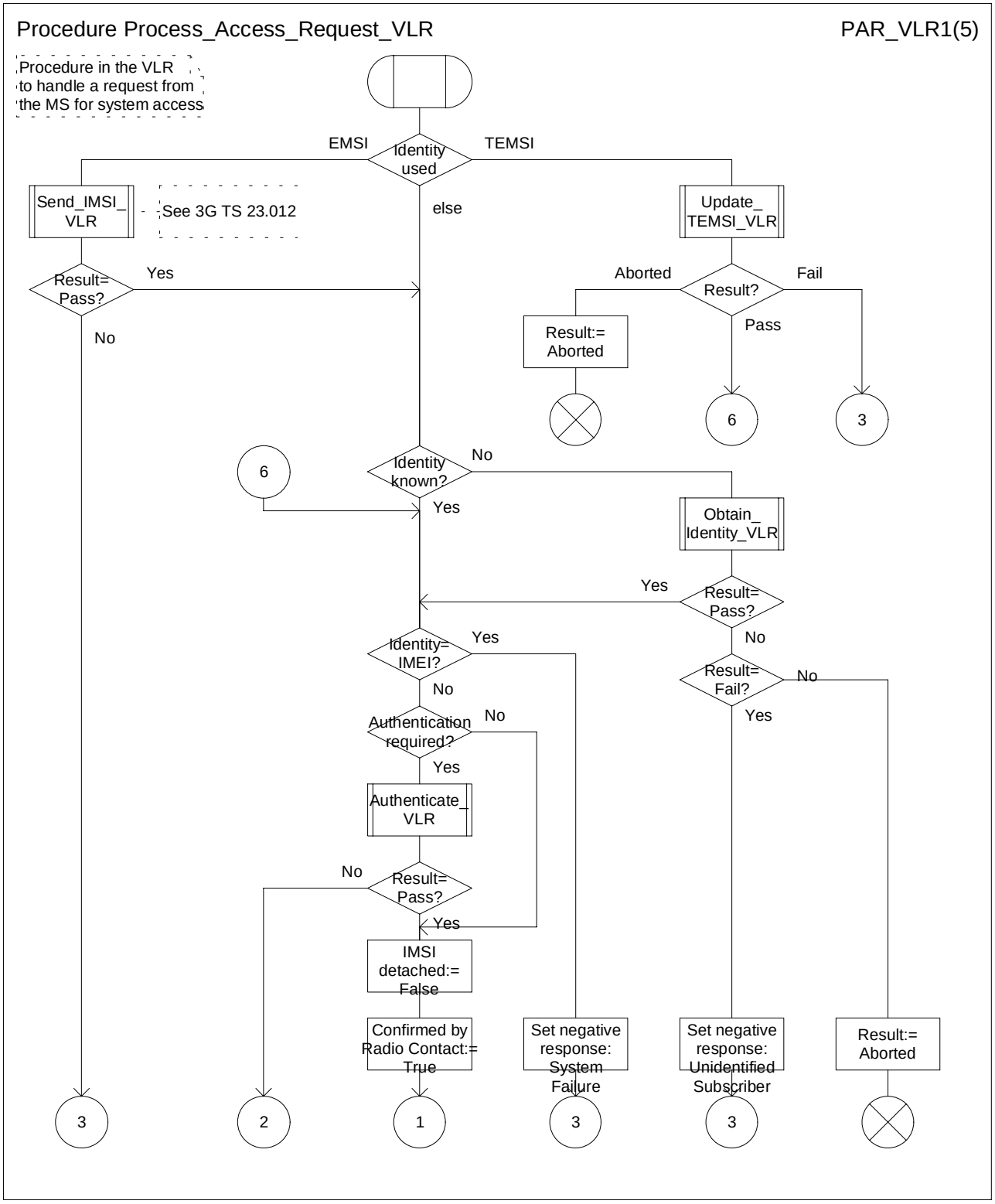
Sheet 1: the procedure Send_IMSI_VLR is defined in the Location Management Procedures in 3G TS 23.012.

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
EMSI
Identity used
TEMSI
Send_IMSI_ VLR
See 3G TS 23.012
else
Update_ TEMSI_VLR
Result= Pass?
Yes
No
Aborted
Result?
Fail
Pass
Result:= Aborted
6
3
6
Identity known?
No
Yes
Obtain_ Identity_VLR
Yes
Result= Pass?
No
Identity= IMEI?
Yes
No
Result= Fail?
No
Yes
Authentication required?
No
Yes
Authenticate_ VLR
No
Result= Pass?
Yes
IMSI detached:= False
Confirmed by Radio Contact:= True
Set negative response: System Failure
Set negative response: Unidentified Subscriber
Result:= Aborted
3
2
1
3
3

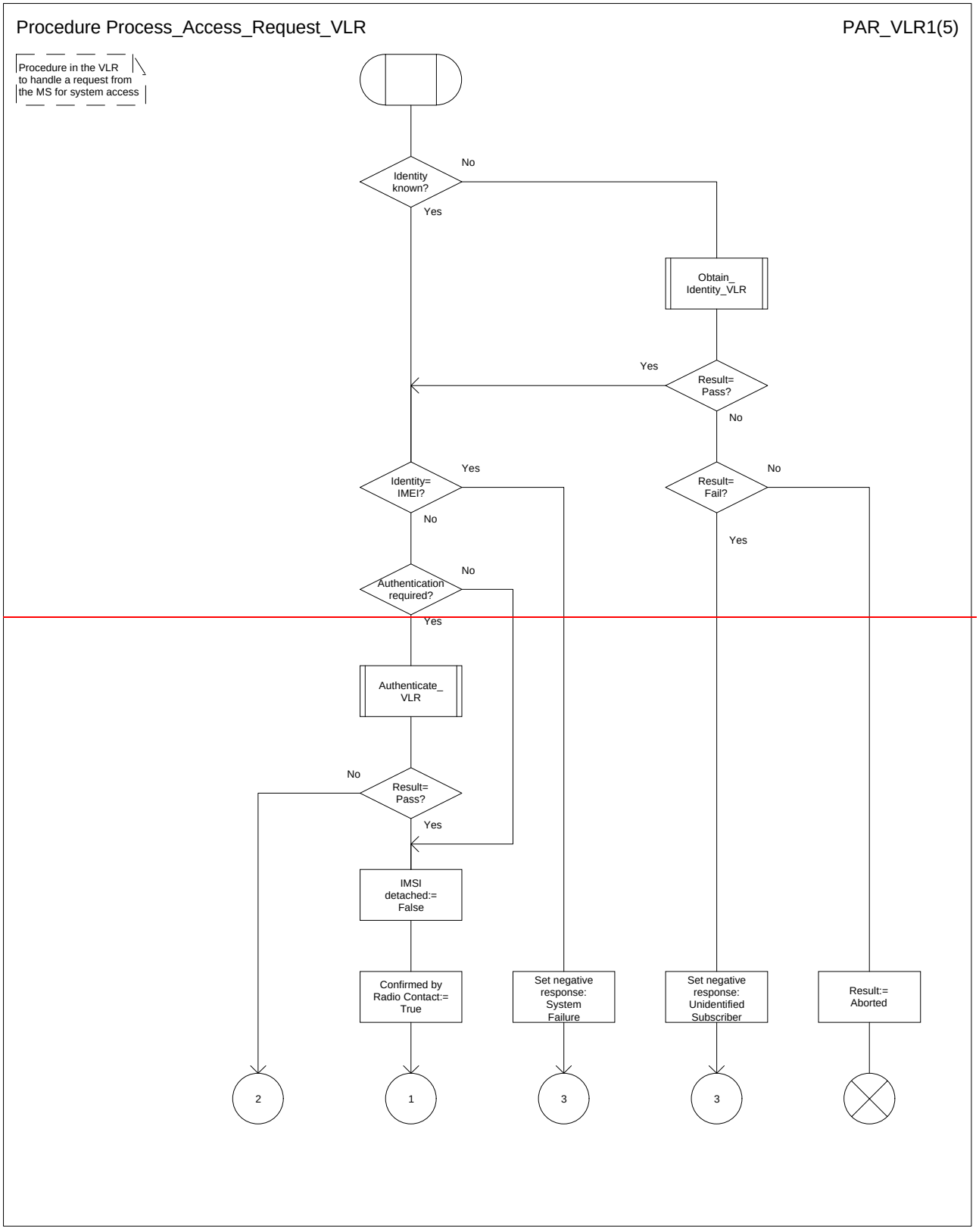


Figure 20a: Procedure Process_Access_Request_VLR (sheet 1)

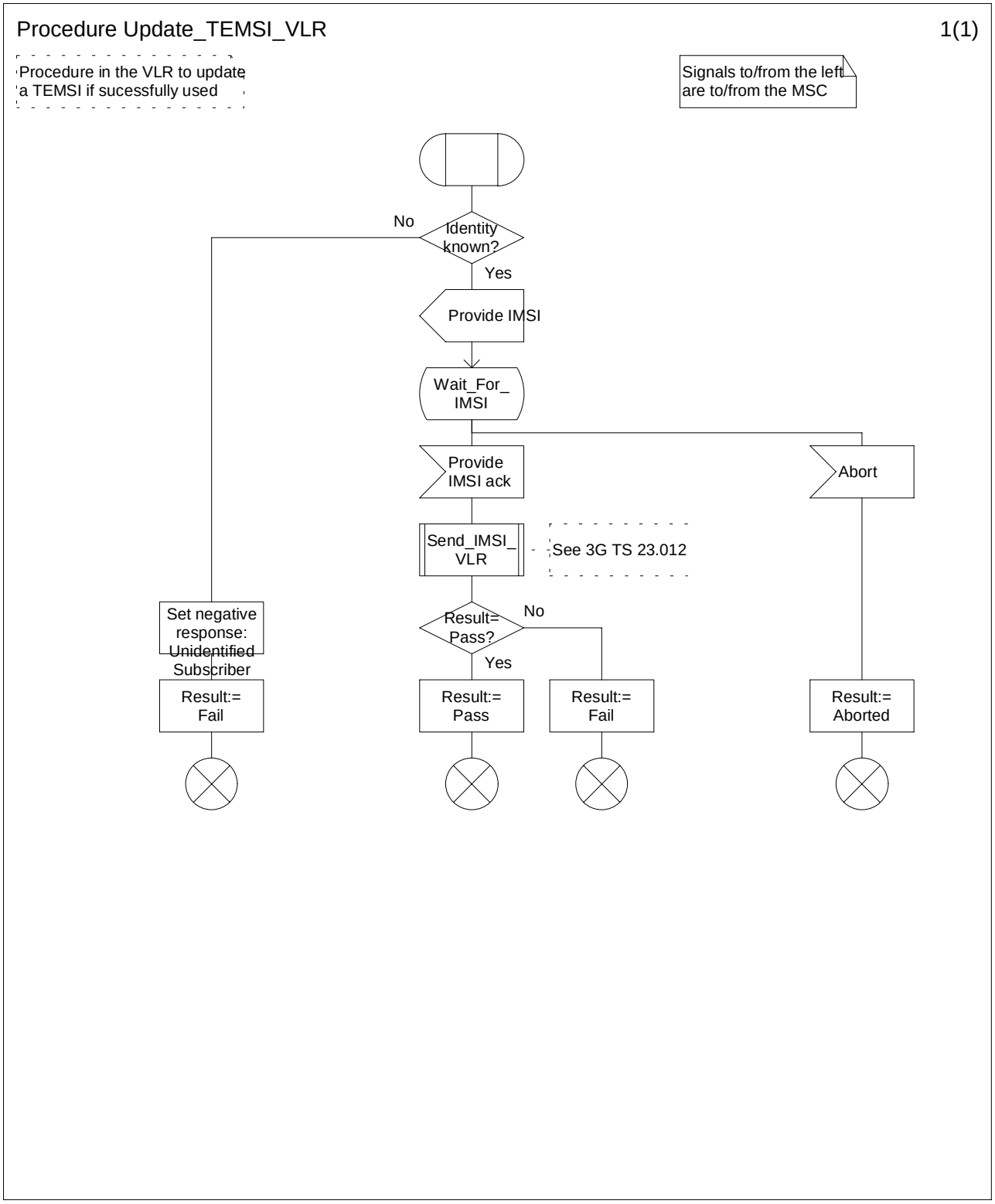
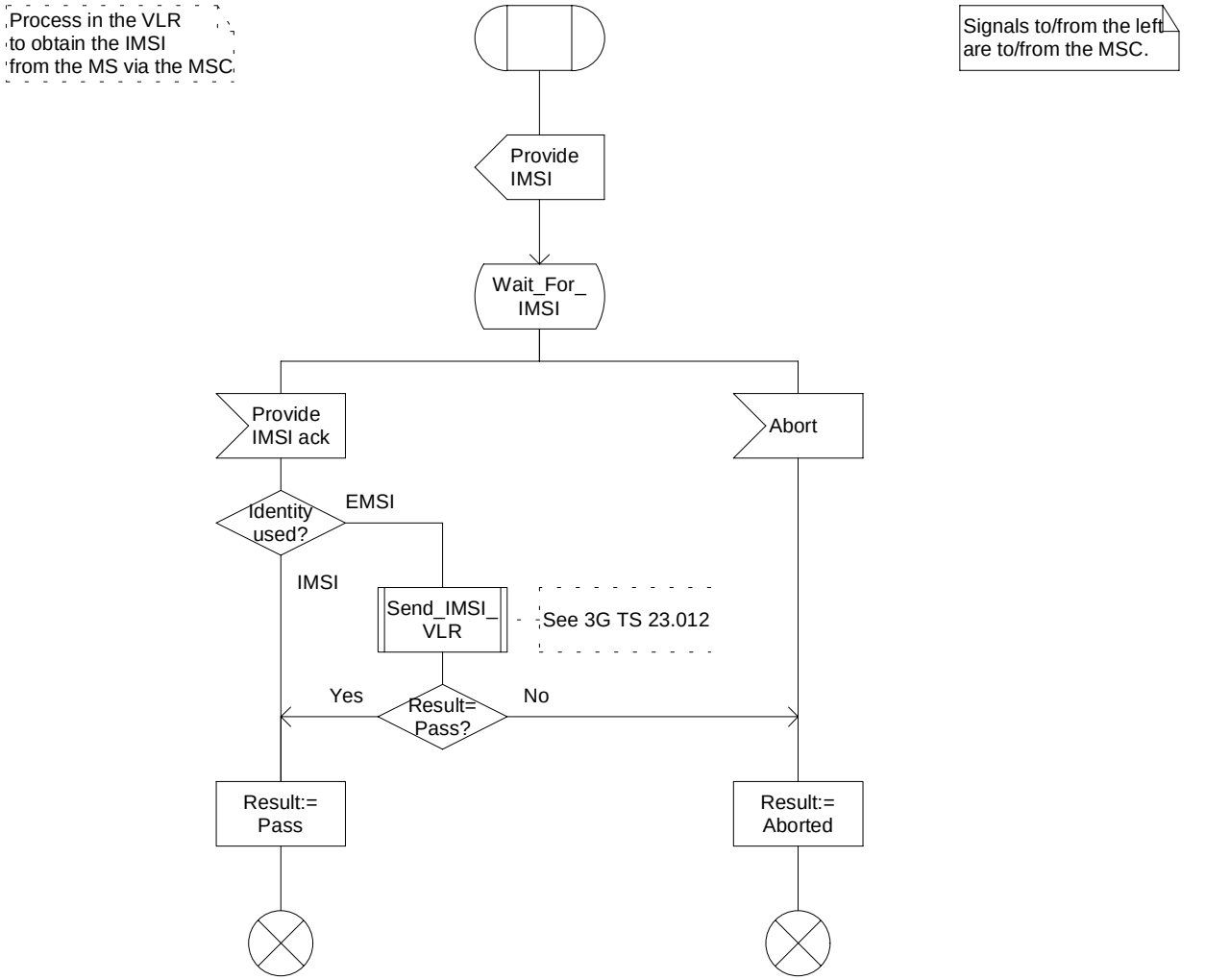


Figure 22: Procedure Update_TEMSI_VLR

Procedure Obtain_IMSI_VLR OIMSI_V1(1)



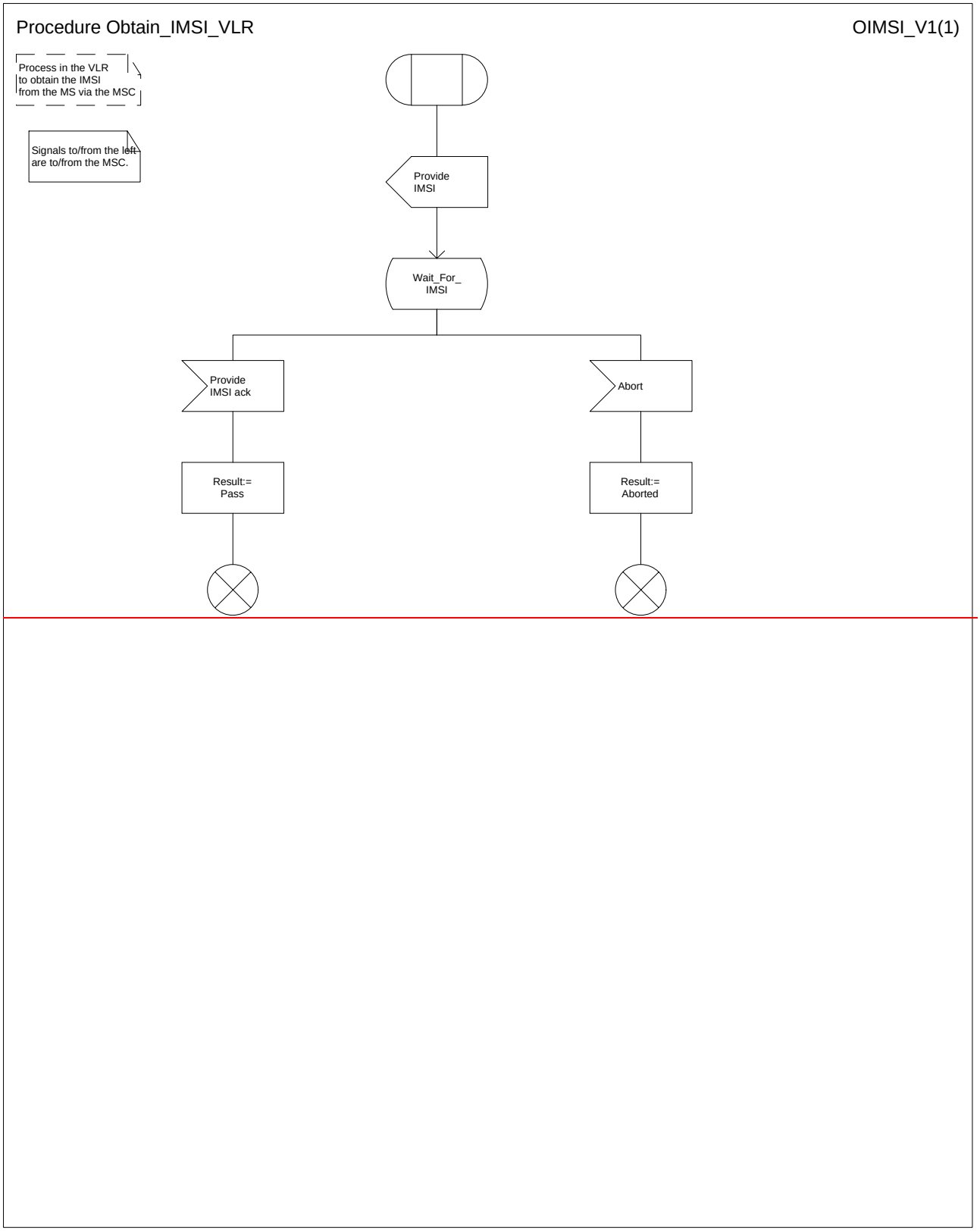


Figure 243: Procedure Obtain_IMSI_VLR

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.

