

Source: TSG_CN WG 4
Title: CRs to Rel-4 Work Item Camel Phase 4
Agenda item: 8.12
Document for: APPROVAL

Introduction:

This document contains 1 CR on Rel-4 Work Item Camel Phase 4, that have been agreed by TSG_CN WG4, and is forwarded to TSG_CN Plenary meeting #10 for approval.

SMG#	TDoc	SPEC	CR	RE	PHAS	VERS	SUBJECT	CAT
CN10	N4-001109	23.079	016	2	Rel-4	3.6.0	CAMEL support for OR	B

3GPP TSG-CN WG4 Meeting #5
Paris, France, 13-17 Nov 2000

Document **N4-001109**

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.

23.079 CR 016r2

Current Version: **3.6.0**

GSM (AA.BB) or 3G (AA.BBB) specification number ?

? CR number as allocated by MCC support team

For submission to: **TSG-CN#10**
list expected approval meeting # here ?

for approval
for information

strategic
non-strategic (for SMG use only)

Form: CR cover sheet, version 2 for 3GPP and SMG The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Formv2.doc

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

Source: CN4 **Date:** 16 Nov 2000

Subject: CAMEL support for OR

Work item: CAMEL phase 4

Category:	F Correction	<input type="checkbox"/>	Release:	Phase 2	<input type="checkbox"/>
<i>(only one category shall be marked with an X)</i>	A Corresponds to a correction in an earlier release	<input type="checkbox"/>		Release 96	<input type="checkbox"/>
	B Addition of feature	<input checked="" type="checkbox"/>		Release 97	<input type="checkbox"/>
	C Functional modification of feature	<input type="checkbox"/>		Release 98	<input type="checkbox"/>
	D Editorial modification	<input type="checkbox"/>		Release 99	<input type="checkbox"/>
				Release 00	<input checked="" type="checkbox"/>

Reason for change: CAMEL phase 4 will include support for OR of mobile-to-mobile calls. This needs to be reflected in the OR stage 2 specification.

Clauses affected: 2; 4.1; 4.2; 5; 5.1; 5.2.1; 5.2.2; 7.1; 7.2; 7.4; 7.5; 8.2; 9.2; 9.3; 9.4; 9.4.2; 9.5; 9.5.1; 9.5.2; 9.6.1; 9.6.2; 9.6.3; 9.7; 9.7.1; 10; 10.1.1; 10.1.2; 10.1.3; 10.1.4; 10.1.5; 10.1.6; 10.1.7; 10.2.1; 10.2.2; 10.2.3; 10.3.1; 10.3.2; 10.3.3; 10.3.4; 10.3.5; 10.4.1; Annex A

Other specs affected:	Other 3G core specifications	<input type="checkbox"/>	? List of CRs:	CR 23.078-xxx; CR 29.078-xxx
	Other GSM core specifications	<input type="checkbox"/>	? List of CRs:	
	MS test specifications	<input type="checkbox"/>	? List of CRs:	
	BSS test specifications	<input type="checkbox"/>	? List of CRs:	
	O&M specifications	<input type="checkbox"/>	? List of CRs:	

Other comments: The linked changes to TS 23.078 and TS 29.078 have been agreed by TSG-CN WG2, and will be included in the single CR against each of 23.078 and 29.078 for the introduction of CAMEL phase 4. Editorial alignment of the style for references to 3GPP specifications has been applied: 3GPP specifications are now cited as "3GPP TS ij.klm"

2 References

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

?? References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

?? For a specific reference, subsequent revisions do not apply.

?? For a non-specific reference, the latest version applies.

- [1] GSM 03.04: "Digital cellular telecommunications system (Phase 2+); Signalling requirements relating to routing of calls to mobile subscribers".
- [2] ~~3G-3GPP~~ TR 21.905: "Vocabulary for 3GPP Specifications".
- [3] ~~3G-3GPP~~ TS 22.079: "Support of Optimal Routing (SOR); Service definition - Stage 1".
- [4] ~~3G-3GPP~~ TS 22.082: "Call Forwarding (CF) supplementary services - Stage 1".
- [5] ~~3G-3GPP~~ TS 23.003: "Numbering, addressing & identification".
- [6] ~~3G-3GPP~~ TS 23.018: "Basic call handling; Technical realization".
- [7] 3GPP TS 23.078: "Customized Applications for Mobile network Enhanced Logic (CAMEL) - Phase 3; Stage 2".
- [8] ~~3G-3GPP~~ TS 23.085: "Closed User Group (CUG) Supplementary Service - Stage 2".
- [9] ~~3G-3GPP~~ TS 23.087: "User-to-User Signalling (UUS) - Stage 2".

