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Information Element Mapping between MS-BSS/BSS-MSC Signalling Procedures and MAP

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1. Reason for changes

No changes since the previously distributed version.

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Information Element Mapping between MS-BSS/BSS-MSC Signalling Procedures and MAP

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PREFATORY NOTE

ETSI has constituted stable and consistent documents which give specifications for the implementation of the European Cellular Telecommunications System. Historically, these documents have been identified as "GSM recommendations".

Some of these recommendations may subsequently become Interim European Telecommunications Standards (I-ETSs) or European Telecommunications Standards (ETSs), whilst some continue with the status of ETSI-GSM Technical Specifications. These ETSI-GSM Technical Specifications are for editorial reasons still referred to as GSM recommendations in some current GSM documents.

The numbering and version control system is the same for ETSI-GSM Technical Specifications as for "GSM recommendations".

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1. SCOPE

The scope of this Recommendation is

i) to provide guidance on information element mapping between information elements contained in layer 3 messages sent on the MS-BSS interface (Recommendation GSM 04.08) and information elements contained in MAP messages (Recommendation GSM 09.02) where the MSC acts as transparent relay of information;

ii) to provide guidance on mapping as in i) above and additional interworking when the MSC also processes the information.

Note: Interworking for supplementary services is given in Recommendation GSM 09.11.

2. CLASSIFICATION OF INTERWORKING CASES

2.1 Transparent operations

The following operations in MAP require transparent mapping in the MSC (see Recommendation GSM 09.02 for definitions and the use of the operations):

- update location area
- detach IMSI
- attach IMSI
- forward new TMSI
- provide IMSI
- authenticate
- perform call control (in MSC-B)

2.2 Non-transparent operations

Operations in this class require processing in the MSC and information element mapping. The operations include:

- operations related to outgoing call set-up
- operations related to incoming call set-up
- operations related to handover

3. TRANSPARENT CASE

3.1 Interworking in the BSS

All messages will use DTAP (see Recommendation GSM 08.08).

3.2 Interworking in the MSC

3.2.1 General

When receiving a forward message from the MS, the MSC will invoke the desired operation of MAP and establish a cross reference between the Recommendation GSM 04.08 procedure and the MAP procedure in order to return the results of the operation to the MS. The cross reference is deleted when the MSC terminates the MAP operation.

Positive or negative results of the MAP operation are returned in the appropriate message of Recommendation GSM 04.08.

The parameters of the forward Recommendation GSM 04.08 message is mapped by a one-to-one mapping into the parameters of the invoke massage of MAP. However, in some cases parameters received on the radio path may be suppressed at the MSC because they are related to another protocol entity, e.g. in MM-management messages information related to RR-management may be included. Similarly, parameters received in the return result is mapped one-to-one into parameters of the corresponding backward message defined in Recommendation GSM 04.08.

Negative outcome as carried in various MAP messages (TC-U-ERROR, TC-L-REJECT, TC-R-REJECT, TC-U-REJECT, T-CP-ABORT and TC-L-CANCEL, see Recommendation GSM 09.02 for definitions) is mapped into cause values in the required backward unsuccessful message in Recommendation GSM 04.08. In this case several negative results of MAP may be mapped into the same cause in Recommendation GSM 04.08, i.e. without discrimination between these negative results.

Note: The MAP procedure entity in the MSC will require a more detailed overview of negative results than the MS for O & M purposes.

These principles are illustrated in Figure 1.

For each of the procedures in para 2.1 above the following format is used to show the mapping.

	04.08		09.02	Notes
Forward message	MS to MSC Message name para 1 para 2	<-----> <-----> <----->	MSC to VLR Invoke name para 1 para 2	
Positive result	MSC to MS Message name para 1 para 2	<-----> <-----> <----->	VLR to MSC Return result para 1 para 2	
Negative result	MSC to MS Message name cause 1 cause 2 cause cause cause cause	<-----> <-----> <-----> <-----> <-----> <-----> <----->	VLR to MSC Return Error cause 1 cause 2 Reject U-reject Abort L-cancel	

Equivalent mapping principles apply for operations invoked by the VLR. However, negative results are then not received on the radio path but generated in the MSC. Therefore, for such operations the interworking for negative results is not shown.