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

Document N2-000315
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.

23.018	**CR**	**049**	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: CN#07	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑	for information		non-strategic	X	

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: N2 **Date:** 14.02.00

Subject: Introduction of Authentication Failure Report

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 the Authentication Failure Report.

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:

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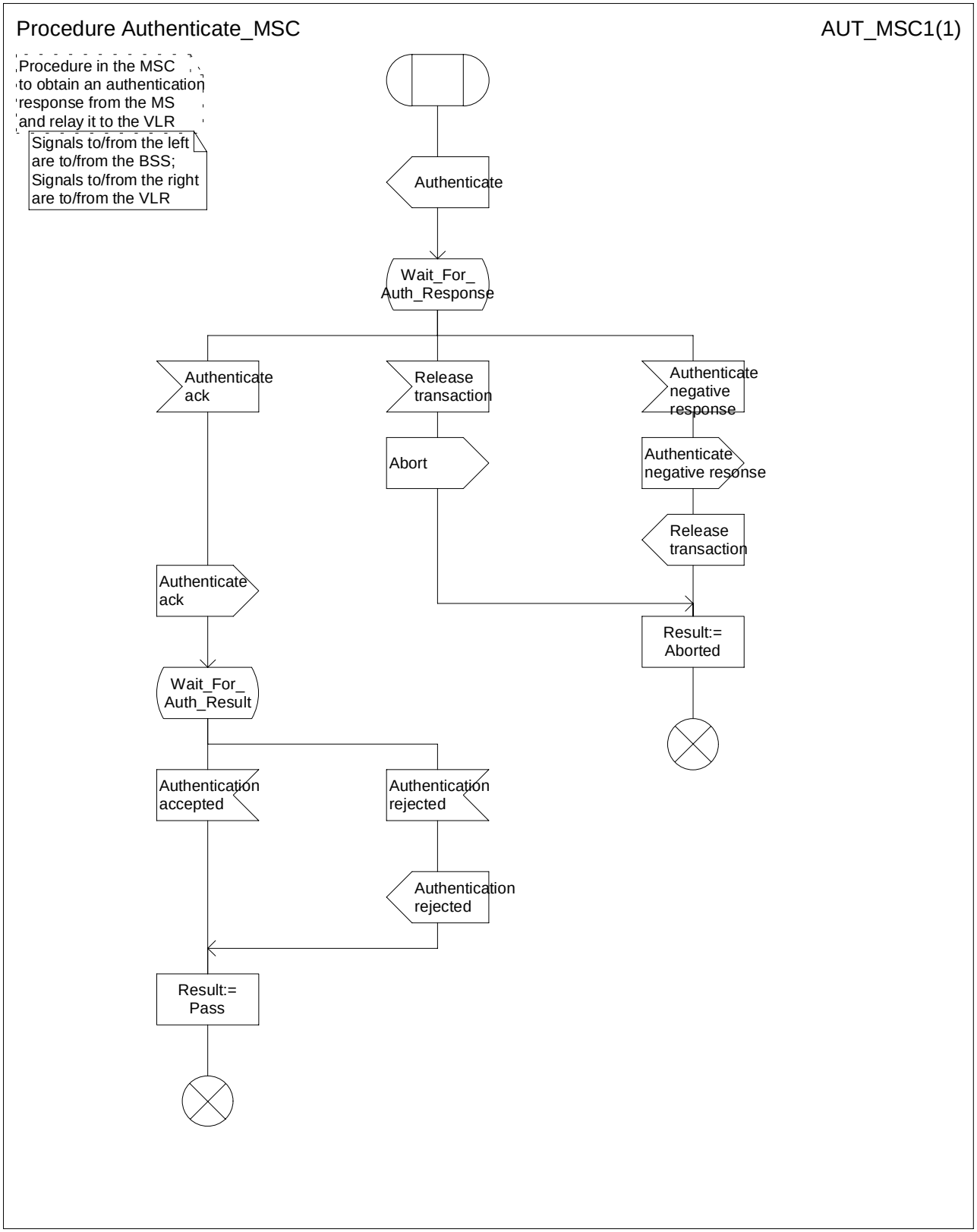


Figure 10: Procedure Authenticate_MSC

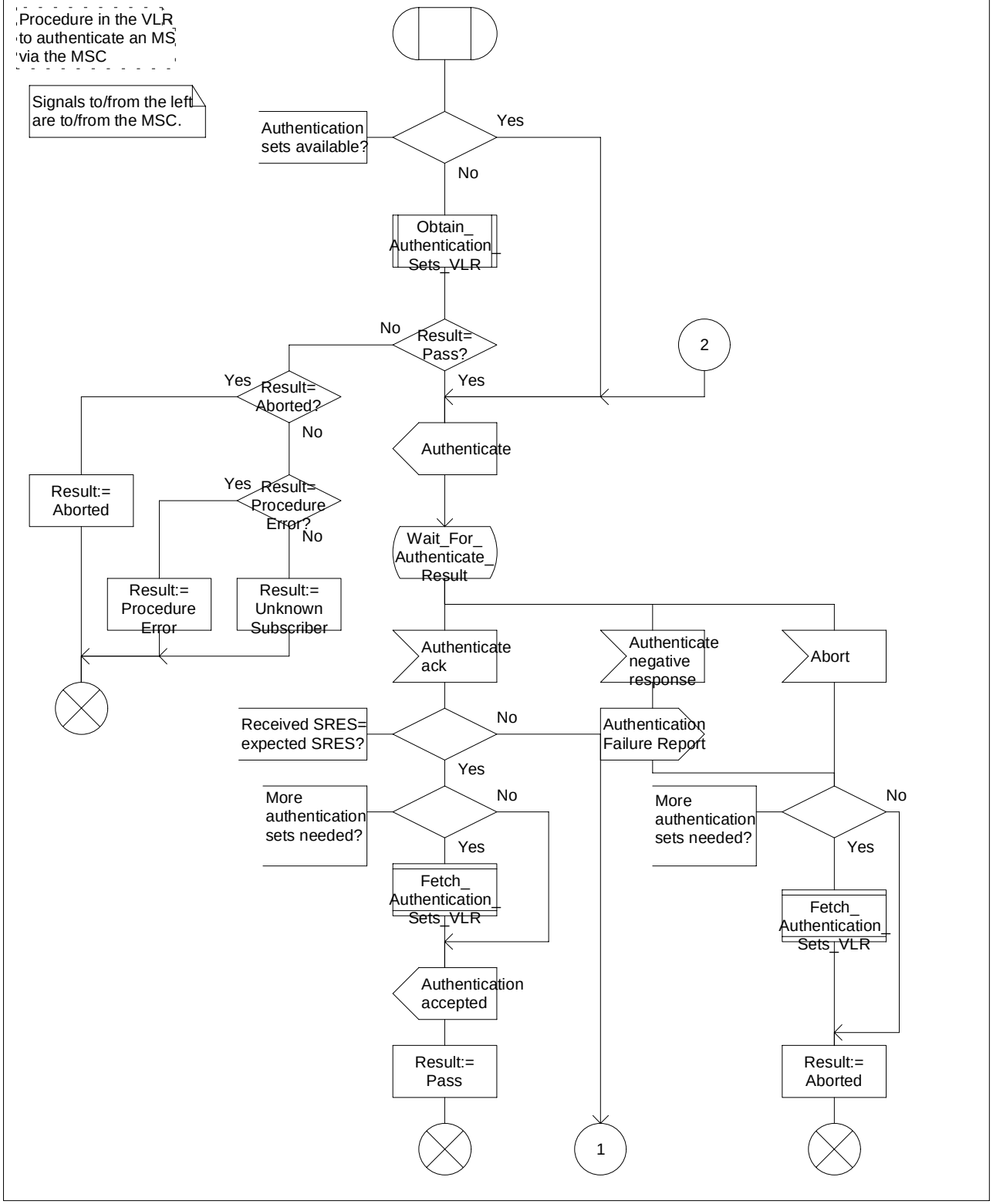

Procedure in the VLR to authenticate an MS via the MSC
Signals to/from the left are to/from the MSC.
Authentication sets available?
Yes
No
Obtain_ Authentication_ Sets_VLR
Result= Pass?
No
Yes
2
Result= Aborted?
Yes
No
Authenticate
Result:= Aborted
Result= Procedure Error?
Yes
No
Wait_For_ Authenticate_ Result
Result:= Procedure Error
Result:= Unknown Subscriber
Authenticate ack
Authenticate negative response
Abort
Received SRES= expected SRES?
No
Yes
Authentication Failure Report
More authentication sets needed?
No
Yes
Fetch_ Authentication_ Sets_VLR
More authentication sets needed?
No
Yes
Fetch_ Authentication_ Sets_VLR
Authentication accepted
Result:= Pass
Result:= Aborted
1

Figure 1a: Procedure Authenticate_VLR (sheet 1)

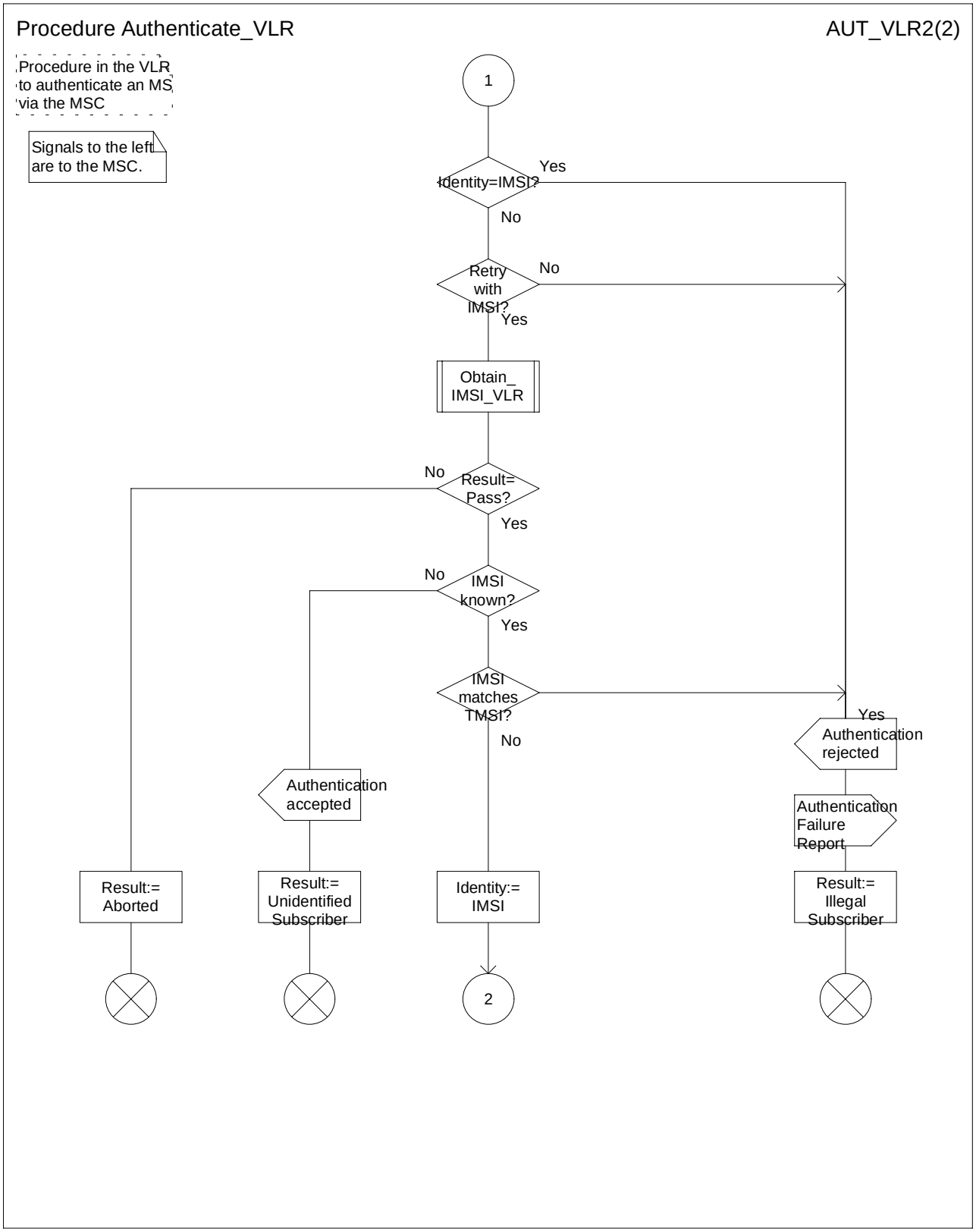


Figure 24b: Procedure Authenticate_VLR (sheet 2)

***Next modified section ***

8 Contents of messages

This clause specifies the content of each message shown in clauses 5 & 7, except for the following messages, which are not specific to call handling:

On the D interface (VLR-HLR):

- Abort;
- Activate Trace Mode
- Authentication Failure Report
- Insert Subscriber Data
- Send Authentication Info;
- Send Authentication Info ack;
- Send Authentication Info negative response;

In the tables which follow, information elements are shown as mandatory (M), conditional (C) or optional (O). A mandatory information element shall always be present. A conditional information element shall be present if certain conditions are fulfilled; if those conditions are not fulfilled it shall be absent. An optional element may be present or absent, at the discretion of the application at the sending entity.

***Next modified section ***

8.1.2 Authenticate

The following information elements are required:

Information element name	Required	Description
RAND	M	Random number challenge to be sent to the MS (GSM 03.20 [**Error! Reference source not found.**])
CKSN	M	Cipher key sequence number to be sent to the MS (GSM 03.20 [**Error! Reference source not found.**])

8.1.3 Authenticate ack

The following information element is required:

Information element name	Required	Description
SRES	M	Signature result returned by the MS (GSM 03.20 [**Error! Reference source not found.**])

8.1.4 Authenticate negative response

The negative response information element can take the following values:

- wrong network signature

3GPP TSG-CN WG2
Kyoto, Japan
17- 21 January 2000

Document N2B000067
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	089	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: CN#07	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑	for information		non-strategic	X	

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 [ ] ME [ ] UTRAN / Radio [ ] Core Network [X]
(at least one should be marked with an X)

Source: N2 **Date:** 13th January 2000

Subject: Security interworking between release 99 and pre-99 MSC/VLRs

Work item: Security

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

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

Reason for change: If the MAP version negotiation between VLR and PVLR leads to MAP version 2 or lower, the VLR shall request authentication sets from the HLR to ensure that USIM is autenticated with 3G vectors

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:

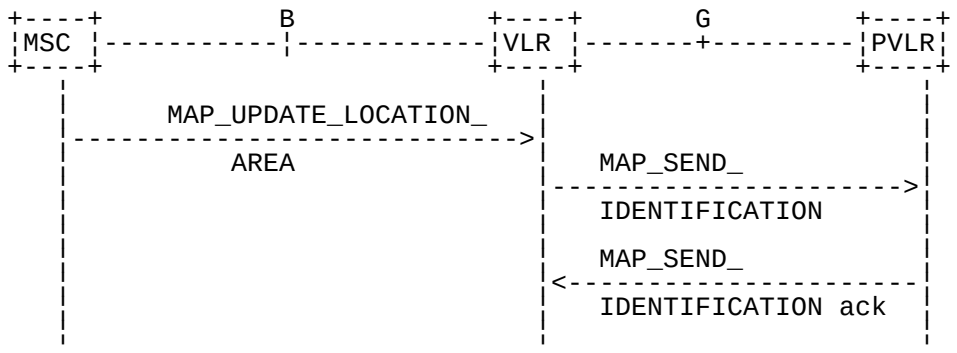
<---------- double-click here for help and instructions on how to create a CR.

19.1.1.5 Send Identification

19.1.1.5.1 General

This service is invoked by a VLR when it receives a MAP_UPDATE_LOCATION_AREA indication containing a LAI indicating that the subscriber was registered in a different VLR (henceforth called the Previous VLR, PVLR). If the identity of the PVLR is derivable for the VLR (usually if both are within the same network), the IMSI and authentication sets are requested from the PVLR (see subclause 19.1.1.3), using the service described in subclause 8.1.4.

If the version negotiation between R99 VLR and pre-R99 PVLR leads to the MAP version 1 or 2, the VLR shall request authentication sets from the HLR.



NOTE: The service shown in dotted lines indicates the trigger provided by other MAP signalling.

Figure 19.1.1/10: Interface and services for Send Identification

3GPP TSG CN WG2 SWG-B
Kista, Sweden, 02 - 03 March 2000

Document N2B000447
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	092r4	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: CN#07					
list expected approval meeting # here ↑	for approval	X	strategic		*(for SMG use only)*
	for information		non-strategic	X	

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: N2 **Date:** 01/03/00

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:

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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 (cancelLocation v3)	HLR
reset (reset)	HLR
subscriberDataMngt (insertSubscriberData v3), (deleteSubscriberData v3)	HLR
tracing (activateTraceMode), (deactivateTraceMode)	HLR
Short Message Service	
shortMsgMT-Relay (MT-ForwardSM v3) (forwardSM v1/v2)	MSC
Network-Requested PDP context activation	
gprsNotify (noteMsPresentForGprs v3),	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.

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. It shall be contained in the MAP_SERVICE_IDENTIFICATION Response and Confirm service if a TEMSI is stored in previous VLR. Otherwise it shall be absent.

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.