****** Next modified section ******

4 Architecture

4.1 Optimal routing for basic mobile-to-mobile calls

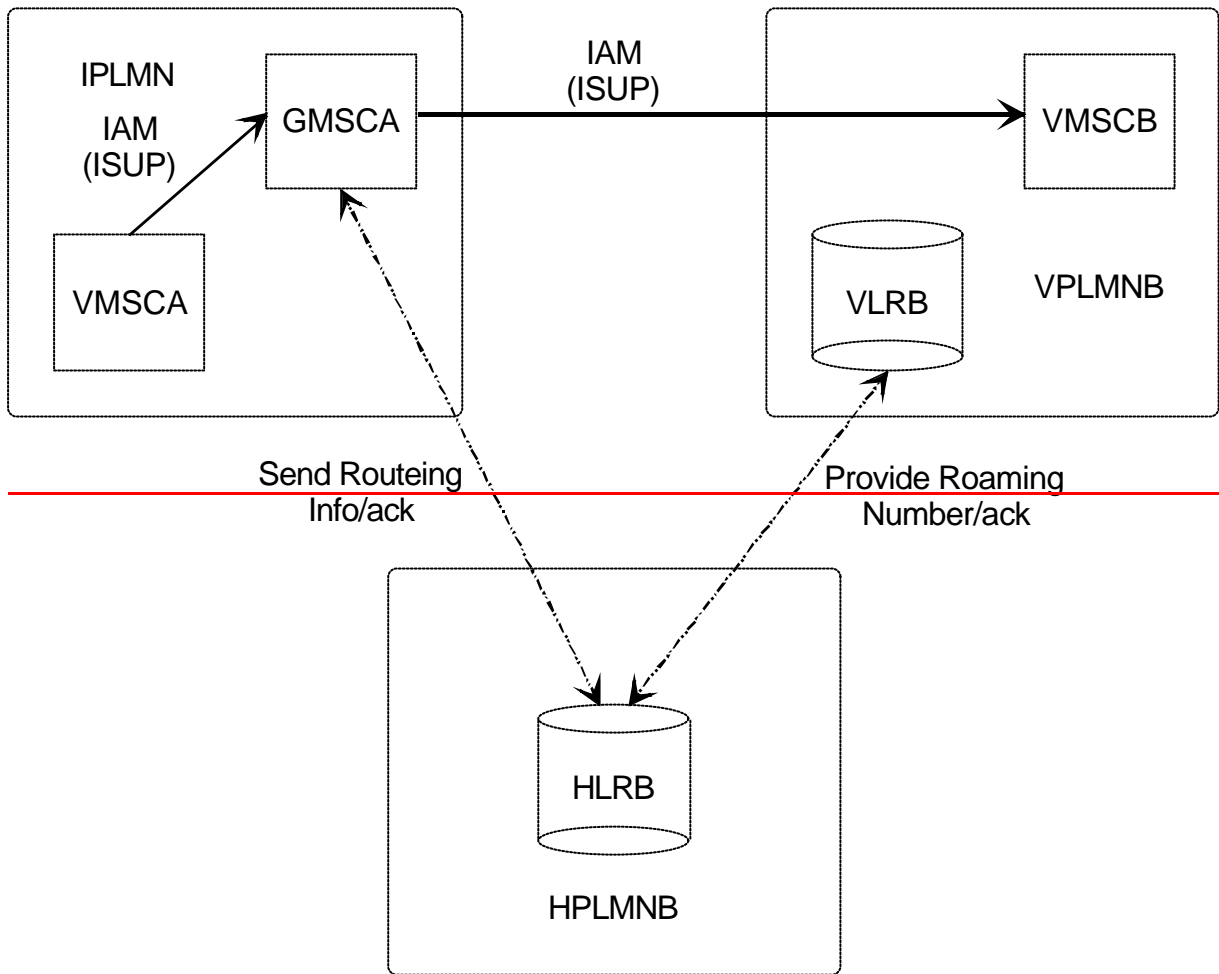
It is a network operator option whether to implement optimal routing for basic mobile-to-mobile calls.