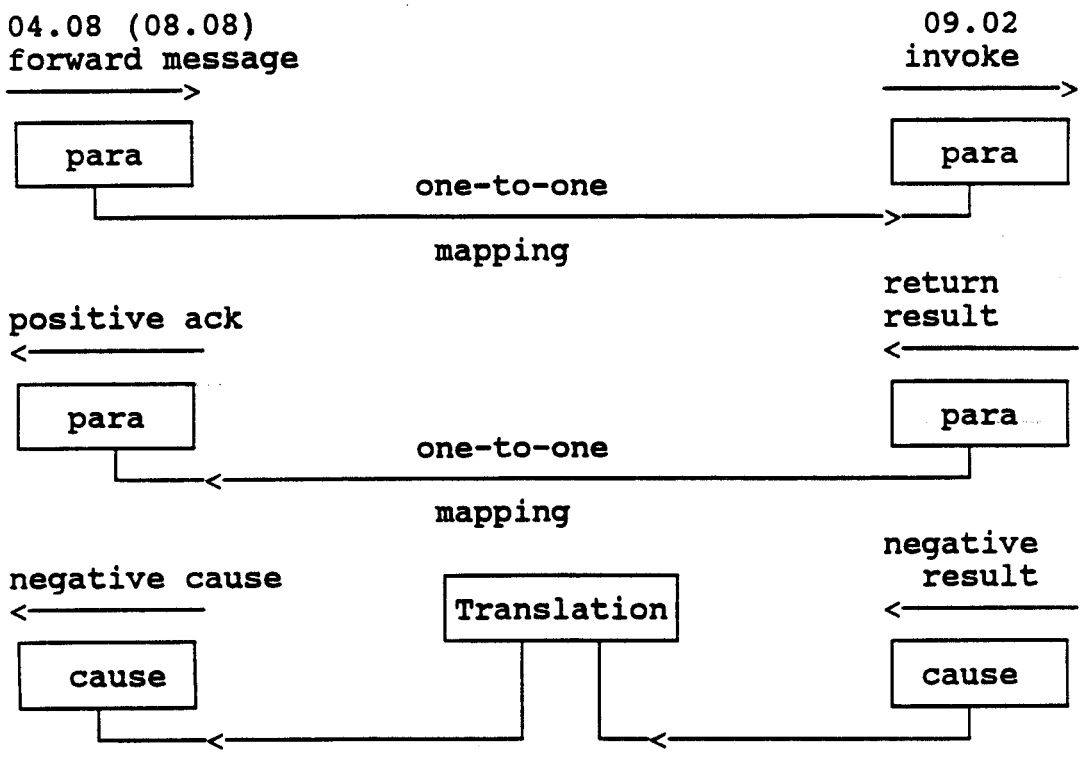


Figure 1 Illustration of mapping principles in the MSC

3.2.2 Location area updating

	04.08	09.02	Notes
Forward message	LOC UPD REQ	Invoke: Update location area	
	Location area id	Loc Area ID	
	Mobile identity	Subscriber ID	
	Mobile station classmark	-	4
	Cell identity	-	5
	-	Target Loc Area ID	1
	Ciphering key seq number	Ciphering key seq number	
	Location update type	-	3
Positive results	LOC UPD ACC	Return result: Location area updating accepted	
	Mobile identity	-	6
Negative results	LOC UPD REJ	Return error	
	IMSI unknown in HLR	Unknown Subscriber	
	Network failure	Unknown Loc Area	2
	Roaming not allowed	Roaming Not Allowed	2
	Illegal MS	Illegal MS	
	Network failure	System Failure	
	Network failure	Reject	
	Network failure	U-reject	
	Network failure	Abort	
	Network failure	L-cancel	

Notes:
1) This information element is inserted by the MSC.
2) The Unknown Loc Area error is not generated because of wrong information provided by the MS. The wrong information has been inserted by the MSC.
3) This parameter is used on the radio path in order to discriminate between normal location updating, periodic registration and IMSI attach.
4) The classmark is required only for radio resource management and is not transferred to the VLR.
5) This information element is not transferred to the VLR.
6) The mobile identity is inserted by the MSC as received in a forward new TMSI operation.

3.2.3 Detach IMSI

	04.08	09.02	Notes
Forward message	IMSI DET IND Mobile identity	Invoke: detach IMSI Subscriber Id	
Positive result			1
Negative result			2

Notes: 1) The forward message is not acknowledged
2) Negative results (reject, U-reject, abort) may be received by MAP. However, these results are not provided to the MS.