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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

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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)}
```

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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                               [0] TEMSI                           OPTIONAL,
    authenticationSetList               [1] 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.

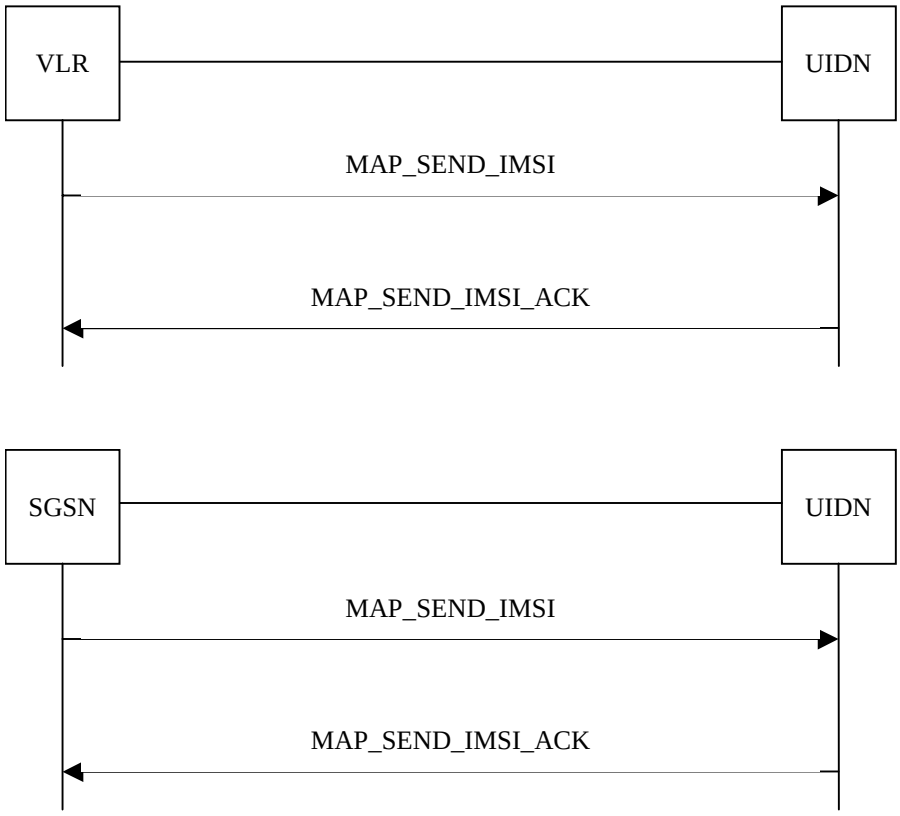


Figure 25.6/1: Message Flows to Enhanced User Identity Confidentiality

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.

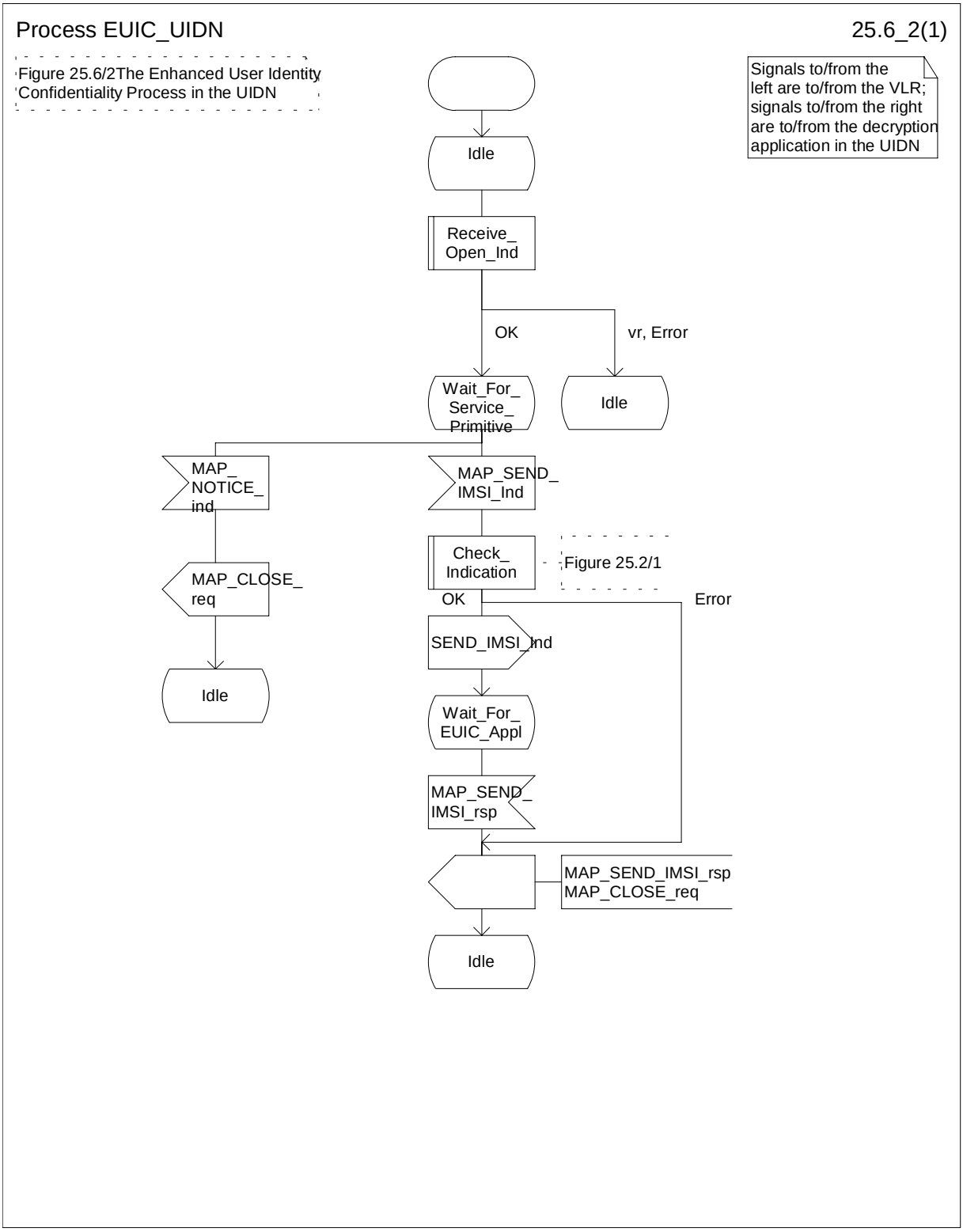


Figure 25.6/2: Process EUIC_HLR

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.

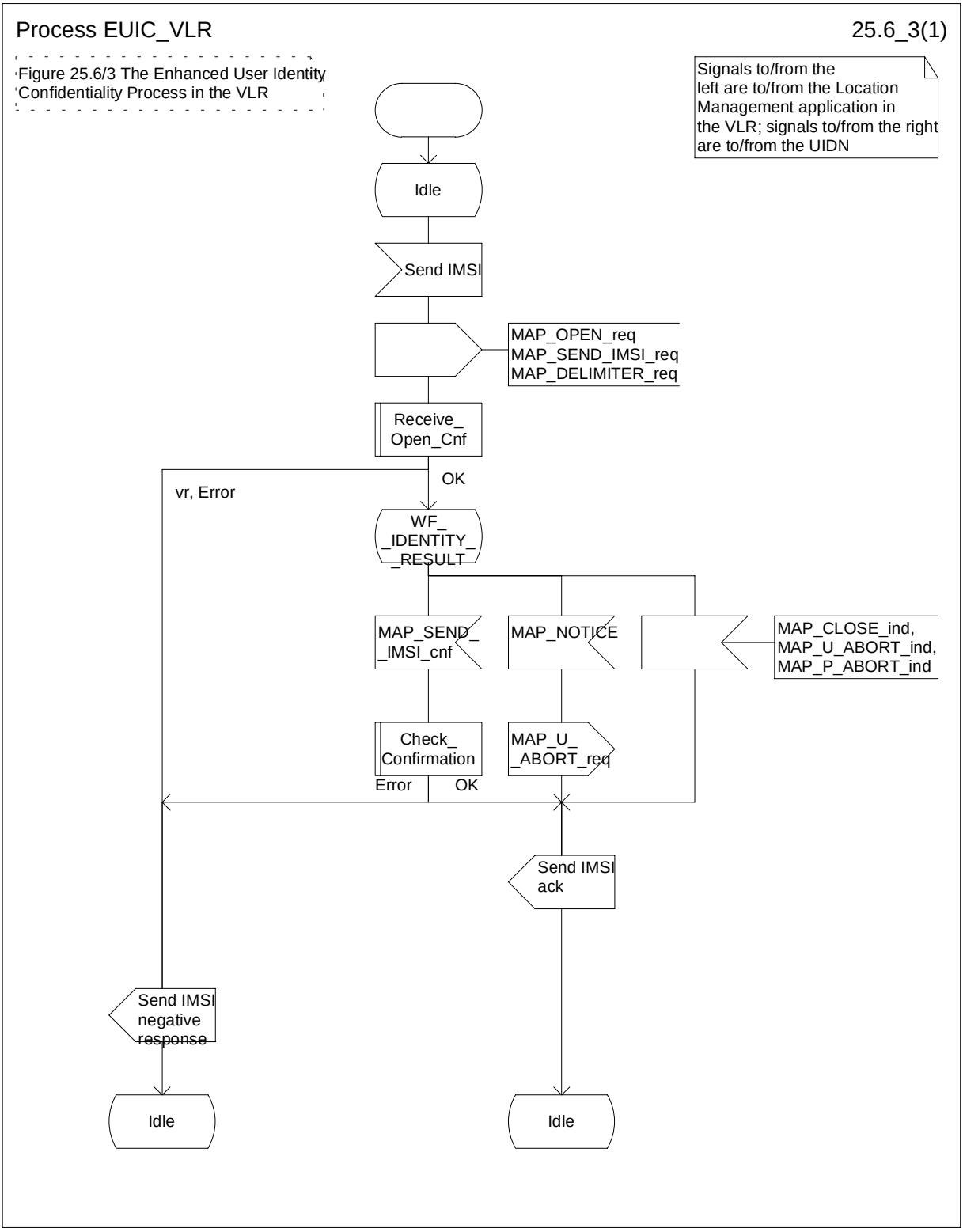


Figure 25.6/3: Process EUIC_VLR

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.

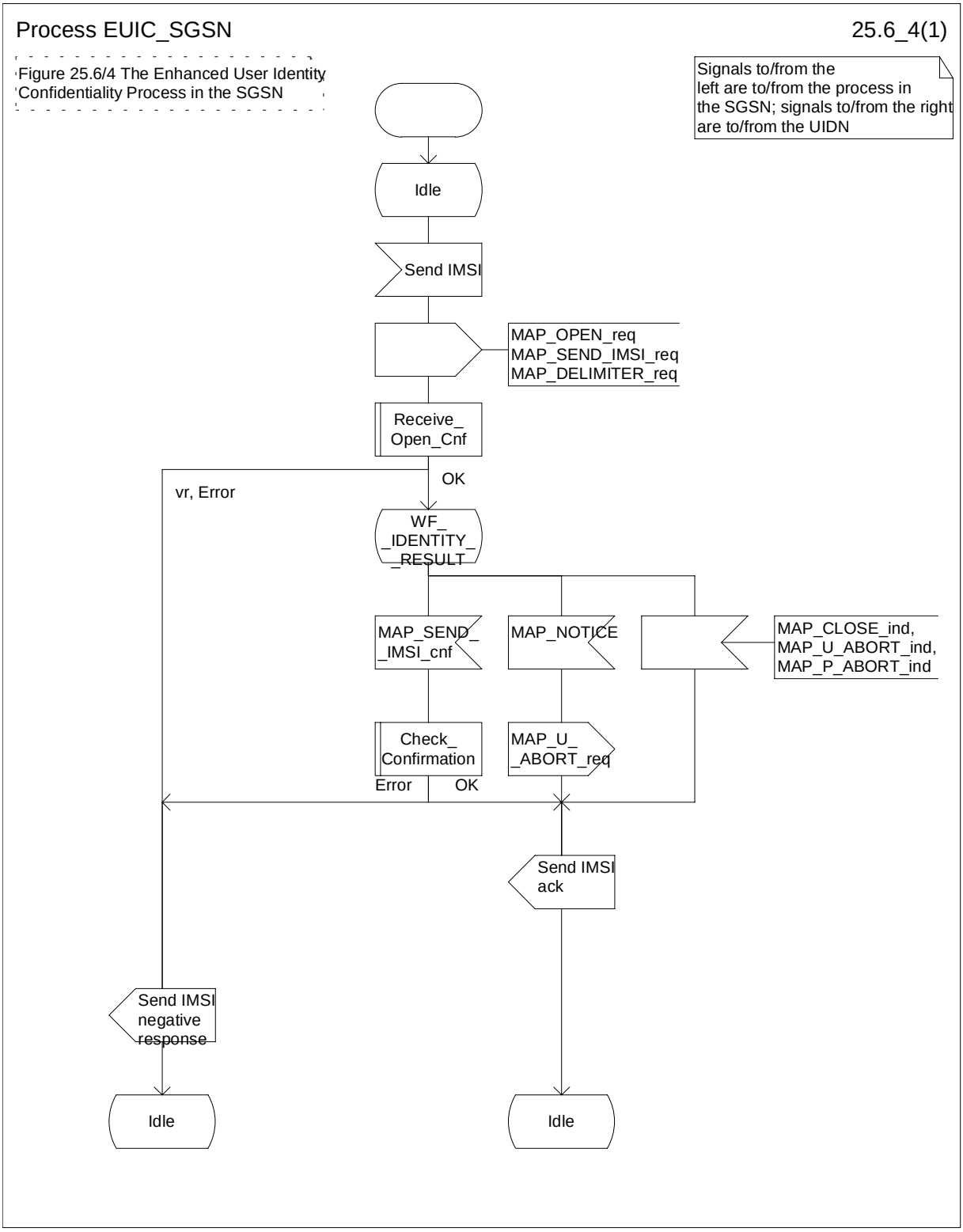


Figure 25.6/4: Process EUIC_SGSN

3GPP TSG CN WG2-B
Milano, Italy, 14-16 Feb 2000

Document N2B000191
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**	**099**	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:	CN #7	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic	X	

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 [ ] ME [ ] UTRAN / Radio [ ] Core Network [X]
(at least one should be marked with an X)

Source: N2 **Date:** 07.02.2000

Subject: UMTS Authentication

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: In TS 33.102 v3.3.1, subclause 6.3.4, the current security context data is required to be transferred from VLRo to VLRn

Clauses affected: 7.6, 8.1.4, 17.7.1

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.

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:

7.6.7 Authentication parameters

7.6.7.1 Authentication set list

This parameter represents a list of sets of authentication parameters for a given subscriber.
The list either contains Authentication Triplets (Rand, Sres, Kc) or Authentication Quintuplets (Rand, Xres, Ck, Ik, Autn). If the list contains Authentication Quintuplets, the order of sequence in this list is chronological, the first quintuplet in the list is the oldest one.

7.6.7.2 Rand

This parameter represents a random number used for authentication.

7.6.7.3 Sres

This parameter represents the response to an authentication request.

7.6.7.4 Kc

This parameter refers to a key used for ciphering purposes.

7.6.7.5 Xres

This parameter represents the response to an UMTS authentication request.

7.6.7.5A Ck

This parameter refers to a key used for UMTS ciphering purposes.

7.6.7.5B Ik

This parameter refers to the Integrity Key.

7.6.7.5C Autn

This parameter refers to the Authentication Token.

7.6.7.6 Cksn

This parameter refers to a ciphering key sequence number.

7.6.7.6A Ksi

This parameter refers to a key set identifier.

7.6.7.6B Auts

This parameter refers to the resynchronisation token.

7.6.7.7 Ciphering mode

This parameter refers to the ciphering mode which is associated with a radio channel. It may take values as follows:

- no encryption;
- identification of specific ciphering algorithm.

7.6.7.8 Current Security Context

This parameter represents a list of security context parameters for a given subscriber.
The list either contains GSM Security Context data (Kc, Cksn) or UMTS Security Context Data (Ck, Ik, Ksi).

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 and authentication ~~sets~~ data 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(=)
Authentication set			U	C(=)
Current Security Context			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.

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.

Current Security Context

See definition in subclause 7.6.7. If the service succeeds, a list of either GSM or UMTS Security Context parameters can be returned.

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.

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,
      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.
    authenticationSetList               AuthenticationSetList           OPTIONAL,
    currentSecurityContext              [1]CurrentSecurityContext       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,
    ...}
```

```
CurrentSecurityContext ::= CHOICE {
    gsm-SecurityContextData             [0] GSM-SecurityContextData,
    umts-SecurityContextData            [1] UMTS-SecurityContextData }
```

```
GSM-SecurityContextData ::= SEQUENCE {
    kc                                  Kc,
    cksn                                Cksn,
    ... }
```

```
UMTS-SecurityContextData ::= SEQUENCE {
    ck                                  CK,
    ik                                  IK,
    ksi                                 KSI,
    ... }
```

```
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))
```

```
Cksn ::= OCTET STRING (SIZE (1))
    -- The internal structure is defined in 3G TS 24.008
```

```
KSI ::= OCTET STRING (SIZE (1))
    -- The internal structure is defined in 3G TS 24.008
```

3GPP TSG-CN 2 SWGB meeting #4
Kista, Sweden, 02-03 March 2000

Document N2B000466
Revised N2B000437

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	100r5	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:	TSG-CN #7	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic	X	

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: N2 **Date:** 2000-03-03

Subject: Support of 3G Handover, including Multicall

Work item: Multicall

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			Release 97	
C	Functional modification of feature	X		Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: Additions of mechanisms in 29.002 to be able to handle multiple bearer case.

Clauses affected: 7.6, 7.6.2.53 (new), 7.6.2.54 (new), 8.4.1.2, 17.7.1, 19.2.2, 19.2.3

Other specs affected:

Other 3G core specifications	X	→ List of CRs:	23.009-002r2
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:

The following changes have been introduced to CR29.002-100r3 (N2B000377):
For the Inter MSC handover with multiple bearer, it has been agreed the following scenario is adopted and relevant CR against 23.009 (input from N1 as N2B000424) has been approved in N1 meeting in Umea;

- MSC-A tries to handover all bearers to MSC-B. MSC-A shall include Multiple Bearer Requested parameter if it requests multiple bearers at relocation.
- If MSC-B does not support multiple bearer MSC-B shall return Multiple Bearer Not Supported parameter which indicates MSC-B does not support multiple bearers.

For this requirement some additional parameters are needed in MAP-PREPARE-HANDOVER service and modification is needed in SDL diagrams for the negotiation•capability between MSC-A and MSC-B.

The following changes have been introduced to CR29.002-100r4 (N2B000437):
In the SDL 19.2.3/1 sheet 1, “diamond” is modified to “triangle” for the test “mutliple bearer supported?”.

help.doc

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

First Change

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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1999 document, references to GSM documents are for Release 1999 versions (version 3.x.y).

[1] 3G TS 21.905: "3G Vocabulary".

[2] GSM 02.01: "Digital cellular telecommunications system (Phase 2+); Principles of telecommunication services supported by a GSM Public Land Mobile Network (PLMN)".

…… ETC. ETC. ……

[116] ITU-T Q.850, May 1998: "Usage of cause and location in the Digital Subscriber Signalling System No. 1 and the Signalling System No. 7 ISDN User Part".

[117] 3G TS 25.413: "UTRAN Iu Interface RANAP Signalling ".

Next Change

4.4.7 Interface between MSCs (E-interface)

When a MS moves from one MSC area to another during a call, a handover or relocation procedure has to be performed in order to continue the communication. For that purpose the MSCs involved have to exchange data to initiate and then to realize the operation.

This interface is also used to forward short messages, to perform location for a target MS for which handover or relocation has occurred on an established call and to transfer LCS messages to and from an LMU for which handover or relocation of a signalling channel has occurred.

This interface is also used to transfer information for inter-MSC VBS/VGCS calls .

Next Change

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

Responder = MSC/VLR	Initiating Entity
Priority high	
Handover	
handoverControl (prepareHandover/v2/v3), (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 Change

6.1.3.2 The Mobile-services Switching Centre (MSC)

There are several cases where it is necessary to address the MSC.

6.3.2.1 MSC interaction during handover or relocation

The address is derived from the target Cell id or from the target RNC id.

Next Change

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 Basic Service Group	7.6.3.5
Extensible Bearer service	7.6.3.3
Extensible Call barring feature	7.6.3.21
Extensible Call barring information	7.6.3.20
Extensible Call barring information for CSE	7.6.3.79
Extensible Forwarding feature	7.6.3.16
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
SGSN number	7.6.2.38
SIWF Number	7.6.2.35
SoLSA Support Indicator	7.6.3.57
SM Delivery Outcome	7.6.8.6
SM-RP-DA	7.6.8.1
SM-RP-MTI	7.6.8.16
SM-RP-OA	7.6.8.2
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
Target RNC Id	7.6.2.9
Teleservice	7.6.4.39
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

Next Change

7.6.1.4 User error

This parameter can take values as follows:

NOTE: The values are grouped in order to improve readability; the grouping has no other significance.

a) Generic error:

- system failure, i.e. a task cannot be performed because of a problem in another entity. The type of entity or network resource may be indicated by use of the network resource parameter;

- data missing, i.e. an optional parameter required by the context is missing;

- unexpected data value, i.e. the data type is formally correct but its value or presence is unexpected in the current context;
- resource limitation;
- initiating release, i.e. the receiving entity has started the release procedure;
- facility not supported, i.e. the requested facility is not supported by the PLMN;
- incompatible terminal, i.e. the requested facility is not supported by the terminal.

b) Identification or numbering problem:

- unknown subscriber, i.e. no such subscription exists;
- number changed, i.e. the subscription does not exist for that number any more;
- unknown MSC;
- unidentified subscriber, i.e. if the subscriber is not contained in the database and it has not or cannot be established whether or not a subscription exists;
- unallocated roaming number;
- unknown equipment;
- unknown location area.

c) Subscription problem:

- roaming not allowed, i.e. a location updating attempt is made in an area not covered by the subscription;
- illegal subscriber, i.e. illegality of the access has been established by use of authentication procedure;
- bearer service not provisioned;
- teleservice not provisioned;
- illegal equipment, i.e. the IMEI check procedure has shown that the IMEI is blacklisted or not whitelisted.

d) Handover problem:

- no handover number available, i.e. the VLR cannot allocate a number for handover or cannot allocate the required amount of numbers for relocation;
- subsequent handover failure, i.e. handover to a third MSC failed for some reason.