The existing UMTS and GSM architectures support the primary technical requirement of optimal routing for mobile-to-mobile calls (basic OR): that a GMSC can interrogate an HLR in a different PLMN to obtain routing information for a mobile terminated call (see GSM 03.04 [1]). Three logically distinct PLMNs are involved in the handling of an optimally routed mobile-to-mobile call:

- the IPLMN, which is also the VPLMN of the calling mobile subscriber;
- the HPLMN of the called mobile subscriber (HPLMNB);
- the VPLMN of the called mobile subscriber (VPLMNB).

Any two or all three of these PLMNs may be identical; in figure 1 they are shown as distinct.

Figure 1 shows the communication between the IPLMN, HPLMNB and VPLMNB for an optimally routed mobile-to-mobile call.



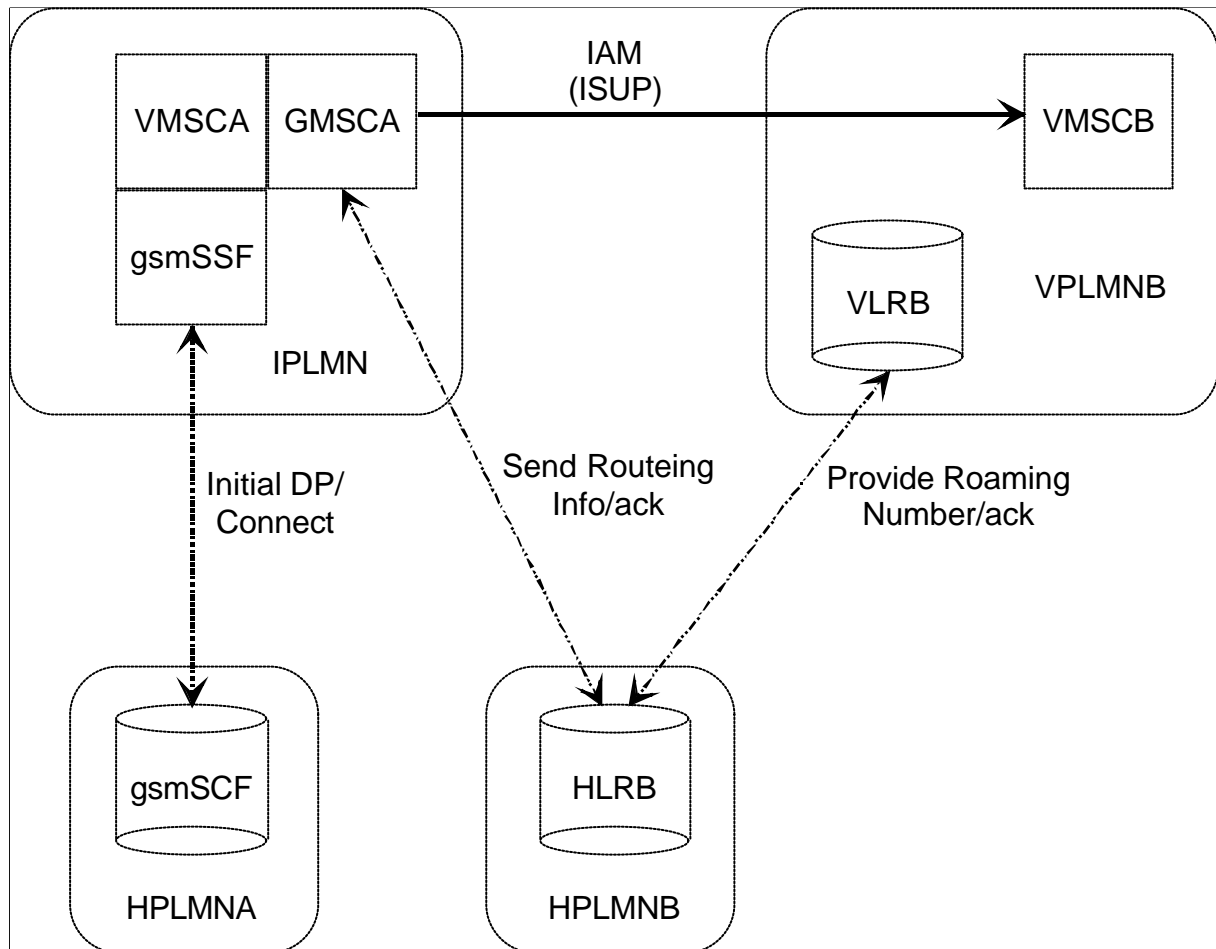


Figure 1: Architecture for optimal routing of basic mobile-to-mobile call

In figure 1 and throughout the present document, the term ISUP is used to denote the telephony signalling system used between exchanges. ~~In a given network, any telephony signalling system may be used; the only additional requirement is that GMSCA must be able to signal to VMSCA the destination address which it has used to route the call.~~

~~If In this architecture the VMSC of the calling mobile subscriber (VMSCA) is distinct from integrated with the GMSC; communication between them is over an internal interface, it constructs an ISUP Initial Address Message (IAM) using the MSISDN of the called subscriber and sends it to the GMSC. A gsmSSF is also associated with VMSCA, to support CAMEL functionality; this is required for the support of optimal routing of mobile-to-mobile calls.~~

~~If the originating subscriber has a CAMEL subscription, then when VMSCA receives the setup message it sends an Initial DP message, containing the address digits received in the setup message, via the gsmSSF to the gsmSCF. If the gsmSCF determines that the destination defined by the address digits belongs to a GSM or UMTS PLMN, it responds to the Initial DP with a Connect or Continue with Argument message to VMSCA containing an indication that the call is eligible for optimal routing. This causes VMSCA to route the call to the associated GMSC (GMSCA).~~