3.2.4 Attach IMSI

	04.08	09.02	Notes
Forward message	LOC UPD REC	Invoke: Attach IMSI	
	Location area Id	Loc Area Id	
	Mobile identity	Subscriber Id	
	Mobile station class mark	-	2
	Cell identity	-	2
	Cipher key seq number	Cipher key seq number	
	Location update type	-	2
Positive result	LOC UPD ACC	Return result: IMSI attach ack	1
Negative result	LOC UPD REJ	Return result: IMSI attach ack	
	IMSI unknown in VLR	Unidentified Subscriber	
	IMSI unknown in HLR	Unknown Subscriber	
	Network failure	Reject	
	Network failure	U-reject	
	Network failure	Abort	
	Network failure	L-cancel	

Notes: 1) The acknowledgement does not contain any parameters.
2) These information elements are suppressed by the MSC.

3.2.5 Perform call control

Note: This section applies to the mapping performed in MSC-B.

	04.08	09.02	Notes
Forward message	Any call control or mobility management message	Invoke: perform call control BSSAPDU	1
Positive result			2
Negative result		Return error: Handover state Undetermined Reject U-reject Abort	3

Notes: 1) All fields received at the BSS-MSC interface are mapped into the BSSAPDU
2) Return result does not apply. If MSC-A returns a message, this message will arrive in an Invoke: process call control information.
3) The negative results are not sent on the radio path.

3.2.6 Authentication

The authenticate operation is shown in Figure 2.

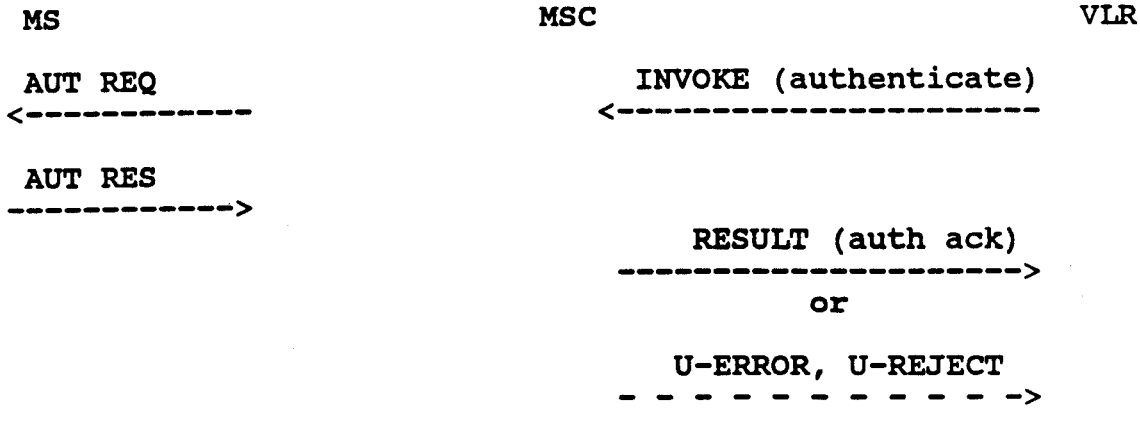


Figure 2. Authentication operation.

The MSC can only act on an INVOKE (authenticate) if a connection exists to the MS on the radio interface. If such connection does not exist, the MSC shall return a U-ERROR with cause "Absent subscriber. The same applies if the MS does not respond to an AUT REQ message.

	04.08	09.02	Notes
Forward message	AUT REQ RAND Ciphering key seq number	Invoke: authenticate RAND Ciphering key seq number	
Backward result	AUT RES SRES	Result authenticate ack SRES	

3.2.7 Retrieval of the IMSI from the MS

The VLR may request open identification of an MS in an INVOKE (provide IMSI) message.

The mapping of information elements is as follows:

	04.08	09.02	Notes
Forward message	ID REQ Identity type set to: IMSI	INVOKE: provide IMSI	 1
Backward result	ID RES IMSI	Result: IMSI ack Subscriber identity	

Note: 1) The INVOKE does not carry any parameters. The identity type is inferred from the invoke name.

The MSC shall return a U-ERROR with cause absent subscriber if

- there is no radio connection the MS when the invoke is received
- there is no response from the MS.

3.2.8 Reallocation of TMSI

This operation is invoked by the VLR. The INVOKE (forward new TMSI) contains the new TMSI which is forwarded to the MS in the TMSI REAL CMD. When the MS acknowledges the receipt of the new TMSI, the MSC will return a RESULT message to the VLR.

If there is no radio connection to the MS when receiving the INVOKE, the MSC shall ignore the message.