Next Change

7.6.2.9 Target RNC Id

This parameter refers to the identity of the RNC to which a call has to be relocated.

Next Change

7.6.2.20 Relocation Number List

This parameter refers to the number(s) used for routing one call or several calls between MSCs during relocation.

Next Change

7.6.2.52 Multicall Bearer Information

This parameter refers to the number of simultaneous bearers supported per user by the serving network.

7.6.2.53 Multiple Bearer Requested

This patrameter indicates whether multiple bearers are requested for a relocation.

7.6.2.54 Multiple Bearer Not Supported

This parameter indicates whether multiple bearers are supported.

Next Change

7.6.6.7 HO-Number Not Required

This parameter indicates that no handover or relocation number allocation is necessary.

Next Change

7.6.9 Access and signalling system related parameters

7.6.9.1 ~~BSS~~AN-apdu

This parameter includes one or two concatenated complete 3G TS 25.413 or GSM 08.06 messages, as described in ~~GSM~~ 3G TS ~~0~~2~~0~~3.0~~0~~9 and ~~GSM~~3G TS 2~~0~~9.0~~1~~0. The access network p~~P~~rotocol ID indicates that the message or messages are according to either GSM 08.06 or 3G TS 25.413. For the coding of the messages see 3G TS 25.413, GSM 08.06 and GSM 08.08.

Next Change

8.4 Handover services

It should be noted that the handover services used on the B-interface have not been updated for Release 99. The B-interface is not fully operational specified. It is strongly recommended not to implement the B-interface as an external interface.

8.4.1 MAP_PREPARE_HANDOVER service

8.4.1.1 Definition

This service is used between MSC-A and MSC-B (E-interface) when a call is to be handed over or relocated from MSC-A to MSC-B.

The MAP_PREPARE_HANDOVER service is a confirmed service using the primitives from table 8.4/1.

8.4.1.2 Service primitives

Table 8.4/1: MAP_PREPARE_HANDOVER

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Target Cell Id	C	C(=)		
Target RNC Id	C	C(=)		
HO-NumberNotRequired	C	C(=)		
~~BSS~~AN-APDU	C	C(=)	C	C(=)
Handover Number			C	C(=)
Relocation Number List			C	C(=)
Multicall Bearer Information			C	C(=)
Multiple Bearer Requested	C	C(=)		
Multiple Bearer Not Supported			C	C(=)
User error			C	C(=)
Provider error				O

8.4.1.3 Parameter use

Invoke Id

For definition of this parameter see subclause 7.6.1.

Target Cell Id

For definition of this parameter see subclause 7.6.2. This parameter is only included if the service is not in an ongoing transaction. This parameter shall also be excluded if the service is a part of the Inter-MSC SRNS Relocation procedure described in 3G TS 23.009.

Target RNC Id

For definition of this parameter see subclause 7.6.2. This parameter shall be included if the service is a part of the Inter-MSC SRNS Relocation procedure described in 3G TS 23.009.

HO-Number Not Required

For definition of this parameter see subclause 7.6.6.

~~BSS~~AN-APDU

For definition of this parameter see subclause 7.6.9.

Handover Number

For definition of this parameter see subclause 7.6.2. This parameter shall be returned at handover, unless the parameter HO-NumberNotRequired is sent. If the parameter Handover Number is returned, the parameter Relocation Number List shall not be returned.

Relocation Number List

For definition of this parameter see subclause 7.6.2. This parameter shall be returned at relocation, unless the parameter HO-NumberNotRequired is sent. If the parameter Relocation Number List is returned, the parameter Handover Number shall not be returned

Multicall Bearer Information

For a definition of this parameter see subclause 7.6.2.

Multiple Bearer Requested

For a definition of this parameter see subclause 7.6.2. This parameter shall be sent when MSC-A requests multiple bearers to MSC-B.

Multiple Bearer Not Supported

For a definition of this parameter see subclause 7.6.2. This parameter shall be returned at relocation when MSC-B receives Multiple Bearer Requested parameter and MSC-B does not support multiple bearers.

User error

For definition of this parameter see subclause 7.6.1. The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- No handover number available;
- System failure;
- Unexpected data value;
- DataMissing.

Provider error

See definition of provider errors in subclause 7.6.1.

8.4.2 MAP_SEND_END_SIGNAL service

8.4.2.1 Definition

This service is used between MSC-B and MSC-A (E-interface) indicating that the radio path has been established by MSC-B to the MS. MSC-A retains then the main control of the call until it clears.

The response is used by MSC-A to inform MSC-B that all resources for the call can be released in MSC-B, either because the call has been released in MSC-A or because the call has been successfully handed over or relocated from MSC-B to another MSC.

The MAP_SEND_END_SIGNAL service is a confirmed service using the primitives from table 8.4/2.

8.4.2.2 Service primitives

Table 8.4/2: MAP_SEND_END_SIGNAL

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
~~BSS~~AN-APDU	M	M(=)		
Provider error				O

8.4.2.3 Parameter use

Invoke Id

For definition of this parameter see subclause 7.6.1.

~~BSS~~AN-APDU

For definition of this parameter see subclause 7.6.9.

Provider error

For definition of this parameter see subclause 7.6.1.

8.4.3 MAP_PROCESS_ACCESS_SIGNALLING service

8.4.3.1 Definition

This service is used between MSC-B and MSC-A (E-interface) to pass information received on the A-interface or Iu-interface in MSC-B to MSC-A.

The MAP_PROCESS_ACCESS_SIGNALLING service is a non-confirmed service using the primitives from table 8.4/3.

8.4.3.2 Service primitives

Table 8.4/3: MAP_PROCESS_ACCESS_SIGNALLING

Parameter name	Request	Indication
Invoke Id	M	M(=)
~~BSS~~AN-APDU	M	M(=)

8.4.3.3 Parameter use

Invoke Id

For definition of this parameter see subclause 7.6.1.

~~BSS~~AN-APDU

For definition of this parameter see subclause 7.6.9.

8.4.4 MAP_FORWARD_ACCESS_SIGNALLING service

8.4.4.1 Definition

This service is used between MSC-A and MSC-B (E-interface) to pass information to be forwarded to the A-interface or Iu-interface of MSC-B.

The MAP_FORWARD_ACCESS_SIGNALLING service is a non-confirmed service using the primitives from table 8.4/4.

8.4.4.2 Service primitives

Table 8.4/4: MAP_FORWARD_ACCESS_SIGNALLING

Parameter name	Request	Indication
Invoke Id	M	M(=)
~~BSS~~AN-APDU	M	M(=)

8.4.4.3 Parameter use

For the definition and use of all parameters and errors, see subclause 7.6.1

Invoke Id

For definition of this parameter see subclause 7.6.1.

~~BSS~~AN-APDU

For definition of this parameter see subclause 7.6.9.

8.4.5 MAP_PREPARE_SUBSEQUENT_HANDOVER service

8.4.5.1 Definition

This service is used between MSC-B and MSC-A (E-interface) to inform MSC-A that it has been decided that a handover or relocation to either MSC-A or a third MSC (MSC-B') is required.

The MAP_PREPARE_SUBSEQUENT_HANDOVER service is a confirmed service using the primitives from table 8.4/5.

8.4.5.2 Service primitives

Table 8.4/5: MAP_PREPARE_SUBSEQUENT_HANDOVER

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Target Cell Id	C~~M~~	C~~M~~(=)		
Target RNC Id	C	C(=)		
Target MSC Number	M	M(=)		
~~BSS~~AN-APDU	M	M(=)	C	C(=)
User error			C	C(=)
Provider error				O

8.4.5.3 Parameter use

Invoke Id

For definition of this parameter see subclause 7.6.1.

Target Cell Id

For definition of this parameter see subclause 7.6.2. This parameter shall be excluded if the service is a part of the Inter-MSC SRNS Relocation procedure described in 3G TS 23.009.

Target RNC Id

For definition of this parameter see subclause 7.6.2. This parameter shall be included if the service is a part of the Inter-MSC SRNS Relocation procedure described in 3G TS 23.009.

Target MSC Number

For definition of this parameter see subclause 7.6.2.

~~BSS~~AN-APDU

For definition of this parameter see subclause 7.6.9.

User error

For definition of this parameter see subclause 7.6.1. The following error causes defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unknown MSC;
- Subsequent handover failure;
- Unexpected data value;
- Data Missing.

Provider error

For definition of this parameter see subclause 7.6.1.

Next Change

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	v2	sendIMSI	
infoRetrievalContext	v3	sendAuthenticationInfo	
interVlrInfoRetrievalContext	v3	sendIdentification	
handoverControlContext	~~v2~~v3	prepareHandover forwardAccessSignalling sendEndSignal processAccessSignalling prepareSubsequentHandover	the syntax of this operation has been extended in comparison with release 98 version
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 Change

17.2.2.12 Handover Control

This operation package includes the operations required for handover procedures between MSCs.

```
HandoverControlPackage-v32 ::= OPERATION-PACKAGE
     -- Supplier is MSCB if Consumer is MSCA
     CONSUMER INVOKES {
          prepareHandover,
          forwardAccessSignalling}
     SUPPLIER INVOKES {
          sendEndSignal,
          processAccessSignalling,
          prepareSubsequentHandover}
```

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

The v1-equivalent package is defined as follows.

```
HandoverControlPackage-v1 ::= OPERATION-PACKAGE
     -- Supplier is MSCB if Consumer is MSCA
     CONSUMER INVOKES {
          performHandover,
          forwardAccessSignalling,
          traceSubscriberActivity}
     SUPPLIER INVOKES {
          sendEndSignal,
          noteInternalHandover,
          processAccessSignalling,
          performSubsequentHandover}
```

Next Change

17.3.2.12 Handover control

This application context is used for handover procedures between MSCs.

```
handoverControlContext-v32 APPLICATION-CONTEXT
     -- Responder is MSCB if Initiator is MSCA
     INITIATOR CONSUMER OF {
          HandoverControlPackage-v32}
::= {map-ac handoverControl(11) version32(32)}
```

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

```
{map-ac handoverControl(11) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac handoverControl(11) version1(1)}
```

Next Change

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-v32  OBJECT IDENTIFIER ::=
     {map-ac handoverControl(11) version32(32)}

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-v2  OBJECT IDENTIFIER ::=
     {map-ac imsiRetrieval(26) version2(2)}

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)
-- handoverControlContext-v2            map-ac handoverControl (11)             version2 (2)
-- 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)

END
```

Next Change

17.6 MAP operation and error types

17.6.1 Mobile Service Operations

```
MAP-MobileServiceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-MobileServiceOperations (5)
   version6 (6)}

DEFINITIONS

::=

BEGIN

EXPORTS

   -- location registration operations
   UpdateLocation,
   CancelLocation,
   PurgeMS,
   SendIdentification,

   -- gprs location registration operations
   UpdateGprsLocation,

   -- subscriber information enquiry operations
   ProvideSubscriberInfo,

   -- any time information enquiry operations
   AnyTimeInterrogation,

   -- any time information handling operations
   AnyTimeSubscriptionInterrogation,
   AnyTimeModification,

   -- subscriber data modification notification operations
   NoteSubscriberDataModified,


   -- handover operations
   PrepareHandover,
   SendEndSignal,
   ProcessAccessSignalling,
   ForwardAccessSignalling,
   PrepareSubsequentHandover,

   -- authentication management operations
   SendAuthenticationInfo,

   -- IMEI management operations
   CheckIMEI,

   -- subscriber management operations
   InsertSubscriberData,
   DeleteSubscriberData,

   -- fault recovery operations
   Reset,
   ForwardCheckSS-Indication,
   RestoreData,

-- gprs location information retrieval operations
   SendRoutingInfoForGprs,

   -- failure reporting operations
   FailureReport,
```

```
   -- gprs notification operations
   NoteMsPresentForGprs,

   -- Mobility Management operations
   NoteMM-Event



;

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

   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   UnknownSubscriber,
   UnknownMSC,
   UnidentifiedSubscriber,
   UnknownEquipment,
   RoamingNotAllowed,
   ATI-NotAllowed,
   NoHandoverNumberAvailable,
   SubsequentHandoverFailure,
   AbsentSubscriber,
   MM-EventNotSupported,
   ATSI-NotAllowed,
   ATM-NotAllowed,
   BearerServiceNotProvisioned,
   TeleserviceNotProvisioned,
   CallBarred,
   IllegalSS-Operation,
   SS-ErrorStatus,
   SS-NotAvailable,
   SS-Incompatibility,
   SS-SubscriptionViolation,
   InformationNotAvailable


FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version6 (6)}

   UpdateLocationArg,
   UpdateLocationRes,
   CancelLocationArg,
   CancelLocationRes,
   PurgeMS-Arg,
   PurgeMS-Res,
   SendIdentificationArg,
   SendIdentificationRes,
   UpdateGprsLocationArg,
   UpdateGprsLocationRes,
   PrepareHO-Arg,
   PrepareHO-Res,
   ForwardAccessSignallingArg,
   ProcessAccessSignallingArg,
   SendEndSignallingArg,
   SendEndSignallingRes,
   PrepareSubsequentHO-Res,
   PrepareSubsequentHO-Arg,
   SendAuthenticationInfoArg,
   SendAuthenticationInfoRes,
   EquipmentStatus,
   InsertSubscriberDataArg,
   InsertSubscriberDataRes,
   DeleteSubscriberDataArg,
   DeleteSubscriberDataRes,
   ResetArg,
   RestoreDataArg,
   RestoreDataRes,
   ProvideSubscriberInfoArg,
   ProvideSubscriberInfoRes,
```

```
   AnyTimeSubscriptionInterrogationArg,
   AnyTimeSubscriptionInterrogationRes,
   AnyTimeModificationArg,
   AnyTimeModificationRes,
   NoteSubscriberDataModifiedArg,
   NoteSubscriberDataModifiedRes,
   AnyTimeInterrogationArg,
   AnyTimeInterrogationRes,
   SendRoutingInfoForGprsArg,
   SendRoutingInfoForGprsRes,
   FailureReportArg,
   FailureReportRes,
   NoteMsPresentForGprsArg,
   NoteMsPresentForGprsRes,
   NoteMM-EventArg,
   NoteMM-EventRes


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

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


-- location registration operations

UpdateLocation ::= OPERATION                                        --Timer m
    ARGUMENT
         updateLocationArg              UpdateLocationArg
    RESULT
         updateLocationRes              UpdateLocationRes
    ERRORS {
         SystemFailure,
         DataMissing,
         UnexpectedDataValue,
         UnknownSubscriber,
         RoamingNotAllowed}

CancelLocation ::= OPERATION                                        --Timer m
    ARGUMENT
         cancelLocationArg              CancelLocationArg
    RESULT
         cancelLocationRes              CancelLocationRes
             -- optional
    ERRORS {
         DataMissing,
         UnexpectedDataValue}

PurgeMS ::= OPERATION                                               --Timer m
    ARGUMENT
         purgeMS-Arg                    PurgeMS-Arg
    RESULT
         purgeMS-Res                    PurgeMS-Res
              -- optional
    ERRORS{
         DataMissing,
         UnexpectedDataValue,
         UnknownSubscriber}
```

```
SendIdentification ::= OPERATION                                    --Timer s
     ARGUMENT
          sendIdentificationArg               SendIdentificationArg
     RESULT
          sendIdentificationRes          SendIdentificationRes
     ERRORS {
          DataMissing,
          UnidentifiedSubscriber}
```

-- gprs location registration operations

```
UpdateGprsLocation ::= OPERATION                                    --Timer m
     ARGUMENT
          updateGprsLocationArg          UpdateGprsLocationArg
     RESULT
          updateGprsLocationRes          UpdateGprsLocationRes
     ERRORS {
          SystemFailure,
          UnexpectedDataValue,
          UnknownSubscriber,
          RoamingNotAllowed}
```

-- subscriber information enquiry operations

```
ProvideSubscriberInfo ::= OPERATION                                 --Timer m
     ARGUMENT
          provideSubscriberInfoArg       ProvideSubscriberInfoArg
     RESULT
          provideSubscriberInfoRes       ProvideSubscriberInfoRes
     ERRORS {
          DataMissing,
          UnexpectedDataValue}
```

-- any time information enquiry operations

```
AnyTimeInterrogation ::= OPERATION                                  --Timer m
     ARGUMENT
          anyTimeInterrogationArg        AnyTimeInterrogationArg
     RESULT
          anyTimeInterrogationRes        AnyTimeInterrogationRes
     ERRORS {
          SystemFailure,
          ATI-NotAllowed,
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

-- any time information handling operations

```
AnyTimeSubscriptionInterrogation ::= OPERATION                      --Timer m
     ARGUMENT
          anyTimeSubscriptionInterrogationArg  AnyTimeSubscriptionInterrogationArg
     RESULT
          anyTimeSubscriptionInterrogationRes  AnyTimeSubscriptionInterrogationRes
     ERRORS {
          ATSI-NotAllowed,
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber,
          BearerServiceNotProvisioned,
          TeleserviceNotProvisioned,
          CallBarred,
          IllegalSS-Operation,
          SS-NotAvailable,
          InformationNotAvailable}
```

```
AnyTimeModification ::= OPERATION                                    --Timer m
    ARGUMENT
        anyTimeModificationArg          AnyTimeModificationArg
    RESULT
        anyTimeModificationRes          AnyTimeModificationRes
    ERRORS {
        ATM-NotAllowed,
        DataMissing,
        UnexpectedDataValue,
        UnknownSubscriber,
        BearerServiceNotProvisioned,
        TeleserviceNotProvisioned,
        CallBarred,
        IllegalSS-Operation,
        SS-SubscriptionViolation,
        SS-ErrorStatus,
        SS-Incompatibility,
        InformationNotAvailable}
```

-- subscriber data modification notification operations

```
NoteSubscriberDataModified ::= OPERATION                             --Timer m
    ARGUMENT
        noteSubscriberDataModifiedArg   NoteSubscriberDataModifiedArg
    RESULT
        noteSubscriberDataModifiedRes   NoteSubscriberDataModifiedRes
            -- optional
    ERRORS {
        UnexpectedDataValue,
        UnknownSubscriber}
```