If the GMSC, which ~~may be distinct from the VMSC of the calling mobile subscriber but~~ is in the VPLMN of the calling mobile subscriber, is in a different PLMN from HLRB, it requests routing information from HLRB using the MAP protocol. If HLRB determines that the call can be routed directly from the GMSC to VMSCB without contravening the charging requirements for optimal routing given in subclause 9.1, it requests a roaming number from VLRB using the MAP protocol, and VLRB returns a roaming number in the Provide Roaming Number ack. HLRB returns the roaming number to the GMSC in the Send Routing Info ack. The GMSC uses the roaming number to construct an ISUP IAM, which it sends to VMSCB. The call is then handled according to the procedures defined in ~~3G~~ 3GPP TS 23.018 [6], except that if the call is answered GMSCA ~~inserts in the ISUP Answer message~~ relays the answer event to VMSCA and includes the destination address which it used to route the call, to allow VMSCA to generate the correct charging record.

NOTE: If the GMSC returns an ISUP Answer message relays an answer event to VMSCA before it has received an Answer message from the final destination (e.g. because of an interaction with a Specialised Resource Function) an incorrect destination address (or no destination address) can be sent to VMSCA, even though the call is eventually optimally routed.

4.2 Optimal routing for conditional call forwarding

Some cases of call forwarding on mobile subscriber not reachable (CFNRc) are handled in the IPLMN, without the call being extended to the VPLMN of the forwarding subscriber. For these cases, referred to in the present document as early call forwarding, the forwarding is already optimally routed.

When a call has been extended from the GMSC to VMSCB, the procedures defined in 3G-3GPP TS 23.018 [6] lead to any conditional call forwarding being routed from VMSCB to the forwarded-to destination; this is referred to in this specification as late call forwarding. Optimal routing for late call forwarding (ORLCF) allows VMSCB to return control of the call to the GMSC, which can then route the call to the forwarded-to destination.

Figure 2 shows the architecture for ORLCF. Phase 1 of SOR does not include optimal routing of forwarding to a mobile subscriber, so optimal routing of the forwarding leg is not considered.