	04.08	09.02	Notes
Forward message	TMSI REAL CMD	INVOKE: Forward new TMSI	
	Mobile identity	TMSI	
	Location area identification	-	
Backward result	TMSI REAL COM	Result: TMSI ack	
	Empty	Empty	

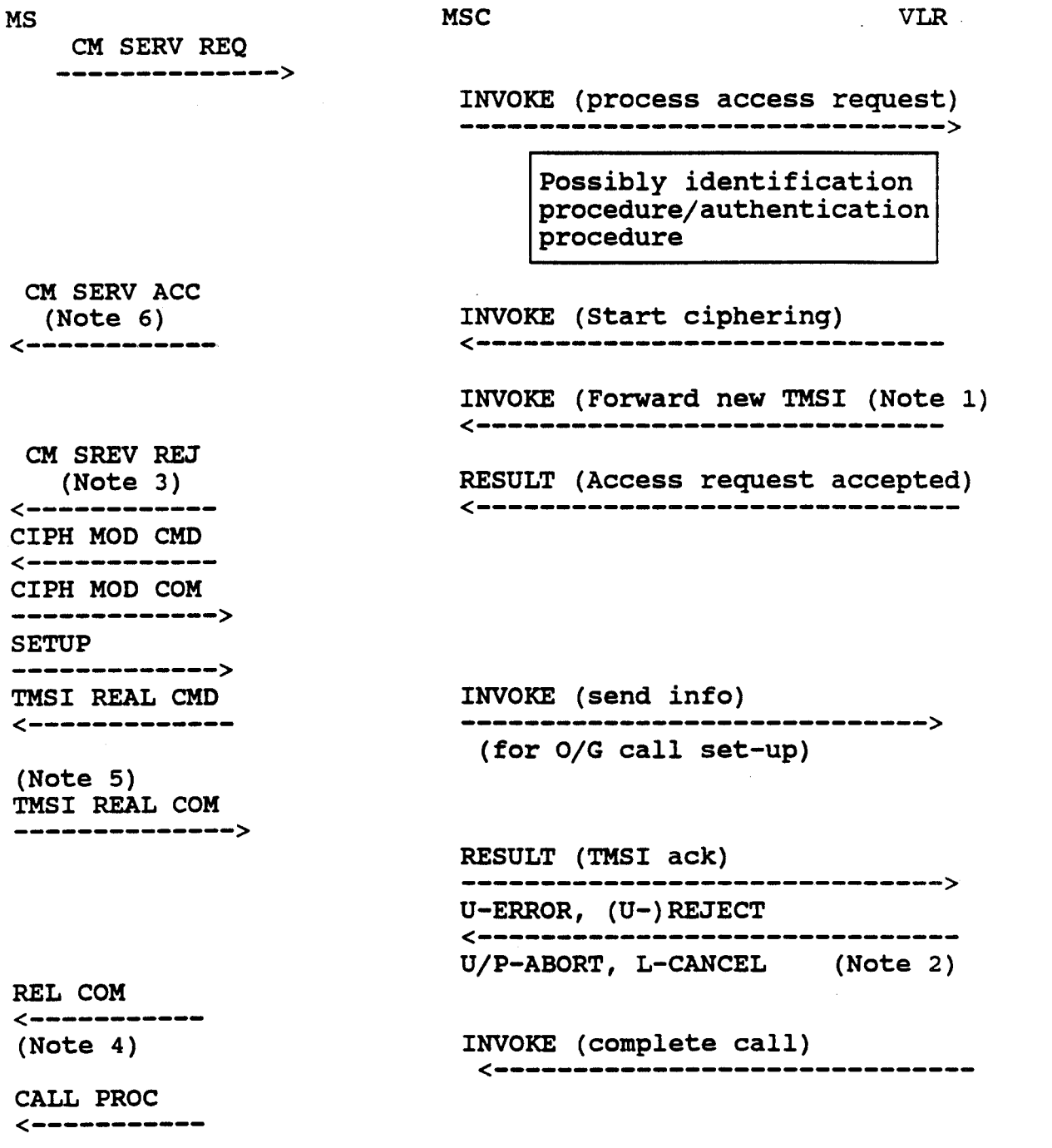
4 NON-TRANSPARENT CASES

4.1 General

For interworking other than mapping of information fields, see Recommendation GSM 09.09.

4.2 Outgoing call set-up (MS originating call)

Figure 3 shows those elements of a call set-up sequence which will require interworking with the mobile application part. Radio interface messages not requiring interworking with MAP are not shown.