-- handover operations

```
PrepareHandover ::= OPERATION                                        --Timer m
    ARGUMENT
        prepareHO-Arg                   PrepareHO-Arg
    RESULT
        prepareHO-Res                   PrepareHO-Res
    ERRORS {
        SystemFailure,
        DataMissing,
        UnexpectedDataValue,
        NoHandoverNumberAvailable}
```

```
SendEndSignal ::= OPERATION                                          --Timer l
    ARGUMENT
        sendEndSignalArg                SendEndSignalArgbss-APDU          ExternalSignalInfo
    RESULT
        sendEndSignalRes                SendEndSignalRes
```

```
ProcessAccessSignalling ::= OPERATION                --Timer s
    ARGUMENT
        processAccessSignallingArg      ProcessAccessSignallingArgbss-APDUExternalSignalInfo
```

```
ForwardAccessSignalling ::= OPERATION                --Timer s
    ARGUMENT
        forwardAccessSignallingArg      ForwardAccessSignallingArgbss-APDUExternalSignalInfo
```

```
PrepareSubsequentHandover ::= OPERATION              --Timer m
    ARGUMENT
        prepareSubsequentHO-Arg         PrepareSubsequentHO-Arg
    RESULT
        prepareSubsequentHO-Res         PrepareSubsequentHO-Resbss-APDU   ExternalSignalInfo
    ERRORS {
        UnexpectedDataValue,
        DataMissing,
        UnknownMSC,
        SubsequentHandoverFailure}
```

Next Change

17.7 MAP constants and data types

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
   ForwardAccessSignallingArg,
   PrepareHO-Arg,
   PrepareHO-Res,
   PrepareSubsequentHO-Arg,
   PrepareSubsequentHO-Res,
   ProcessAccessSignallingArg,
   SendEndSignallingArg,
   SendEndSignallingRes,


   -- 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,
    AccessNetwork~~External~~SignalInfo,
    IMSI,
    TMSI,
    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.
     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

```
ForwardAccessSignallingArg ::= SEQUENCE {
    an-APDU                             AccessNetworkSignalInfo,
    extensionContainer                  [0]  ExtensionContainer             OPTIONAL,
    ...}
```

```
PrepareHO-Arg ::= [3] SEQUENCE {
    targetCellId                        [0] GlobalCellId                    OPTIONAL,
    ho-NumberNotRequired                NULL                                OPTIONAL,
    targetRNC-Id                        [1] RNC-Id                          OPTIONAL,
    an-APDU                             [2] AccessNetworkSignalInfo         OPTIONAL,
    multipleBearerRequested             NULL                                OPTIONAL,
    extensionContainer                  [3] ExtensionContainer              OPTIONAL,bss-APDU
    ExternalSignalInfo                  OPTIONAL,
    ...}
```

```
PrepareHO-Res ::= [3] SEQUENCE {
    handoverNumber                  [0]  ISDN-AddressString          OPTIONAL,
    relocationNumberList            [1]  RelocationNumberList        OPTIONAL,
    an-APDU                         [2]  AccessNetworkSignalInfo     OPTIONAL,
    multicallBearerInfo             [3]  MulticallBearerInfo         OPTIONAL,
    multipleBearerNotSupported      NULL                              OPTIONAL,
    extensionContainer              [4]  ExtensionContainer          OPTIONAL,bss-APDU
    ExternalSignalInfo              OPTIONAL,
    ...}
```

```
PrepareSubsequentHO-Arg ::= [3] SEQUENCE {
    targetCellId                    [0]  GlobalCellId,
    targetMSC-Number                [1]  ISDN-AddressString,
    targetRNC-Id                    [2] RNC-Id                        OPTIONAL,
    an-APDU                         [3]  AccessNetworkSignalInfo     OPTIONAL,
    extensionContainer              [4]  ExtensionContainer          OPTIONAL,bss-APDU
    ExternalSignalInfo,
    ...}
```

```
PrepareSubsequentHO-Res ::= SEQUENCE {
    an-APDU                         AccessNetworkSignalInfo,
    extensionContainer              [0]  ExtensionContainer          OPTIONAL,
    ...}
```

```
ProcessAccessSignallingArg ::= SEQUENCE {
    an-APDU                         AccessNetworkSignalInfo,
    extensionContainer              [0]  ExtensionContainer          OPTIONAL,
    ...}
```

```
SendEndSignalArg ::= SEQUENCE {
    an-APDU                         AccessNetworkSignalInfo,
    extensionContainer              [0]  ExtensionContainer          OPTIONAL,
    ...}
```

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

```
RNC-Id ::= OCTET STRING (SIZE (5))
    -- Refers to the Target RNC-ID in the Target ID in 3G TS 25.413.
    -- 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               RNC ID
```

```
RelocationNumberList ::= SEQUENCE SIZE (1..maxNumOfRelocationNumber) OF
                                    RelocationNumber
```

```
MulticallBearerInfo ::= INTEGER (1..maxNumOfRelocationNumber)
```

```
RelocationNumber ::= SEQUENCE {
    handoverNumber                  ISDN-AddressString,
    rab-Id                          RAB-Id,
    -- RAB Identity is needed to relate the calls with the radio access bearers.
    ...}
```

```
RAB-Id ::= INTEGER (1..maxNrOfRABs)
```

```
maxNrOfRABs INTEGER ::= 256
```

```
maxNumOfRelocationNumber  INTEGER ::= 7
```

Next Change

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,
   AccessNetworkSignalInfo,
   SignalInfo,
   maxSignalInfoLength,
   AlertingPattern,

   -- data types for numbering and identification
   IMSI,
   TMSI,
   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.
```

```
AccessNetworkSignalInfo ::= SEQUENCE {
     accessNetworkProtocolId              AccessNetworkProtocolId,
     signalInfo                           SignalInfo,
     -- Information about the internal structure is given in
     -- subclause 7.6.9.4
     extensionContainer                   [0] ExtensionContainer              OPTIONAL,
     ...}
```