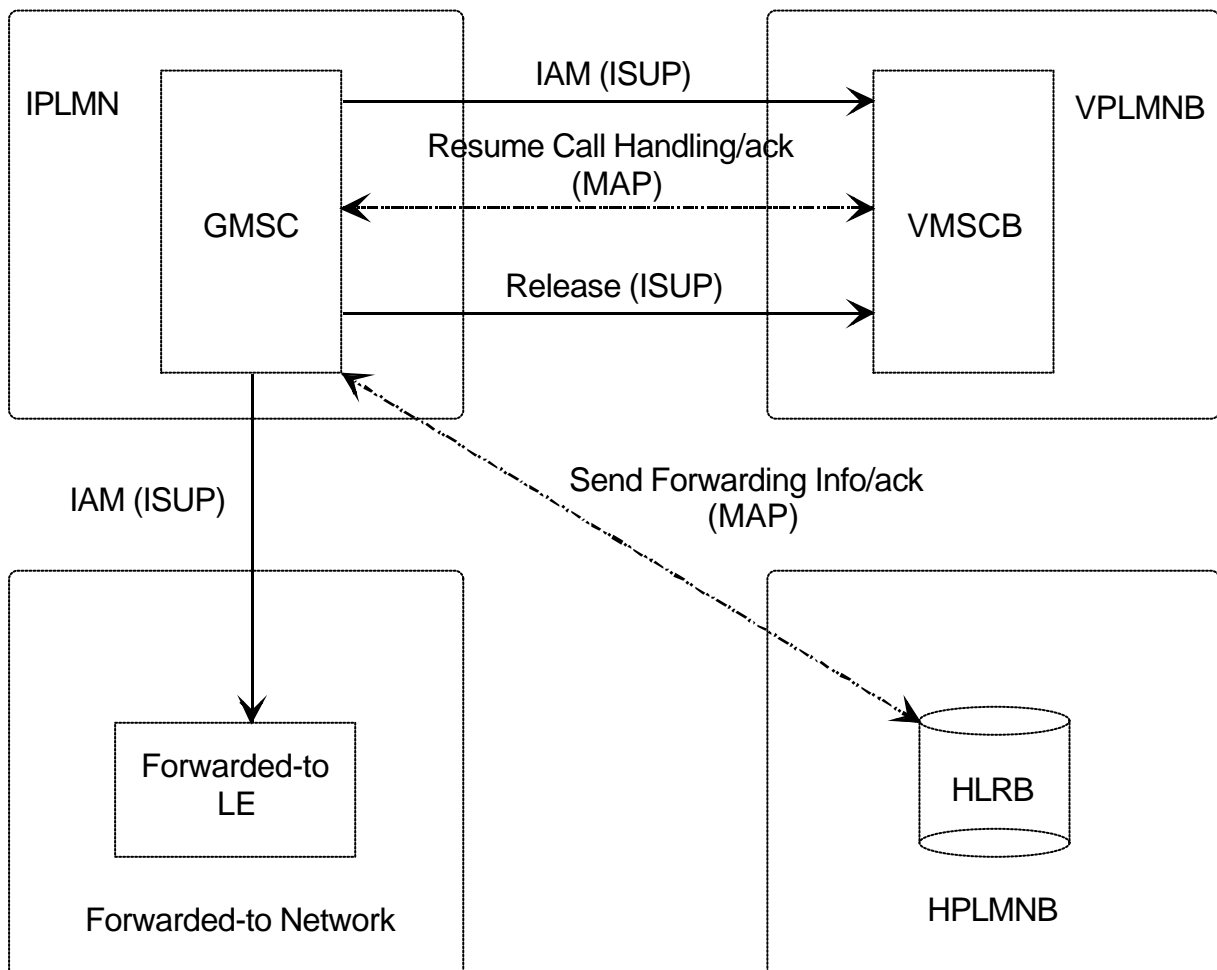


Figure 2: Architecture for optimal routing of late call forwarding

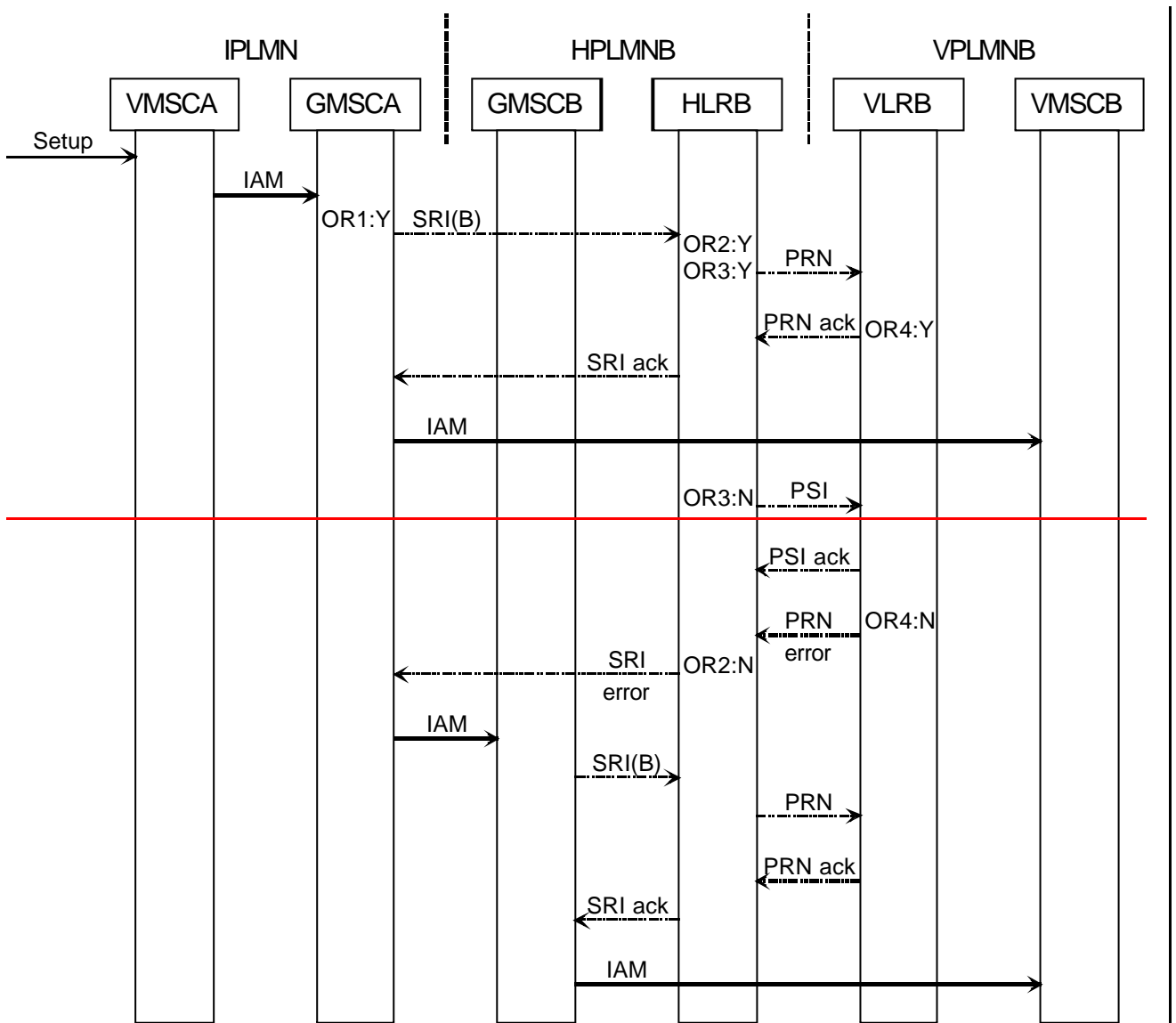
After the call has been extended from the GMSC to VMSCB, if the VMSC/VLR determines that the call should be forwarded it requests the GMSC to resume call handling. The GMSC uses the forwarding information received in the request to resume call handling, or interrogates HLRB for forwarding information, depending on the indication received from the HLR with the roaming number. If the GMSC determines that the call can be routed directly to the forwarded-to destination without contravening the charging requirements for optimal routing given in subclause 9.1 it acknowledges the request, clears the traffic connection to VMSCB and sends an ISUP IAM to the forwarded-to local exchange.