Note 1: These messages may be received simultaneously.
Note 2: L-CANCEL is local in the MSC.
Note 3: CM-SERVICE-REJECT is sent as a response to a negative result in the process access request message.
Note 4: Release because of negative result.
Note 5: No sequencing required with other messages. Must be sent after ciphering.
Note 6: CM SERV ACC is only sent if the ciphering procedure is not invoked.

Figure 3 Part of outgoing call set-up sequence.

	04.08	09.02	Notes
Forward	CM-SERV-REQ	INVOKE: Process access request	
	CM Service type	CM Service type	1
	Ciphering key sequence number	Ciphering key sequence number	
	Mobile identity	Subscriber Id	
	Mobile station Class mark	-	
	-	Access Connection Status	3
Positive result	CM-SERV-ACC	RESULT: Access request accepted	2
Negative result	CM-SERV-REJ	Return error	
	IMSI unknown in VLR	Unidentified Subscriber	
	IMSI unknown in HLR	Unknown Subscriber	
	Network failure	Reject	
	Network failure	U-reject	
	Network failure	Abort	
	Network failure	L-cancel	
	AUT REJ	Return error	
	Illegal MS	Illegal subscriber	

Notes: 1) Indicates in this case an outgoing call.

2) The CM-SERV-ACC is sent when the ciphering procedure is no invoked.

3) Indicates whether or not an RR-connection exists and whether or not ciphering has been started.

The procedure is initiated by the MS sending a CM-SERVICE-REQUEST message. The MSC will forward the service request to the VLR in the process access request message. The VLR may then invoke other operations, e.g. authentication and identification. These operations are defined in para 3.2.6 and 3.2.7.

If the request is for a first MM-connection, the VLR indicates acceptance of the call request by returning the start ciphering message which will initiate the ciphering on the radio path. This interworking is described in para 4.4. If the request is for a parallel MM-connection, then the return result is used to inform the MS in the CM-service acceptance. After cipher mode setting has been completed or the CM SERV ACC message has been returned, the MS will send the SETUP message and information retrieval takes place as shown.

Information element mapping is required between the messages

- CM-SERVICE-REQUEST to INVOKE (process access request)
- SETUP to INVOKE (send information for O/G call set-up)
- U-ERROR, (U-)REJECT, U/P-ABORT or L-CANCEL into REL COM or CM-SERVICE-REJECT.

The information contained in the INVOKE (complete call) is not passed on the radio interface but used in the MSC for connecting the call.

The conversion of information elements is as follows:

	04.08	09.02	Notes
Forward message	SETUP	Invoke: Sent info for OG call set-up	
	Bearer capabilities	-	3
	Mobile identity	Subscriber Id	
	Called part BCD number	Called Number	
	Low layer compatibility	-	3
	High layer compatibility	-	3
	Facility	-	1
	User-user	-	
	Calling party number BCD number	-	
Positive result			2
Negative result	REL COM	Return error	
	Rec GSM 04.10	CallBarred	
	Network out of order(38)	DataMissing	
	Network out of order(38)	UnexpectedDataValue	
	Network out of order(38)	SystemFailure	
	Network out of order(38)	(Reject (U-reject (Abort	