```
AccessNetworkProtocolId ::= ENUMERATED {
     gsm-0806   (1),
     ts3G-25413 (2),
     ...}
     -- exception handling:
     -- For AccessNetworkSignalInfo sequences containing this parameter with any
     -- other value than the ones listed the receiver shall ignore the whole
     -- AccessNetworkSignalInfo sequence.
```

Next Change

19.2 Handover procedure

It should be noted that procedures related to the B-interface have not been updated for Release 99. The B-interface is not fully operational specified. It is strongly recommended not to implement the B-interface as an external interface.

19.2.1 General

The handover or relocation between different MSCs is called Inter-MSC handover. The interfaces involved for Inter-MSC handover are shown in figure 19.2/1. Following two Inter-MSC handover procedures apply:

1) Basic Inter-MSC handover:

   The call is handed over from the controlling MSC, called MSC-A to another MSC, called MSC-B (figure 19.2/1a).

   Figure 19.2/2 shows a successful handover between MSC-A and MSC-B including a request for handover number allocation by MSC-B to VLR-B.

2) Subsequent Inter-MSC handover:

   After the call has been handed over from MSC-A to MSC-B, a handover to either MSC-A (figure 19.2/1a) or to a third MSC (MSC-B') (figure 19.2/1b) is necessary in order to continue the connection.

Figure 19.2/1: Interface structure for handover

The MAP handover procedures achieve the functionality required to set up an MSC-MSC dialogue, to optionally allocate a handover number or one or several relocation numbers and to transport BSSAP or RANAP messages.

The transported BSSAP or RANAP messages are controlled and handled by the Handover Control Application in the MSCs. This information will be transparent to the MAP protocol. If the MSC receives via the MAP protocol BSSAP or RANAP messages, this information will be forwarded to the Handover Control Application (shown in the handover SDL diagrams with the internal HO_CA signalling, it is an internal process in the MSC) and vice versa if the Handover Control Application requires the sending of BSSAP or RANAP messages via the MAP protocol.

For detailed interworking between the A-interface and MAP procedures or the Iu-interface and MAP procedures, see ~~GSM~~3G TS ~~0~~2~~3~~.0~~0~~9 and ~~GSM~~ 3G TS 2~~0~~9.0~~1~~0.

NOTE: This can be sent at any time after the connection between MSC-A and MSC-B is established.

Figure 19.2/2: Example of a successful basic handover procedure to MSC-B

NOTE: This can be sent at any time after the connection between MSC-A and MSC-B is established.

Figure 19.2/3: Example of a handover towards a third MSC

19.2.2 Handover procedure in MSC-A

This subclause describes the handover or relocation procedure in MSC-A, including the request for a basic handover or relocation to another MSC (MSC-B), subsequent handover or relocation to a third MSC (MSC-B') or back to the controlling MSC (MSC-A).

19.2.2.1 Basic handover

When MSC-A has decided that a call has to be handed over or relocated to MSC-B, the Handover Control Application in MSC-A requests the MAP application to initiate the MAP_PREPARE_HANDOVER request to MSC-B.

MSC-A opens the dialogue to MSC-B with a MAP_OPEN request containing no user specific parameters and sends a MAP_PREPARE_HANDOVER request. This request may optionally contain an indication that a handover number allocation is not required, targetCellId, for compatibility reasons if handover, and all information required by MSC-B to allocate the necessary radio resources.

If MSC-B accepts the dialogue, it returns a MAP_PREPARE_HANDOVER confirmation containing a handover number or one or several relocation numbers, unless the request has included the HO-NumberNotRequired parameter, and BSSAP or RANAP information which is forwarded to and handled by the Handover Control Application in MSC-A.

Optionally MSC-A can receive, after a MAP_PREPARE_HANDOVER confirmation, a MAP_PROCESS_ACCESS_SIGNALLING indication containing BSSAP or RANAP information.

When the connection has been established between the MS and MSC-B, MSC-A will be informed by a MAP_SEND_END_SIGNAL indication.

When MSC-A wants to clear the connection with BSS-B, an indication from the Handover Control Application is received in the Map Application to send the MAP_SEND_END-SIGNAL response to MSC-B to close the MAP dialogue.

MSC-A may abort the handover or relocation procedure at any time (e.g. if the call is cleared).

19.2.2.2 Handling of access signalling

If required, the Handover Control Application in MSC-A requests the MAP application to invoke the MAP_FORWARD_ACCESS_SIGNALLING request containing the information to be transferred to the A-interface or the Iu-interface of MSC-B (e.g. call control information).

MAP_FORWARD_ACCESS_SIGNALLING is a non-confirmed service.

MSC-B will then forward the required information to the Handover Control Application. The MAP_FORWARD_ACCESS_SIGNALLING is composed in such a way that the information can be passed transparently to the A-interface or the Iu-interface for call control and mobility management information. Any response received in MSC-B from the A-interface or the Iu-interface that should be brought to MSC-A will require a new independent request from the Handover Control Application in MSC-B to MSC-A by invoking a MAP_PROCESS_ACCESS_SIGNALLING request.

19.2.2.3 Other procedures in stable handover situation

During a call and after handover or relocation, a number of procedures between MSC-A and BSS-B or RNS-B controlled by or reported to MSC-A may be initiated in both directions by invoking a MAP_FORWARD_ACCESS_SIGNALLING request and reception of a MAP_PROCESS_ACCESS_SIGNALLING indication.

19.2.2.4 Subsequent handover

When MSC-A receives a MAP_PREPARE_SUBSEQUENT_HANDOVER request, it will start the procedure of handing or relocate the call over to a third MSC (MSC-B'), or back to the controlling MSC (MSC-A). If the new handover or relocation procedure towards MSC-B' or MSC-A is successful, the handover control application in MSC-A will request the release of the dialogue towards MSC-B by sending the MAP_SEND_END_SIGNAL confirmation.

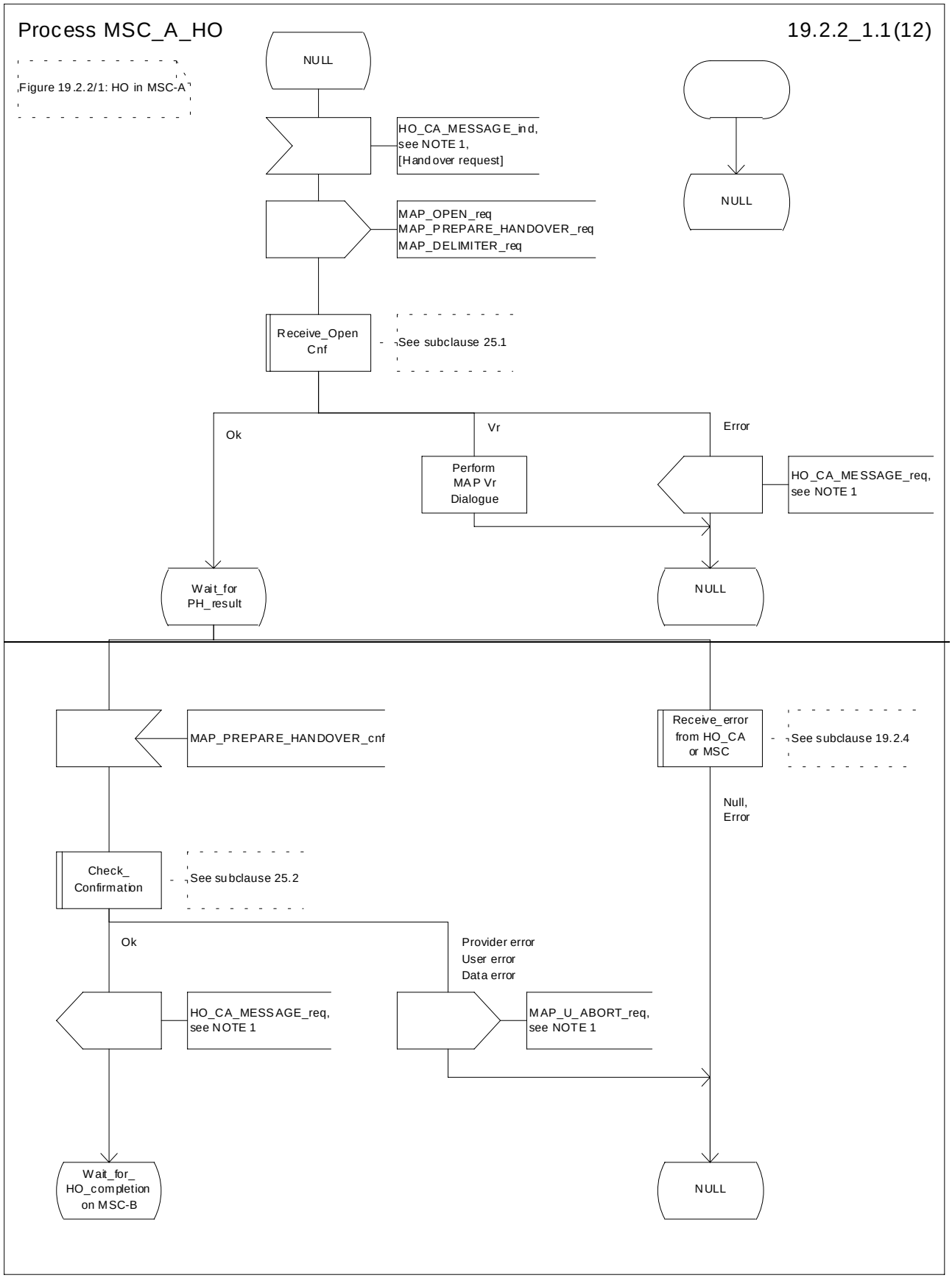
19.2.2.5 SDL Diagrams

The SDL diagrams on the following pages describe the user processes in MSC-A for the procedures described in this subclause.

The services used are defined in subclause 8.4.

NOTE: The message primitives HO_CA_MESSAGE used in the SDL-Diagrams are used to show the internal co-ordination between the MAP application and the Handover Control Application. For a detailed description of the co-ordination between the applications for the handover or relocation procedure, see ~~GSM~~ 3G TS ~~0~~2.0.09.

Note that in case of reception of errors from the MSCs (see the Handover error handling macro), the MAP user reports them to the Handover Control Application and does not take any action except in cases explicitly mentioned in the SDL diagrams.



~~Figure 19.2.2/1 (sheet 1 of 12): Process MSC_A_HO~~

Figure 19.2 2/1: HO in MSC-A

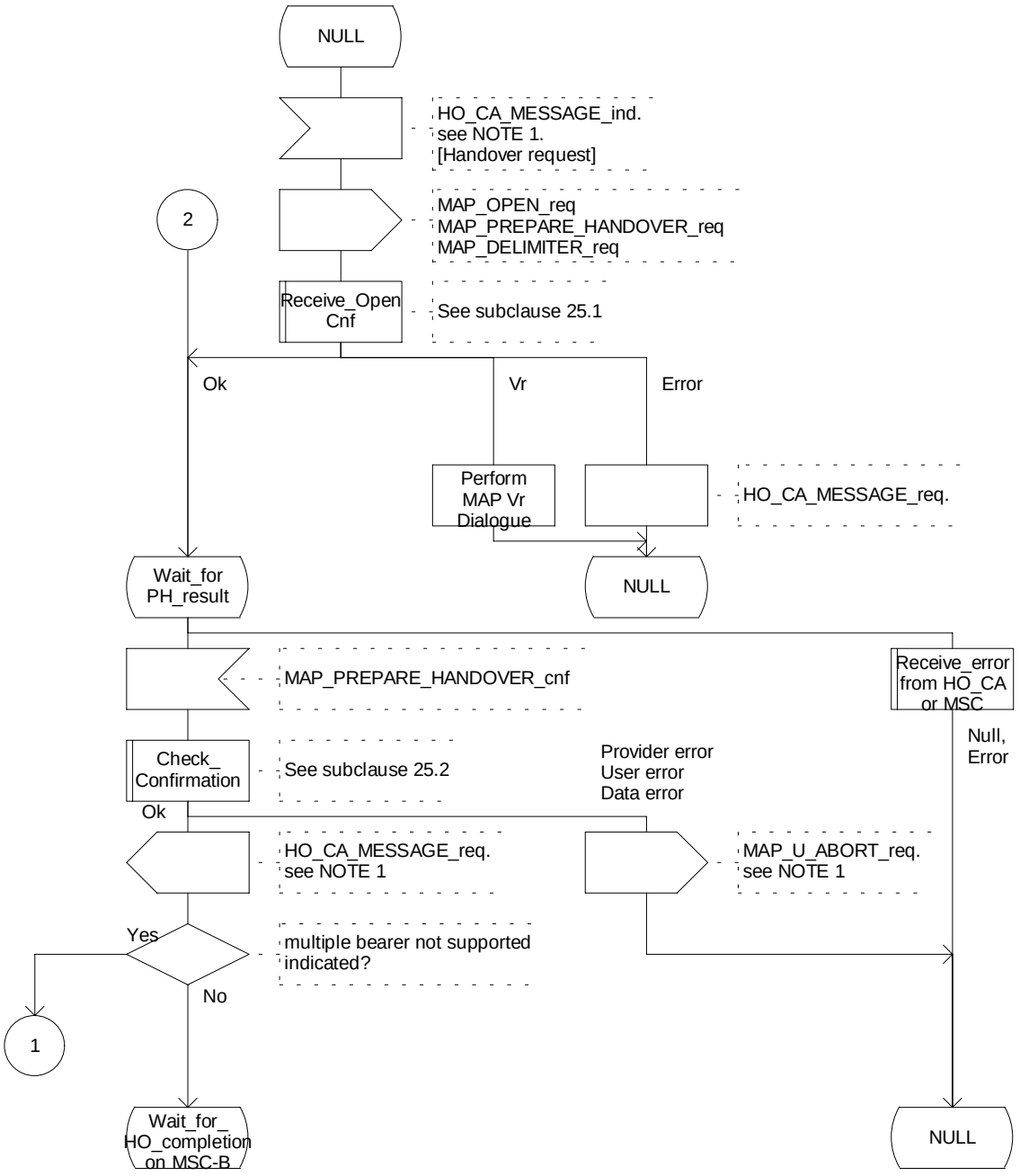


Figure 19.2.2/1 (sheet 1 of 13): Process MSC_A_HO

Figure 19.2 2/1: HO in MSC-A

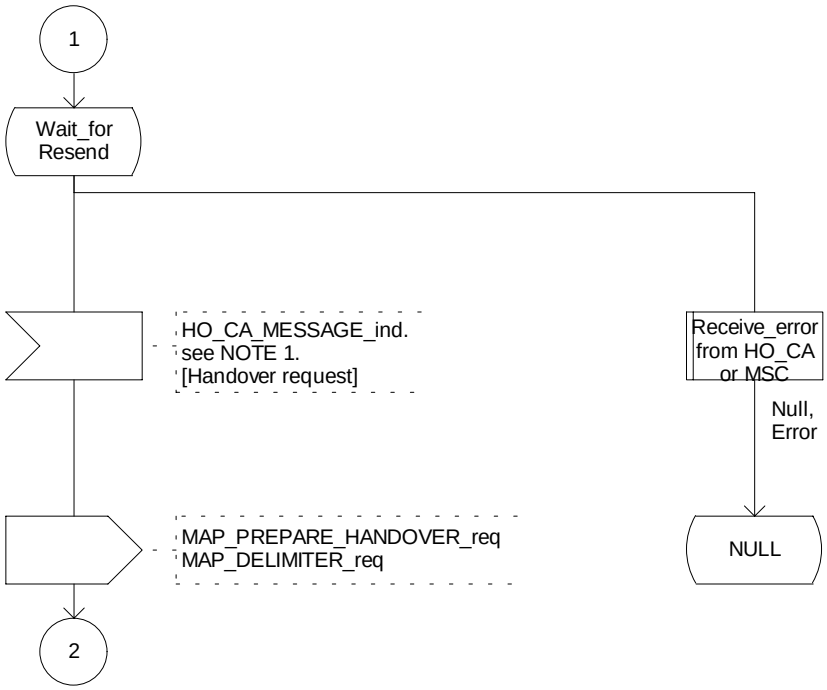


Figure 19.2.2/1 (sheet 2 of 13): Process MSC_A_HO

[Editor's note: not modifed as Figure 19.2.2/1 (sheet 3 of 13): Process MSC_A_HO]

Figure 19.2.2/1 (sheet 2 of 12): Process MSC_A_HO

[Editor’s note: not modifed as Figure 19.2.2/1 (sheet 4 of 13): Process MSC_A_HO]

Figure 19.2.2/1 (sheet 3 of 12): Process MSC_A_HO

[Editor’s note: not modifed as Figure 19.2.2/1 (sheet 5 of 13): Process MSC_A_HO]

Figure 19.2.2/1 (sheet 4 of 12): Process MSC_A_HO

[Editor’s note: not modifed as Figure 19.2.2/1 (sheet 6 of 13): Process MSC_A_HO]

Figure 19.2.2/1 (sheet 5 of 12): Process MSC_A_HO

[Editor’s note: not modifed as Figure 19.2.2/1 (sheet 7 of 13): Process MSC_A_HO]

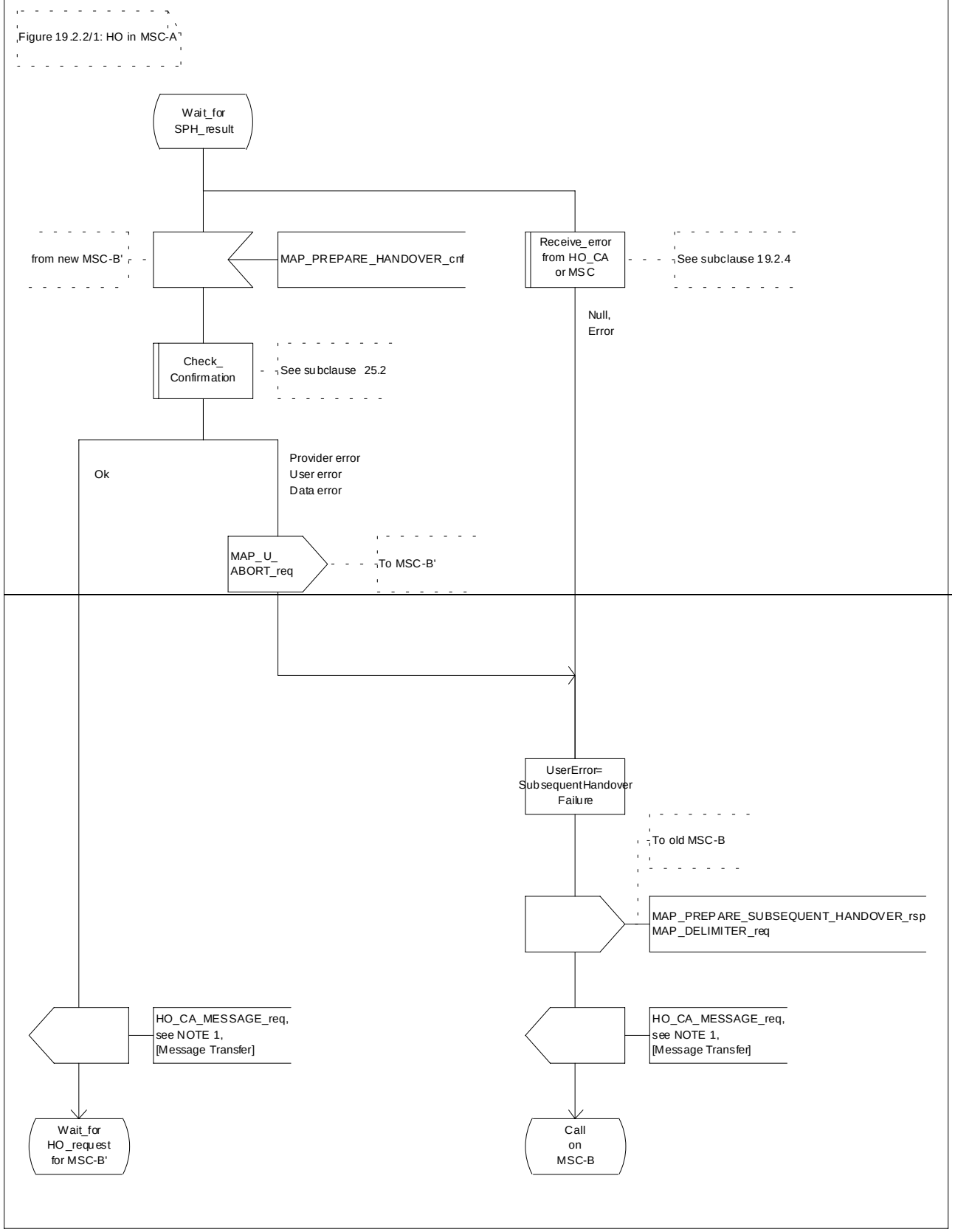
Figure 19.2.2/1 (sheet 6 of 12): Process MSC_A_HO

[Editor’s note: not modifed as Figure 19.2.2/1 (sheet 8 of 13): Process MSC_A_HO]

Figure 19.2.2/1 (sheet 7 of 12): Process MSC_A_HO

[Editor’s note: not modifed as Figure 19.2.2/1 (sheet 9 of 13): Process MSC_A_HO]

Figure 19.2.2/1 (sheet 8 of 12): Process MSC_A_HO



~~Figure 19.2.2/1 (sheet 9 of 12): Process MSC_A_HO~~

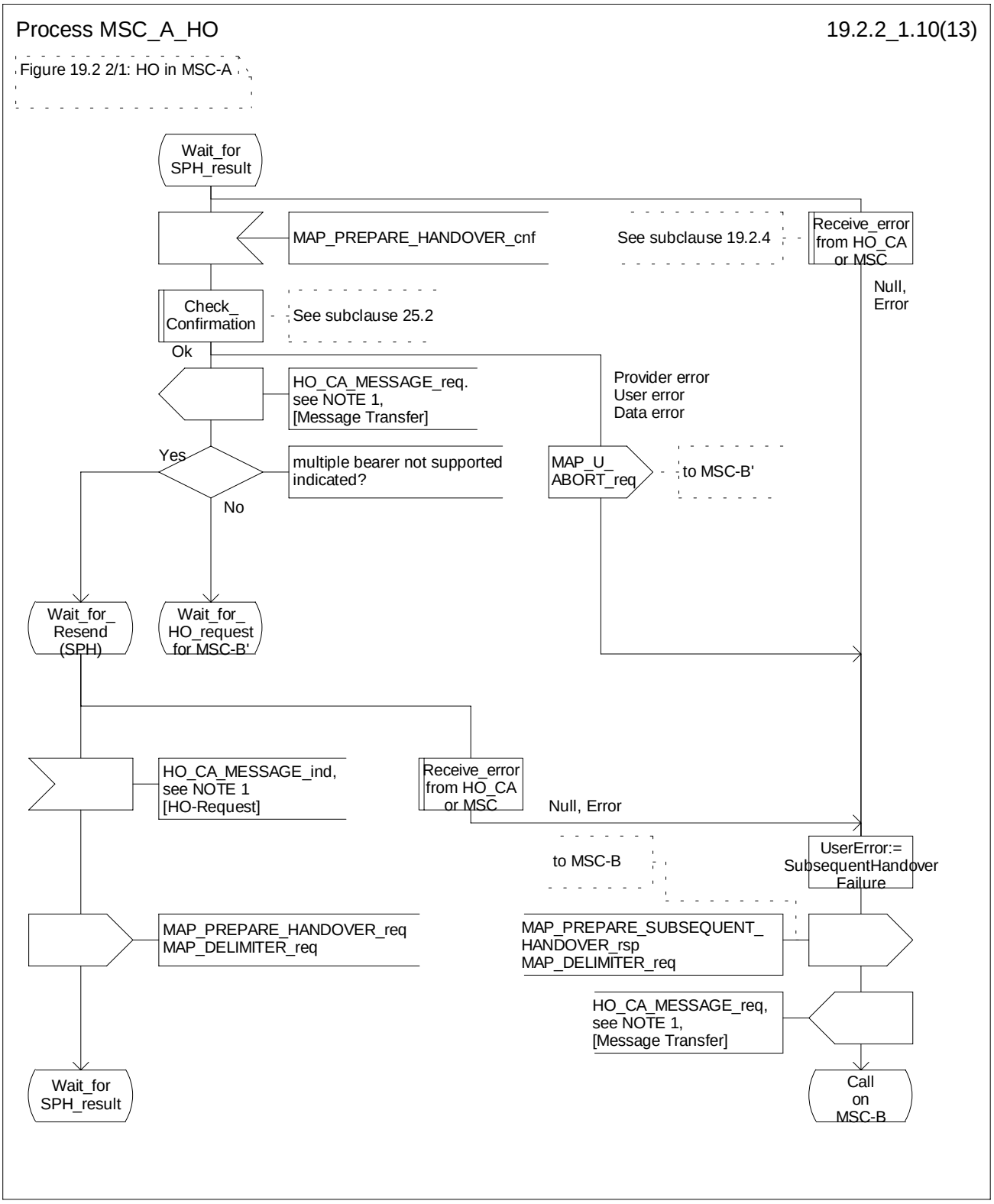


Figure 19.2.2/1 (sheet 10 of 13): Process MSC_A_HO

[Editor's note: not modifed as Figure 19.2.2/1 (sheet 11 of 13): Process MSC_A_HO]

Figure 19.2.2/1 (sheet 10 of 12): Process MSC_A_HO

[Editor's note: not modifed as Figure 19.2.2/1 (sheet 12 of 13): Process MSC_A_HO]

Figure 19.2.2/1 (sheet 11 of 12): Process MSC_A_HO

[Editor's note: not modifed as Figure 19.2.2/1 (sheet 13 of 13): Process MSC_A_HO]

Figure 19.2.2/1 (sheet 12 of 12): Process MSC_A_HO

19.2.3 Handover procedure in MSC-B

This subclause describes the handover or relocation procedure in MSC-B, including the request for a handover or relocation from another MSC (MSC-A), subsequent handover or relocation to a third MSC (MSC-B') or back to the controlling MSC (MSC-A).