5 Optimal routeing for basic mobile-to-mobile calls: message flows

It is a network operator option whether to implement optimal routeing for basic mobile -to-mobile calls.

This clause does not consider the handling of calls to a fixed network B subscriber.

The message flow for an optimally routed call from one mobile subscriber to another mobile subscriber is shown in figure 3. For simplicity of description, it is assumed that forwarding of calls from the B subscriber is not required. Solid lines indicate circuit-associated signalling; dashed lines indicate connectionless signalling.



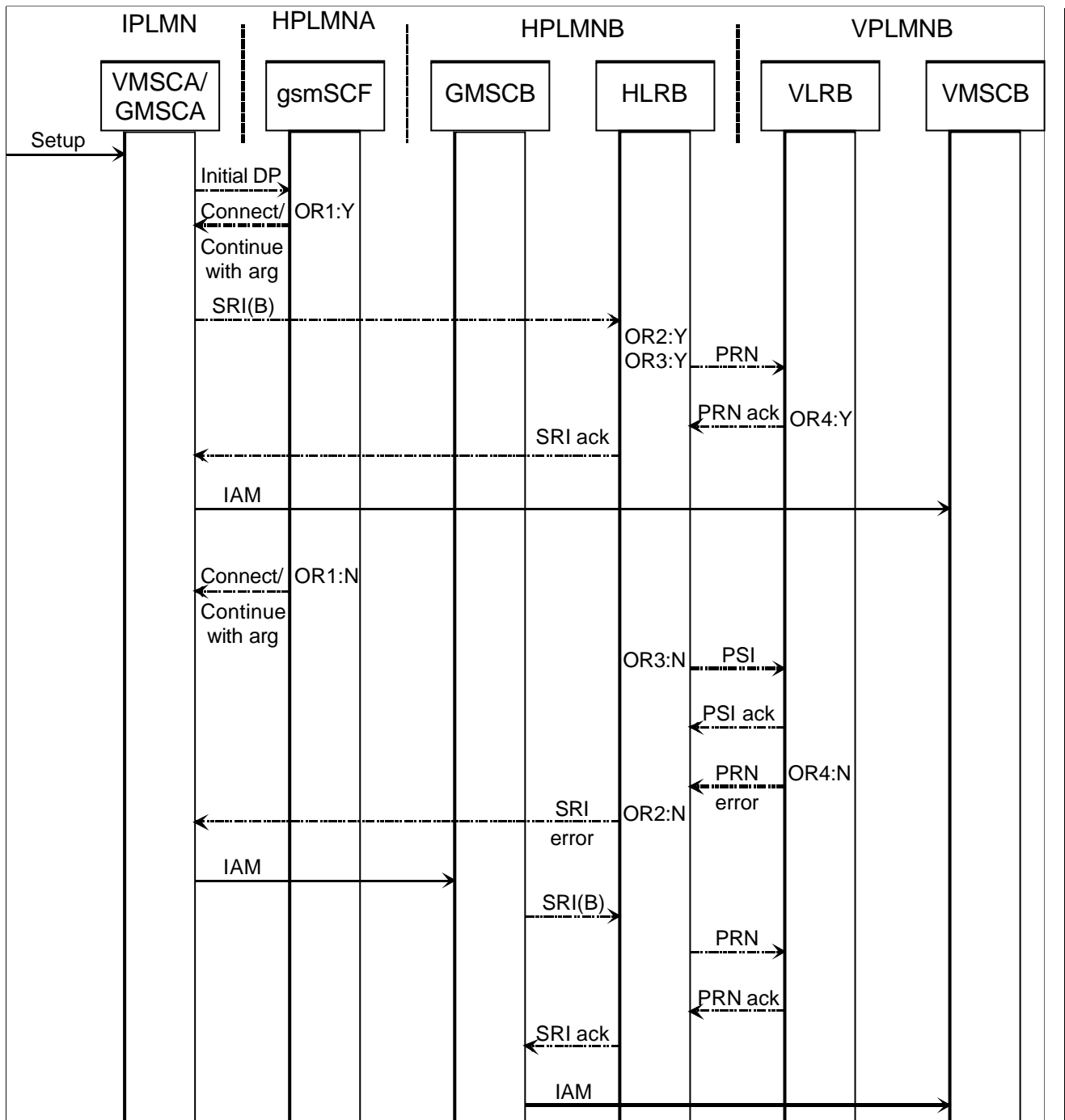


Figure 3: Message flow for optimal routing of basic mobile-to-mobile call

5.1 Successful outcome

When VMSCA receives a Setup message from the MS, it sends a request for information to handle the outgoing call to VLRA, according to the procedures described in 3GPP TS 23.018 [6]. If VLRA determines that the MS is allowed service, it returns a positive acknowledgement, including an indication that the subscriber has a CAMEL subscription, so that VMSCA will request instructions via the gsmSSF (not shown in this diagram) from the gsmSCF. When VMSCA receives the acknowledgement, it constructs an IAM using the B subscriber address and sends it to GMSCA.

If GMSCA the gsmSCF recognises the B subscriber address as belonging to a UMTS or GSM PLMN (decision OR1:Y), it sends a Connect message or a Continue with Argument message, containing an indication that the call is eligible for optimal routing, to VMSCA. This causes VMSCA to route the call to the associated GMSC function (GMSCA). GMSCA checks the identity of HPLMNB. If GMSCA is in a different PLMN from HLRB, it then sends a request for routing information (SRI(B)) to HLRB; this request contains an indication that it is an optimal routing

enquiry for information to route a basic call. If HLRB is prepared to accept an optimal routing enquiry from GMSCA (decision OR2:Y), it checks whether at least one of the three conditions:

- the GMSC is in the same country as VMSCB;
- the HLR is in the same country as VMSCB;
- the GMSC is in the same PLMN as the HLR;