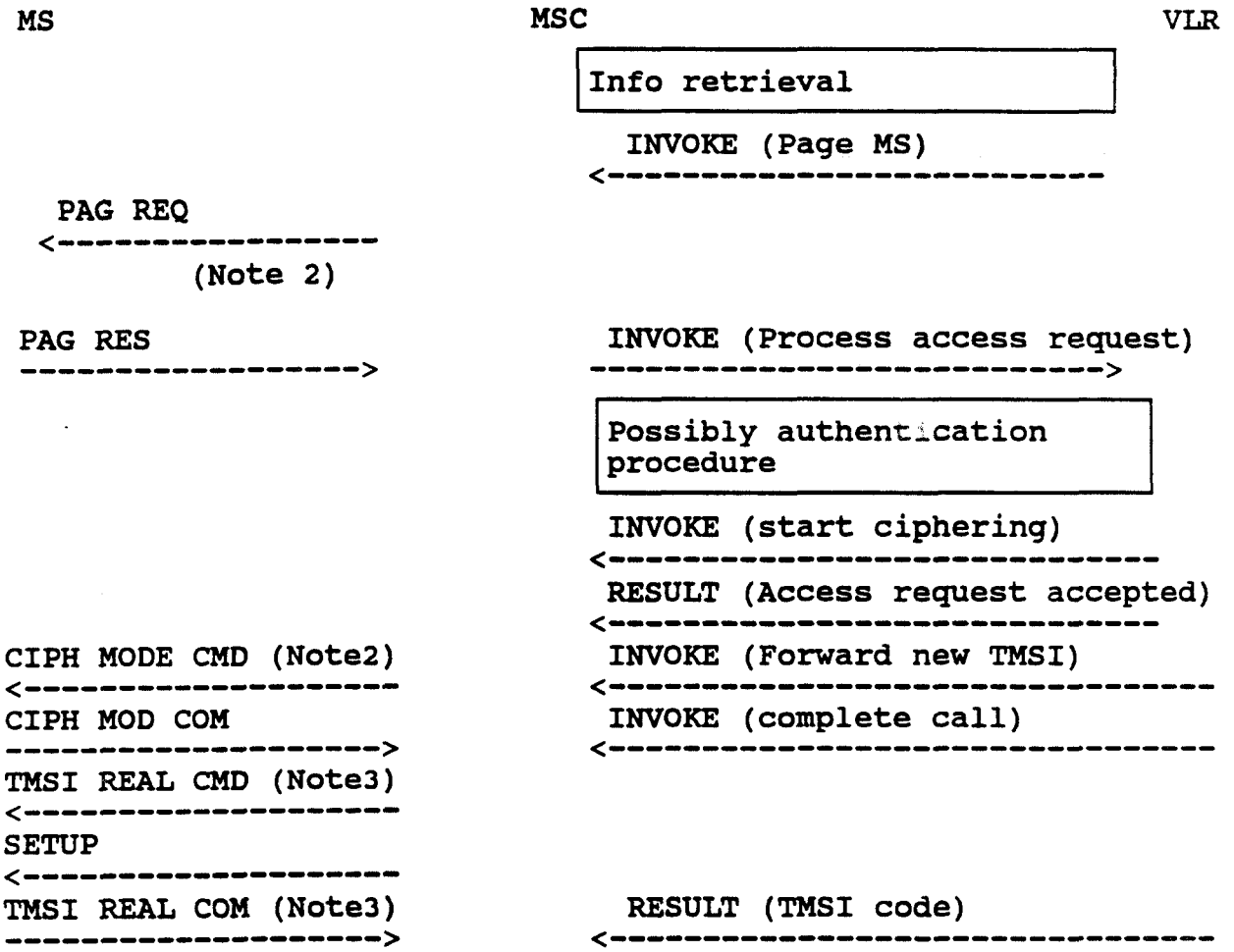
Notes: 1) This information is passed if required in separate operations

2) The call set-up parameters retrieved from the VLR are not sent to the MS. The parameters are contained in the complete call message.

3) Servive information may be included as Bearer Service code and/or teleservice code.

4.3 Incoming call set-up (MS terminating call)

Figure 4 shows these elements of the procedure which require interworking between the mobile application part in Recommendation GSM 04.08.



Notes: 1) All four messages may be received simultaneously.
2) Required only if an MM-connection does not exist already.
3) No sequencing required with other messages. Must be sent after ciphering.

Figure 4 Incoming call set-up.

The paging procedure is controlled by the VLR. It may be followed by authentication (para 3.2.6), ciphering (para 4.4) and reallocation of TMSI(para 3.2.8). The SETUP message is sent when the complete call message is received.

Normally there is no interworking between the complete call message and the SETUP message. However, the complete call message may contain bearer service indication which will be used to establish the bearer capabilities at the MSC.

The interworking between Page MS and PAG REQ is as follows:

	04.08	09.02	Notes
Forward message	PAG REQ	INVOKE: (Page MS)	
	Mobile identity	IMSI, TMSI	1
	PAG RES	INVOKE(Process access request	
	Ciphering key sequence number	Ciphering key sequence number	
	Mobile identity	-	
	Mobile station class mark	-	

Note 1) If TMSI is included, the TMSI is then also used as mobile identity in PAG REQ. Otherwise the IMSI is used.

4.4 Cipher mode setting

The interworking is as follows:

	04.08	09.02	Notes
Forward	CIPH MOD CMD	INVOKE (start ciphering)	
	Cipher mode setting	Cipher mode setting	
	-	Kc	1
Backward message	CIPH MOD COM	None	

Note 1) The key Kc is passed to the BSS.

4.5 Handover

The general principles of operation and interworking are given in Recommendation GSM 03.09. This Recommendation together with Recommendations GSM 08.08, GSM 09.09 and 09.02 give the necessary information for interworking. No direct mapping of information elements is required.