19.2.3.1 Basic handover

Opening of the dialogue is described in the macro Receive_Open_Ind in subclause 25.1.

When MSC-B process receives a MAP_PREPARE_HANDOVER indication from MSC-A, MSC-B requests its associated VLR to provide a handover number, unless the parameter HO-NumberNotRequired is received in the indication.

When the connection between the MS and MSC-B is established on MSC-B, the Handover Control Application will request the MAP application to indicate this event to MSC-A by invoking the MAP_SEND_END_SIGNAL request. When a call is released, MSC-A will inform MSC-B by MAP_SEND_END_SIGNAL response and the MAP dialogue between MSC-A and MSC-B is closed.

19.2.3.2 Allocation of handover number

When a handover number is required, a MAP_ALLOCATE_HANDOVER_NUMBER request will be sent to the VLR. The handover number is received in the MAP_SEND_HANDOVER_REPORT request, and will be included in the MAP_PREPARE_HANDOVER response to MSC-A.

When relocation numbers are required, one or several MAP_ALLOCATE_HANDOVER_NUMBER requests will be sent to the VLR. Each relocation number is received in a MAP_SEND_HANDOVER_REPORT request, and the collected relocation numbers will be included in the MAP_PREPARE_HANDOVER response to MSC-A.

As soon as the call from MSC-A using the handover number arrives in MSC-B, MSC-B shall release the handover number in the VLR using the MAP_SEND_HANDOVER_REPORT response.

As soon as a call from MSC-A using a relocation number arrives in MSC-B, MSC-B shall release the relocation number in the VLR using the MAP_SEND_HANDOVER_REPORT response.

19.2.3.3 Handling of access signalling

If required by the Handover Control Application, MSC-B invokes the MAP_PROCESS_ACCESS_SIGNALLING request containing the information received on the A-interface or the Iu-interface that should be transferred to MSC-A (e.g. call control information).

MAP_PROCESS_ACCESS_SIGNALLING is a non-confirmed service and any response from MSC-A will require a MAP_FORWARD_ACCESS_SIGNALLING request.

19.2.3.4 Other procedures in stable handover situation

During a call and after handover or relocation, a number of procedures between MSC-A and BSS-B or RNS-B controlled by or reported to MSC-A may be initiated by involving access signalling transfer in both directions.

19.2.3.5 Subsequent handover

The procedure is used when the Handover Control Application in MSC-B has decided that a call is to be handed over or relocated to another MSC (either back to the controlling MSC (MSC-A) or to a third MSC (MSC-B')).

After the MAP_PREPARE_SUBSEQUENT_HANDOVER response is received from MSC-A, MSC-B will await the disconnection of the call. Once the disconnect is complete, MSC-B will inform its VLR by invoking the MAP_SEND_HANDOVER_REPORT confirmation. VLR-B will then release the allocated handover number.

The subsequent handover procedure is shown in figure 19.2/3.

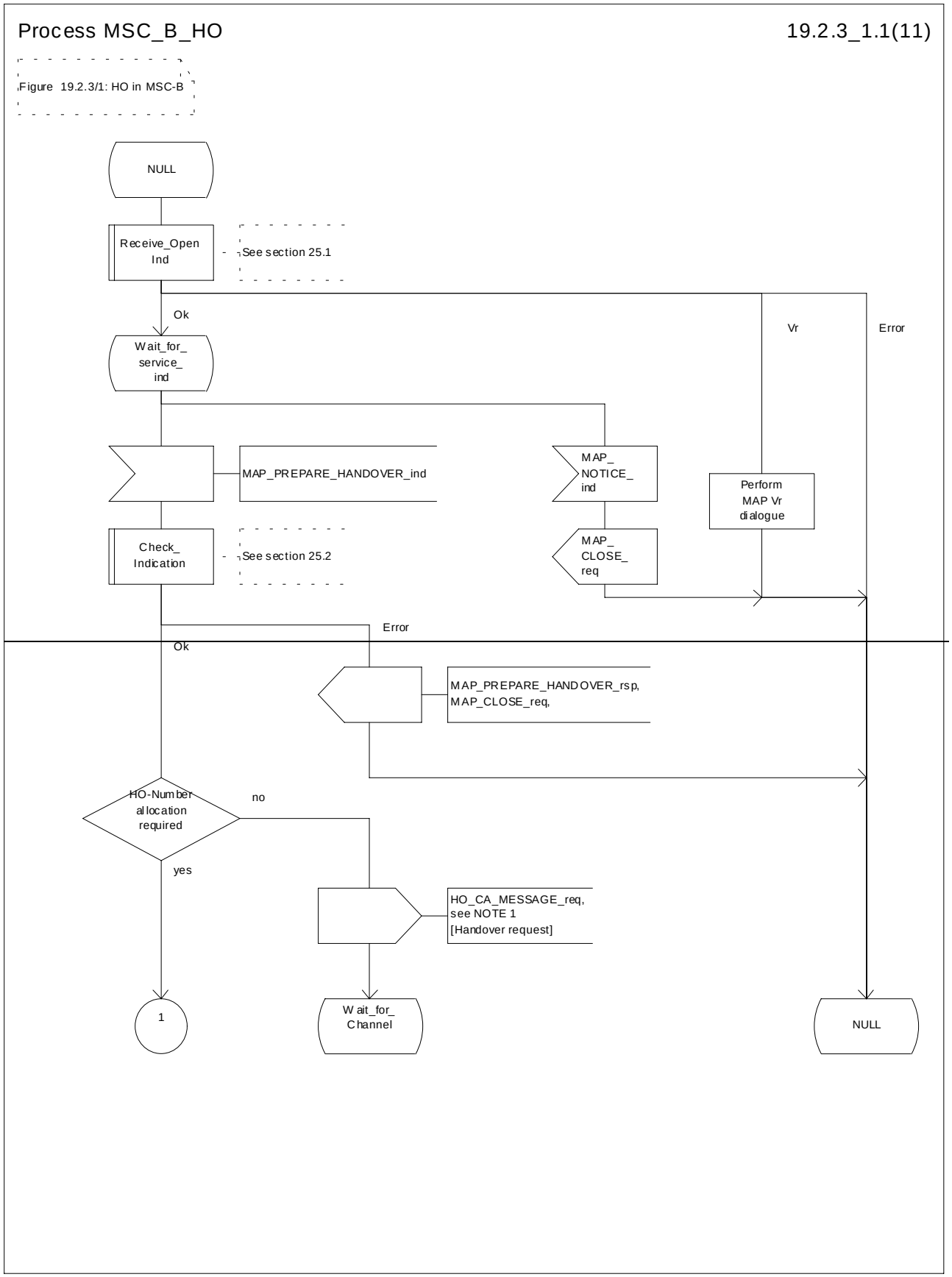
19.2.3.6 SDL Diagrams

The SDL diagrams on the following pages describe the user process in MSC-B for the procedures described in this subclause.

The services used are defined in subclause 8.4.

NOTE 1: The message primitives HO_CA_MESSAGE in the SDL-diagrams are used to show the internal co-ordination between the MAP application and the Handover Control Application. For a detailed description of the co-ordination between the applications for the handover procedure, see ~~GSM~~ 3G TS ~~0~~2.0.09.

NOTE 2: The order in the SDL diagrams to allocate first the handover number and then the radio resources is not binding.



~~Figure 19.2.3/1 (sheet 1 of 11): Process MSC_B_HO~~

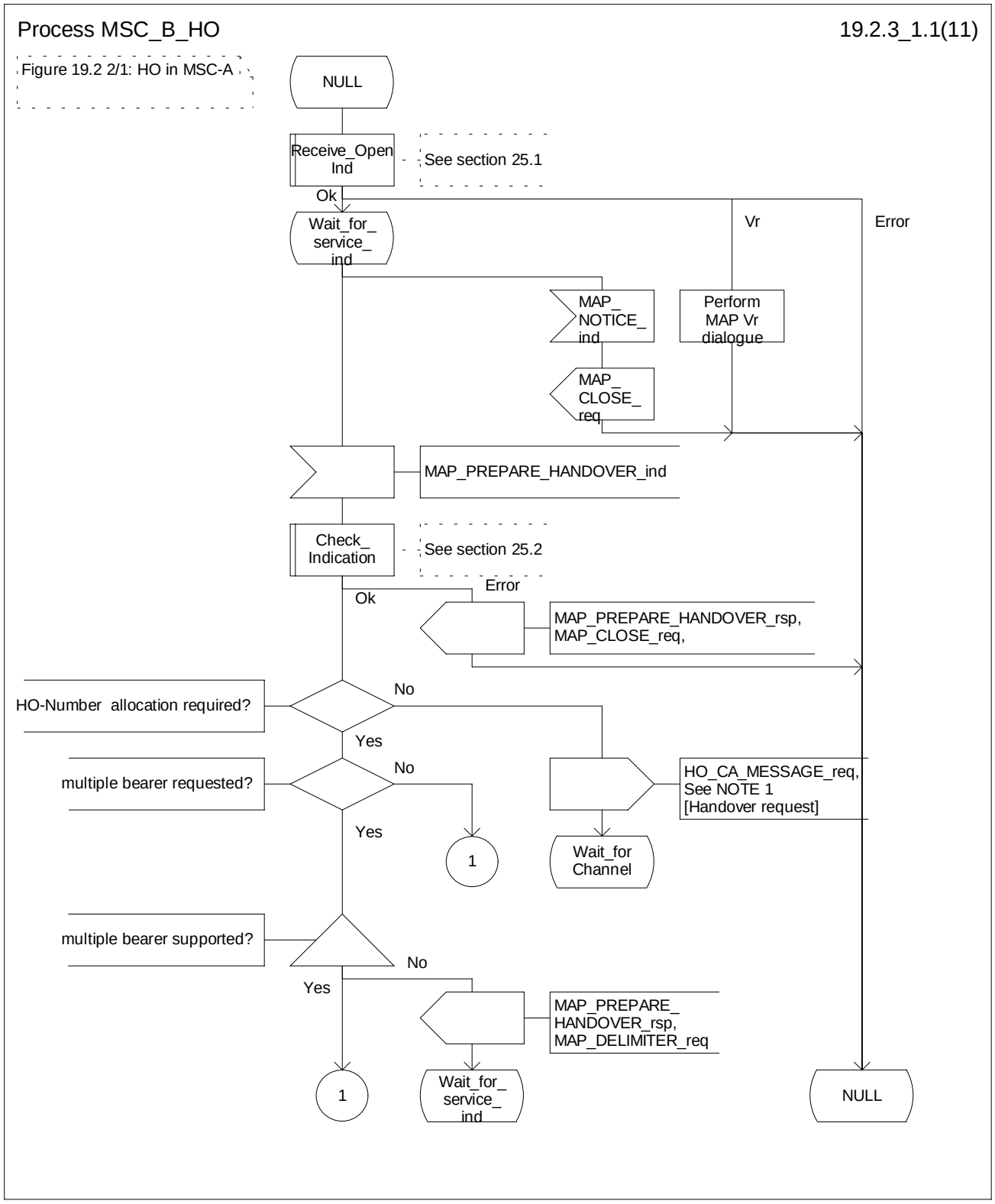


Figure 19.2.3/1 (sheet 1 of 11): Process MSC_B_HO

[Omitted]

19.2.4 Handover error handling macro

This macro is used for the handover procedures to receive errors from the MSCs and from the Handover Control Application at any state of a handover process.

If a MAP_NOTICE indication is received, the Handover Control Application is informed and the actual situation is kept and the Handover Control Application decides how the handover or relocation process should continue. In all other cases the MSC is returned to a "NULL" state.

Tdoc 3GPP ***N2B000380***

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	102r2	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:	CN#07	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic	X	

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: N2 **Date:** 16/02/2000

Subject: Clarification on Authentication Info Retrieval

Work item: Security

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

F	Correction	X
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
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:
To clarify the use of the Immediate Response Preferred Indicator in Send Authentication Info.
To clarify the use of the parameter "Number of requested vectors" in Send Authentification Info and Send Identification.
To clarify that the HLR returns triplets for GSM subscribers and quintuplets for UMTS subscribers.

Clauses affected: 8.1.4, 8.5.2, 17.7.1, 25.5.5

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.

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 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(=)
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.
Number of requested vectors
A number indicating how many authentication vectors the new VLR is prepared to receive. The previous VLR shall not return more vectors than indicated by this parameter.
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.

.....

8.5.2 MAP_SEND_AUTHENTICATION_INFO service

8.5.2.1 Definition

This service is used between the VLR and the HLR for the VLR to retrieve authentication information from the HLR. The VLR requests up to five authentication vectors.
Also this service is used between the SGSN and the HLR for the SGSN to retrieve authentication information from the HLR. The SGSN requests up to five authentication vectors.
If the user is a UMTS subscriber, the HLR shall return authentication quintuplets. If the user is a GSM subscriber, the HLR shall return authentication triplets.

If the HLR cannot provide the VLR or the SGSN with triplets, an empty response is returned. The VLR or the SGSN may then re-use old authentication triplets, except where this is forbidden under the conditions specified in GSM 03.20 [24].
If the HLR cannot provide the VLR or the SGSN with quintuplets, an empty response is returned. The VLR or the SGSN shall not re-use old authentication quintuplets.
If the VLR or SGSN receives a MAP-SENDend_AUTHENTICATION_INFO response containing a User Error parameter as part of the handling of an authentication procedure, the authentication procedure in the VLR or SGSN shall fail.
Security related network functions are further described in GSM 03.20 and 3GPP TS 33.102.
The service is a confirmed service and consists of four service primitives.

8.5.2.2 Service primitives

The service primitives are shown in table 8.5/2.

Table 8.5/2: MAP_SEND_AUTHENTICATION_INFOPARAMETERS parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
Number of requested vectors	M	M(=)		
Re-synchronisation Info	C	C(=)		
Segmentation prohibited indicator	C	C (=)		
Immediate response preferred indicator	UC	C (=)		
AuthenticationSetList			C	C(=)
User error			C	C(=)
Provider error				O

8.5.2.3 Parameter use

Invoke id
See subclause 7.6.1 for the use of this parameter.
IMSI
See subclause 7.6.2 for the use of this parameter.
Number of requested vectors
A number indicating how many authentication vectors the VLR or SGSN is prepared to receive. The HLR shall not return more vectors than indicated by this parameter.
Re-synchronisation Info
For definition and use of this parameter see 3G TS 33.102.
Segmentation prohibited indicator
This parameter indicates if the VLR or SGSN allows message segmentation.

Immediate response preferred indicator

This parameter indicates that one of the requested authentication vectors is requested for immediate use in the VLR or SGSN requests that the HLR immediately sends back the available authentication vectors. It may be used by the HLR together with the number of requested vectors and the number of vectors stored in the HLR to determine the number of vectors to be obtained from the AuC. It shall be ignored if the number of available vectors is lessgreater than the number of requested vectors and if the VLR or SGSN or the HLR does not support message segmentation.

AuthenticationSetList
A set of one to five authentication vectors are transferred from the HLR to the VLR or from the HLR to the SGSN, if the outcome of the service was successful.
User error
One of the following error causes defined in subclause 7.6.1 shall be sent by the user in case of unsuccessful outcome of the service, depending on the respective failure reason:

- unknown subscriber;
- unexpected data value;
- system failure;

- data missing.

Provider error
See subclause 7.6.1 for the use of this parameter.

17.7.1 Mobile Service data types

.....

```
SendIdentificationArg ::= SEQUENCE {
     tmsi                              TMSI,
     numberOfRequestedVectors          NumberOfRequestedVectors          OPTIONAL,
     -- if segmentation is used, numberOfRequestedVectors shall be present in
     -- the first segment and shall not be present in subsequent segments. If received
     -- in a subsequent segment it shall be discarded.
     segmentationProhibited            NULL                              OPTIONAL,
     -- if segmentation is prohibited the previous VLR shall not send the result
     -- within a TC-CONTINUE message.
     extensionContainer                ExtensionContainer                OPTIONAL,
     ...}
```

.....

```
SendAuthenticationInfoArg ::= SEQUENCE {
     imsi                              [0] IMSI,
     numberOfRequestedVectors          NumberOfRequestedVectors          OPTIONAL,
     -- if segmentation is used, numberOfRequestedVectors shall be present in
     -- the first segment and shall not be present in subsequent segments. If received
     -- in a subsequent segment it shall be discarded.
     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).
     -- if segmentation is used, immediateResponsePreferred shall not be present in
     -- subsequent segments. If received in a subsequent segment it shall be discarded.
     re-synchronisationInfo            Re-synchronisationInfo            OPTIONAL,
     extensionContainer                [2] ExtensionContainer            OPTIONAL,
     ...}
```

.....

25.5.5 Process Obtain_Auth_Sets_HLR

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

- reversion to version one or two procedure;
- procedure termination; or
- dialogue acceptance, with proceeding as below.

This process is used by the HLR to obtain authentication vectors from the AuC, upon request from the VLR or from the SGSN. The process acts as follows:

- a MAP_SEND_AUTHENTICATION_INFO indication is received by the HLR;
- the HLR checks the service indication for errors. If any, they are reported to the VLR or to the SGSN in the MAP_SEND_AUTHENTICATION_INFO response. If no errors are detected, authentication vectors are fetched from the AuC. Further details are found in GSM 03.20;
- if errors are detected they are reported to the VLR or to the SGSN in the MAP_SEND_AUTHENTICATION_INFO response. Otherwise the authentication vectors are returned.

- if segmentation of the response message is required and allowed, a MAP_SEND_AUTHENTICATION_INFO_response, containing at least one authentication vector, followed by a MAP_DELIMITER_request is returned to the VLR or SGSN, the remaining authentication vectors are stored and the HLR waits for a new service indication from the VLR or SGSN.

The process is described in figure 25.5/5.

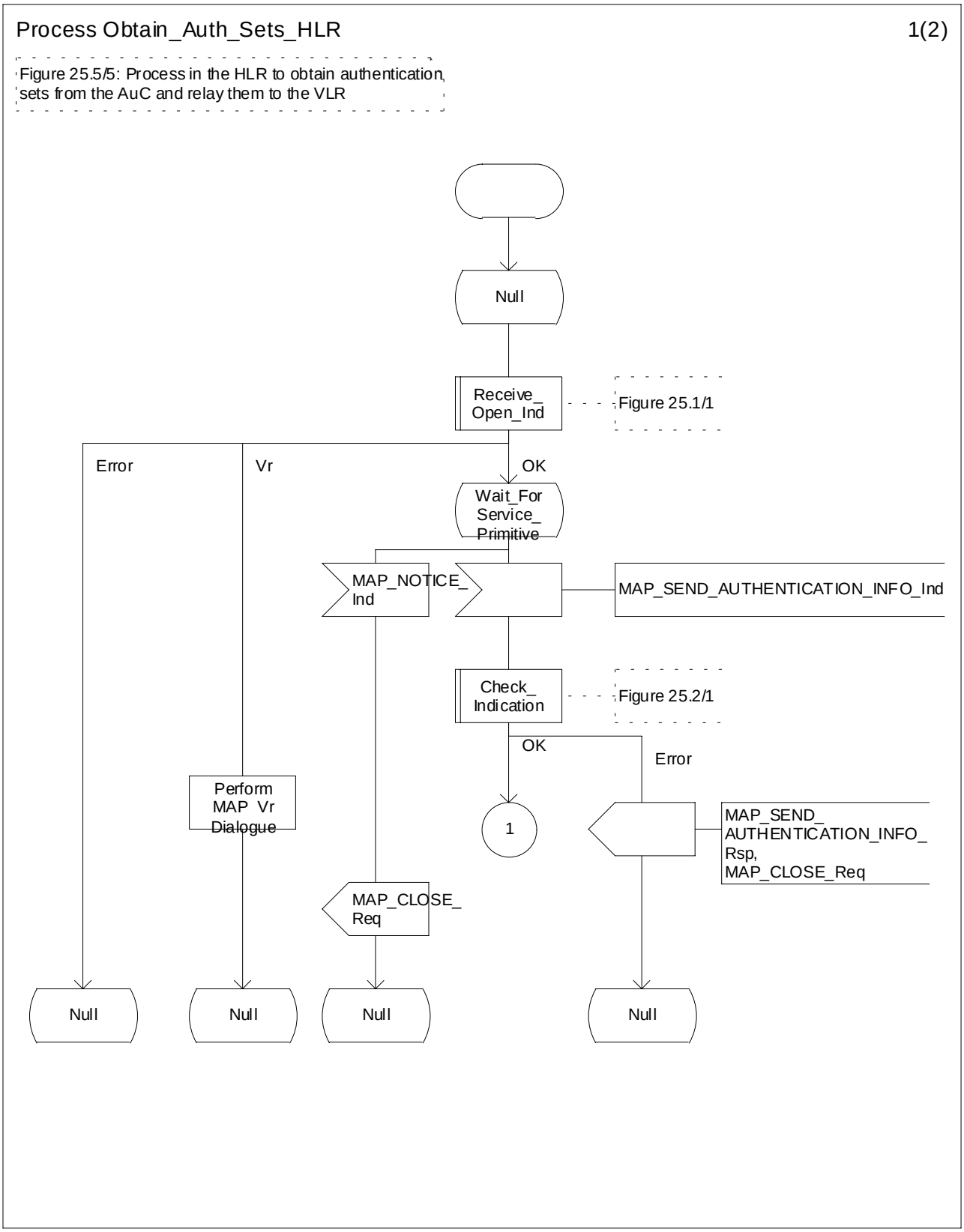
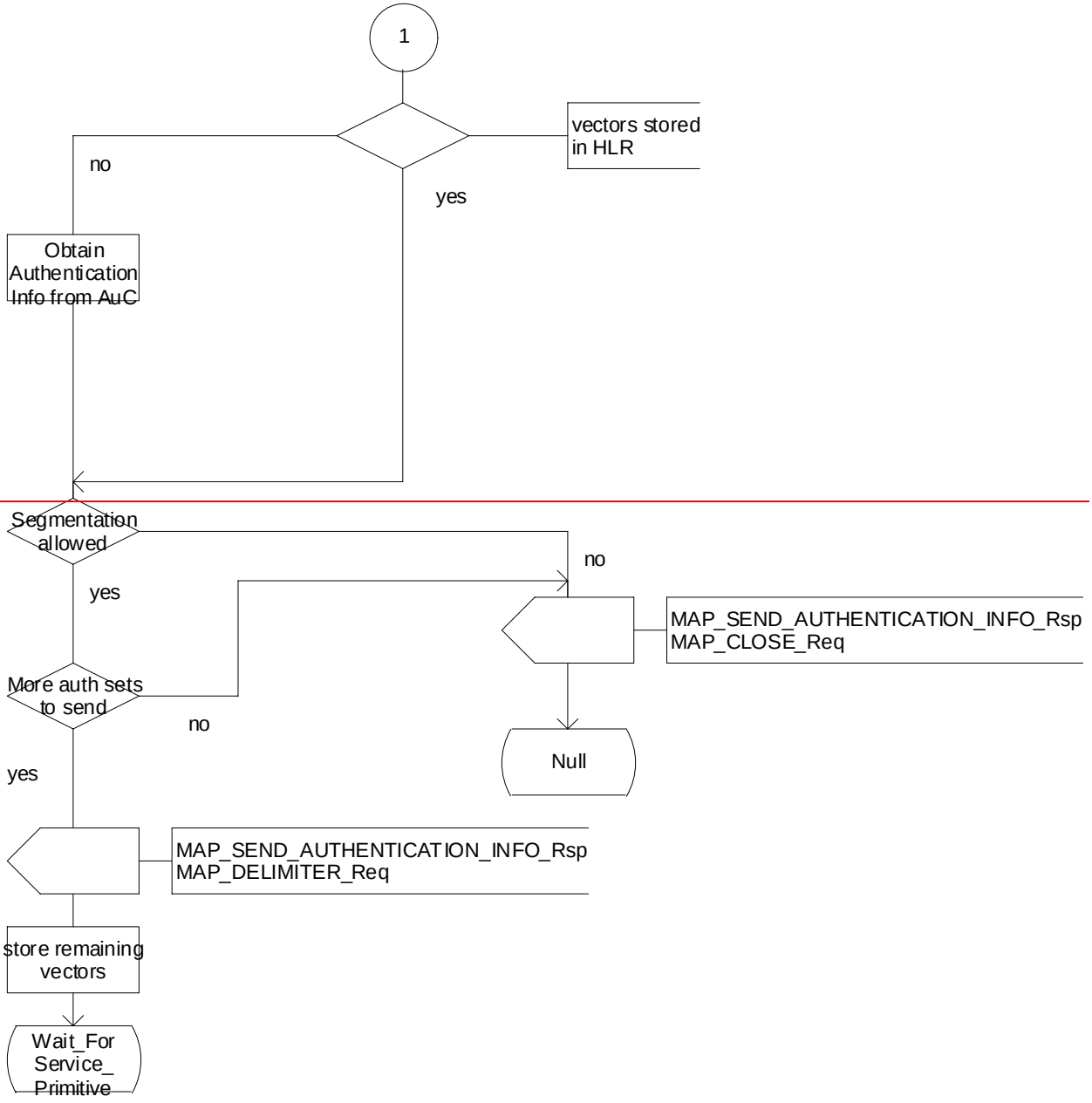


Figure 25.5/5 (sheet 1 of 2): Process Obtain_Auth_Sets_HLR

Figure 25.5/5: Process in the HLR to obtain authentication sets from the AuC and relay them to the VLR



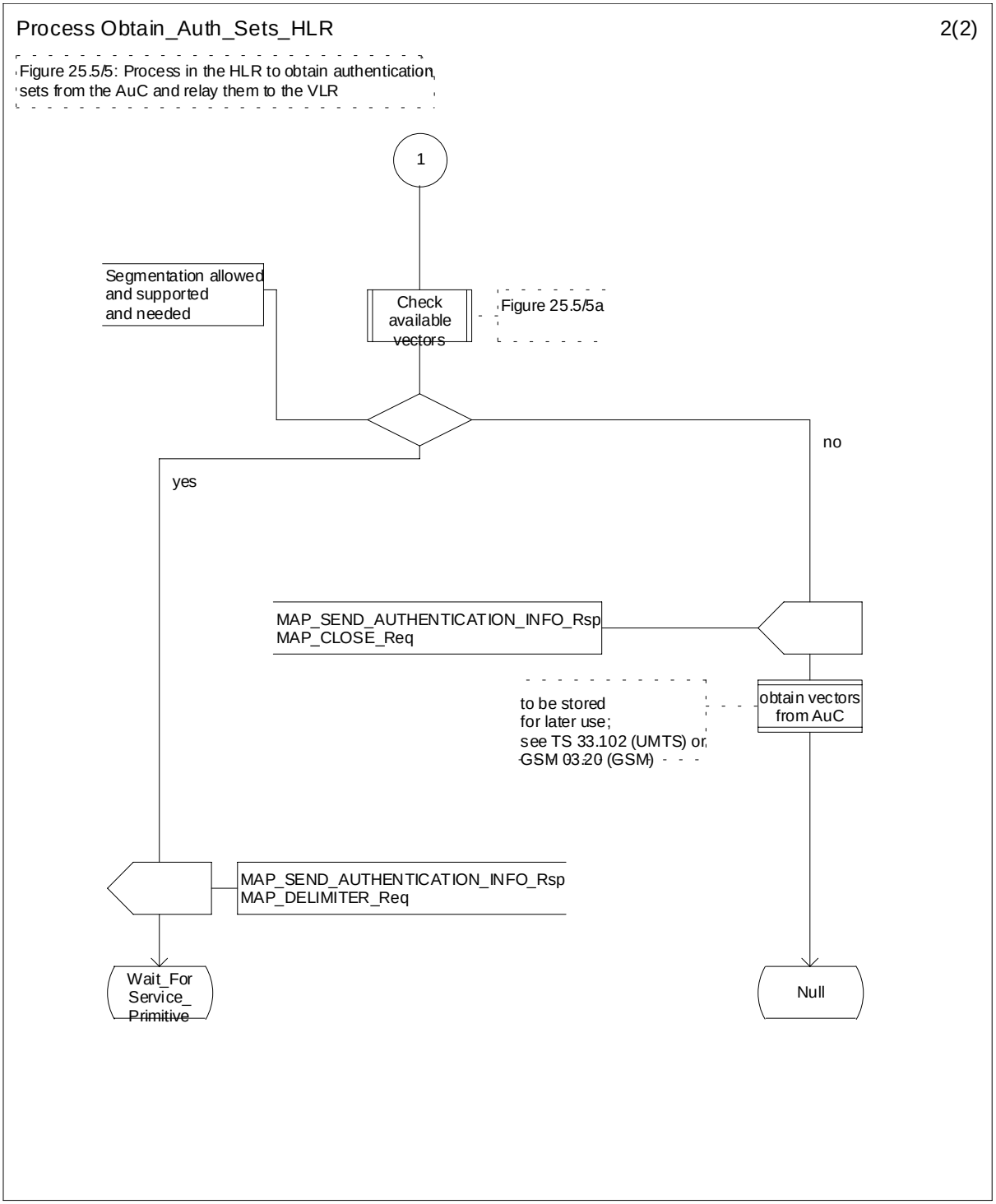


Figure 25.5/5 (sheet 2 of 2): Process Obtain_Auth_Sets_HLR

Procedure Check_Available_Vectors 1(1

Figure 25.5/5a

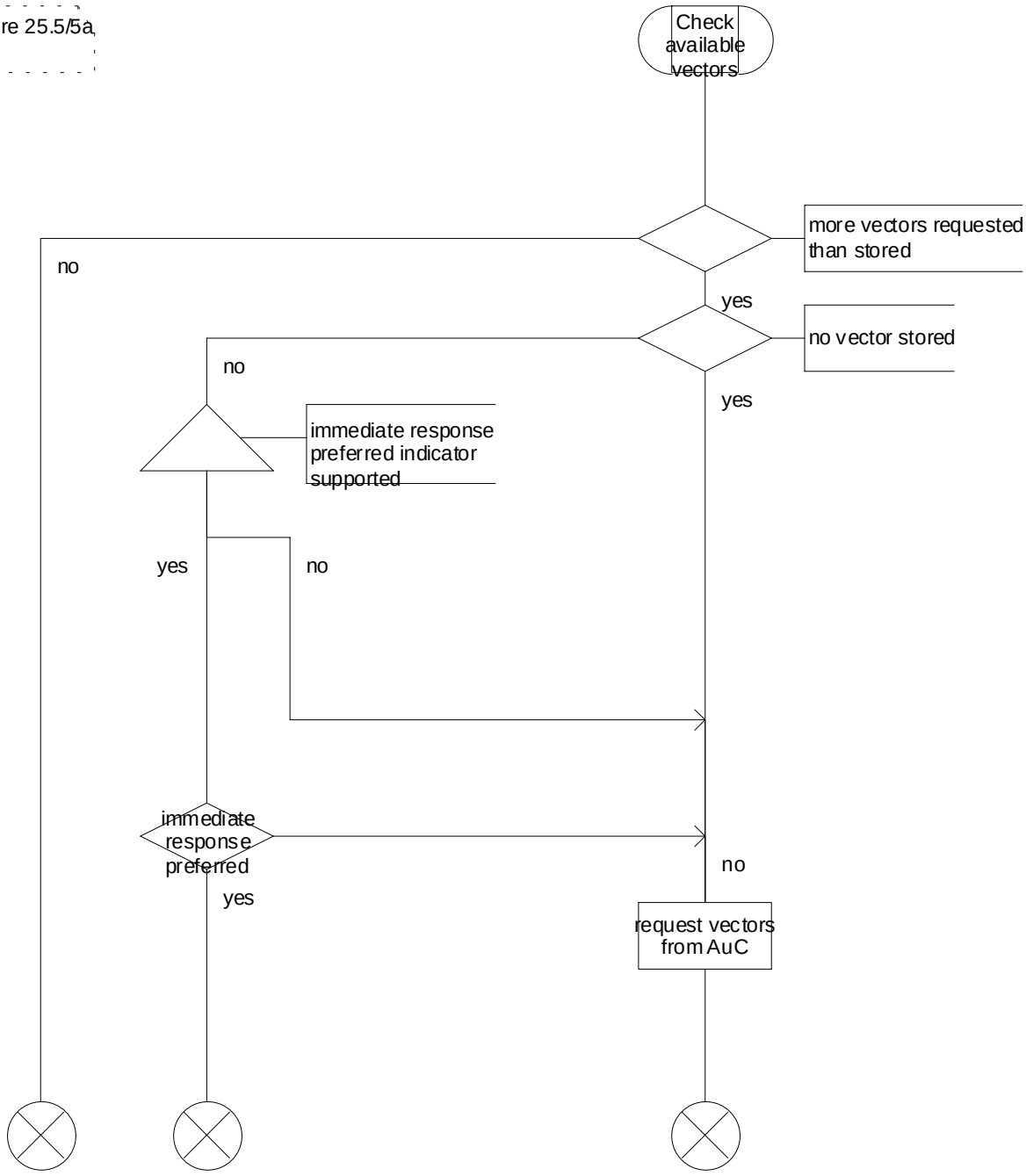


Figure 25.5/5a: Procedure Check_Available_Vectors

3GPP TSG-N2B
Mailand, 14 - 16 Feb 2000

Tdoc 3GPP ***N2B000330***

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**	**103r1**	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:	CN#07	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic	X	

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: N2 **Date:** 14/02/2000

Subject: Addition of UMTS security to MAP B interface

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: To add the required parameters to the MAP_AUTHENTICATE and MAP_SET_CIPHERING_MODE services by referencing 23.018

Clauses affected: 8.5.1, 8.6.1, 25.5

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.

8.5.1 MAP_AUTHENTICATE service

The MAP_AUTHENTICATE service is used on the MAP B inerface. This interface is not fully operational specified. It is strongly recommended not to implement the B-interface as an external interface.

8.5.1.1 Definition

This service is used between the VLR and the MSC when the VLR receives a MAP service indication from the MSC concerning a location registration, call set-up, operation on a supplementary service or a request from the MSC to initiate authentication.
The service is a confirmed service and consists of four service primitives.

8.5.1.2 Service primitives

The service primitives are shown in table 8.5/1

Table 8.5/1: MAP_AUTHENTICATE parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
RAND	M	M(=)		
CKSN	M	M(=)		
SRES			M	M(=)
Provider error				O

8.5.1.3 Parameter use

Invoke id
See subclause 7.6.1 for the use of this parameter.
RAND
See subclause 7.6.7 for the use of this parameter.
CKSN
See subclause 7.6.7 for the use of this parameter.
SRES
See subclause 7.6.7 for the use of this parameter.
Provider error
See subclause 7.6.1 for the use of this parameter.

8.6.1 MAP_SET_CIPHERING_MODE service

8.6.1.1 Definitions

This service is used between the VLR and the MSC to set the ciphering mode and to start ciphering if applicable. It is called when another service requires that information is to be sent on the radio path in encrypted form.
The service is a non-confirmed service and consists of two service primitives.

8.6.1.2 Service primitives

The service primitives are shown in table 8.6/1

Table 8.6/1: MAP_SET_CIPHERING_MODE parameters

Parameter name	Request	Indication
Invoke id	M	M(=)
Ciphering mode	M	M(=)
Kc	C	C(=)

8.6.1.3 Parameter use

Invoke id
See subclause 7.6.1 for the use of this parameter.
Ciphering mode
See subclause 7.6.7 for the use of this parameter.
Kc
The Kc parameter should be included when the ciphering mode parameter indicates that ciphering must be performed.

25.5.2 Macro Authenticate_VLR

This macro is used by the VLR to control the authentication of a subscriber. The macro proceeds as follows:

- if there are not enough authentication ~~triplets~~vectors in the VLR to perform the authentication, then the macro "Obtain_Authent_Para_VLR" described below is invoked. If this macro fails, then the corresponding error (Unknown Subscriber or Procedure Error) is returned to the calling process;

- if there are enough authentication ~~triplets~~vectors in the VLR, or the Obtain_Authent_Para_VLR macro was successful, then a MAP_AUTHENTICATE request is sent to the MSC. This request contains the RAND, ~~and~~ CKSN or KSI, and possibly AUTN parameters as indicated in the service description;

- the VLR then waits for a response from the MSC;

- if a MAP_U_ABORT, MAP_P_ABORT or MAP_CLOSE indication is received from the MSC in this wait state, the VLR checks whether authentication sets are available. If no sets are available the process Obtain_Authent_Sets_VLR is invoked to fetch authentication sets from the HLR. The "Null" exit is then used;

- if a MAP_NOTICE indication is received from the MSC in this wait state, the VLR closes the dialogue with the MSC, then checks whether authentication sets are available. If no sets are available the process Obtain_Authent_Sets_VLR is invoked to fetch authentication sets from the HLR. The "Null" exit is then used;

- if a MAP_AUTHENTICATE confirmation is received by the VLR, it checks whether the received Signed Result (SRES) is identical to the stored one (see GSM 03.20), or whether the received RES is identical to the stored XRES. If this is not the case, the "Illegal Subscriber" exit is used. If the SRES values or RES and XRES are identical, then the "OK" exit is used;

- before exit, the VLR may fetch a new set of triplets from the HLR. This is done by initiating a separate Obtain_Authent_Sets_VLR process described below.

The macro is described in figure 25.5/2.

25.5.3 Process Obtain_Authentication_Sets_VLR

This process is initiated by the VLR to fetch authentication vectors~~triplets~~ from a subscriber's HLR in a stand-alone, independent manner. The Obtain_Authent_Para_VLR macro described below is simply called; the process is described in figure 25.5/3.

3GPP TSG-N2B
Mailand, 14 - 16 Feb 2000

Tdoc 3GPP N2B000244

CHANGE REQUEST

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29.002	CR	104	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:	CN#07	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic	X	

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: N2 **Date:** 28/01/2000

Subject: Re-Synchronisation Info

Work item: UMTS Security

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

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

Reason for change: To align with 33.102 (CR 37r1)

Clauses affected: 17.7.1

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.

17.7.1 Mobile Service data types

.....

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

.....

3GPP TSG-CN WG2
Kista, Sweden, 2-3 March 2000

Document N2B000446
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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29.060	**CR**	**080r2**	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:	CN#7	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic	X	

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	X	Core Network	X

Source: N2 **Date:** 2000-03-02

Subject: GTP Security

Work item: GTP Enhancements

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

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

Release:

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

Reason for change: The Security Group (S3) have requirements on the Core Network signalling protocols (MAP and GTP).

For GTP signalling it is proposed that, since IP is the transport technology used, IP Security shall is. A reference to 3G TS 33.102 is proposed to be made in a new section 13.3 on GTP Security.

Clauses affected: Clause 4 (changes), 13.3 (new)

Other specs affected:

Other 3G core specifications	X	→ List of CRs:	CR 33.102-xxx
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: The CR to TS 33.102 is linked to this CR, i.e. the two CRs must be approved or rejected together as a package.


help.doc

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

4 General

This document defines the GPRS Tunnelling Protocol (GTP), i.e. the protocol between GPRS Support Nodes (GSNs) in the UMTS/GPRS backbone network. It includes both the GTP signalling (GTP-C) and data transfer (GTP-U) procedures. It also lists the messages and information elements used by the GTP based charging protocol GTP', which is described in GSM 12.15.

GTP is defined for the Gn interface, i.e. the interface between GSNs within a PLMN, and for the Gp interface between GSNs in different PLMNs. Only GTP-U is defined for the Iu interface between Serving GPRS Support Node (SGSN) and the UMTS Terrestrial Radio Access Network (UTRAN).

The Internet protocol (IP) is the transport network technology used to carry GTP. In order to secure GTP signalling IP Security is used.

On the Iu interface, the Radio Access Network Application Part (RANAP) protocol is performing the control function for GTP-U.

GTP' is defined for the interface between CDR generating functional network elements and Charging Gateway(s) within a PLMN. Charging Gateway(s) and GTP' protocol are optional, as the Charging Gateway Functionalities may either be located in separate network elements (Charging Gateways), or alternatively be embedded into the CDR generating network elements (GSNs) when the GSN-CGF interface is not necessarily visible outside the network element. These interfaces relevant to GTP are between the grey boxes shown in the figure below.

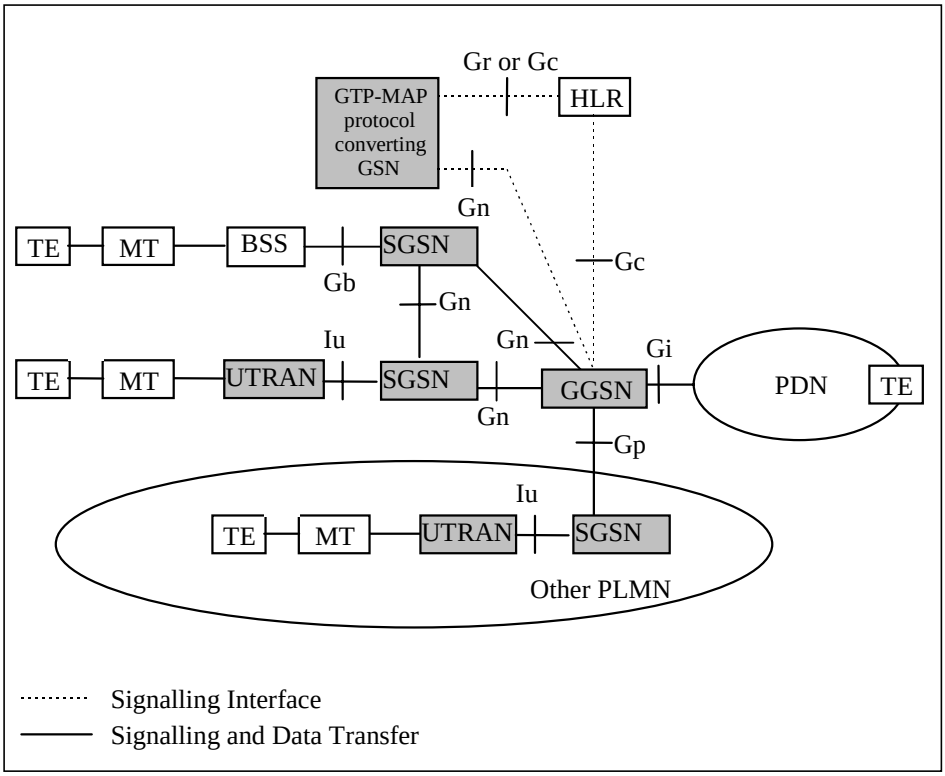

Figure 1: GPRS Logical Architecture with interface name denotations

GTP allows multiprotocol packets to be tunnelled through the UMTS/GPRS Backbone between GSNs and between SGSN and UTRAN.

In the signalling plane, GTP specifies a tunnel control and management protocol (GTP-C) which allows the SGSN to provide packet data network access for an MS. Signalling is used to create, modify and delete tunnels.

In the transmission plane, GTP uses a tunnelling mechanism (GTP-U) to provide a service for carrying user data packets. The choice of path is dependent on whether the user data to be tunnelled requires a reliable link or not.

The GTP-U protocol is implemented by SGSNs and GGSNs in the UMTS/GPRS Backbone and by Radio Network Controllers (RNCs) in the UTRAN. The GTP-C protocol is implemented by SGSNs and GGSNs in the UMTS/GPRS Backbone. No other systems need to be aware of GTP. UMTS/GPRS MSs are connected to an SGSN without being aware of GTP.

It is assumed that there will be a many-to-many relationship between SGSNs and GGSNs. A SGSN may provide service to many GGSNs. A single GGSN may associate with many SGSNs to deliver traffic to a large number of geographically diverse mobile stations.

SGSN and GGSN implementing GTP protocol version 1 should be able to fallback to GTP protocol version 0. All GSNs should be able to support all earlier GTP versions.

*** *Next Change* ***

13.3 GTP Security

In order to secure GTP signalling IP Security mechanisms ~~is~~are used. The requirements on GTP Security and the mechanisms to be used are further described in 3G TS 33.102 “3G Security; Security Architecture” [18].

3GPP TSG CN WG2 SWG-B
Kista, Sweden, 02 - 03 March 2000

Document N2B000449
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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29.060	CR	082r1	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:	CN#07	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic	X	

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: N2 **Date:** 01.03.00

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	X	→ 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: The Type allocation for the new parameter TEMSI needs to be done if the CR is incorporated in the specification.


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<-------

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

7.5.2 Identification Response

The old SGSN shall send an Identification Response to the new SGSN as a response to a previous Identification Request.

Possible Cause values are:

- 'Request Accepted'
- 'IMSI not known'
- 'System failure'
- 'Mandatory IE incorrect'
- 'Mandatory IE missing'
- 'Optional IE incorrect'
- 'Invalid message format'
- 'Version not supported'
- 'P-TMSI Signature mismatch'

Only the Cause information element shall be included in the response if the Cause contains another value than 'Request accepted'.

The IMSI information element is mandatory if the Cause contains the value 'Request accepted'.

The TEMSI information element shall be included if a TEMSI was stored in the old SGSN and the Cause contains the value 'Request accepted'.

One or several Authentication Triplet information elements or up to 5 Authentication Quintuplet information elements may be included in the message if the Cause contains the value 'Request accepted'.

The optional Private Extension contains vendor or operator specific information.

Table 28: Information elements in an Identification Response

Information element	Presence requirement	Reference
Cause	Mandatory	7.7.1
IMSI	Conditional	7.7.2
Authentication Triplet	Conditional	7.7.7
Authentication Quintuplet	Optional	7.7.27
TEMSI	Conditional	7.7.35
Private Extension	Optional	7.7.26

****** New Section******

7.7.35 Temporarily Encrypted Mobile Subscriber Identity (TEMSI)

The TEMSI information element is given by:

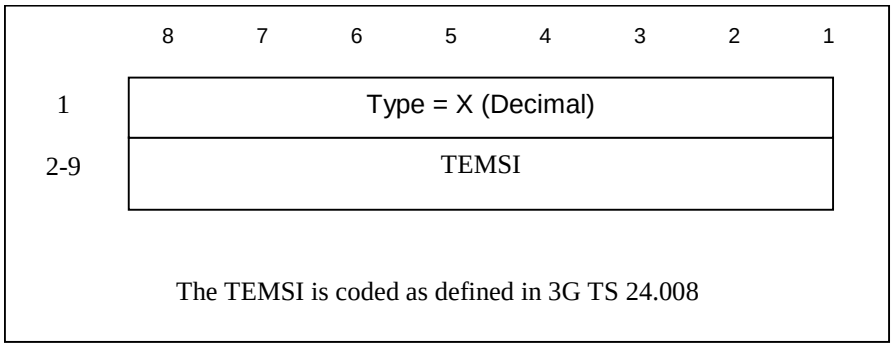

Figure 49: TEMSI information element