is met. If it is (decision OR3:Y), HLRB sends a request for a roaming number (PRN) to VLRB; the request contains an indication that it is for an optimally routed call. If VLRB supports optimal routing (decision OR4:Y), it returns the roaming number in the PRN ack, and HLRB relays the roaming number in the SRI ack to GMSCA. GMSCA constructs an ISUP IAM using the roaming number, and sends it to VMSCB, which processes the incoming IAM according to the procedures described in [3GPP TS 23.018](#) [6].

5.2 Unsuccessful outcome

Error situations which lead to failure of the call, rather than non-optimal routing, are not described in this subclause.

5.2.1 B subscriber address not recognised as belonging to a UMTS or GSM PLMN

If ~~GMSCA does not support optimal routing for basic mobile-to-mobile calls, or~~ the gsmSCF does not recognise the B subscriber address as belonging to a UMTS or GSM PLMN (decision OR1:N), it sends a Connect or Continue with argument message, omitting the indication that the call is eligible for optimal routing. VMSCA constructs an IAM using the B subscriber address and sends it to GMSCB in HPLMNB. GMSCB analyses the address received in the IAM, and sends a request for routing information (SRI(B)) to HLRB; this request contains an indication that it is not an optimal routing enquiry. Because GMSCB is in the same PLMN as HLRB, it will always be able to derive an HLR address. HLRB sends a request for a roaming number (PRN) to VLRB. VLRB returns the roaming number in the PRN ack, and HLRB relays the roaming number in the SRI ack to GMSCB. GMSCB constructs an ISUP IAM using the roaming number, and sends it to VMSCB, which processes the incoming IAM according to the procedures described in ~~3G~~ [3GPP TS 23.018](#) [6].

5.2.2 HLRB or VLRB does not support optimal routing

If HLRB is not prepared to accept an optimal routing enquiry from GMSCA, because:

- it does not support optimal routing for basic mobile-to-mobile calls, or
- because there is no agreement for optimal routing for basic mobile-to-mobile calls between the operators of GMSCA and HLRB, or [CR editor's note: this paragraph has been reformatted with style B1]
- because optimal routing of basic mobile-to-mobile calls to the specific B subscriber is not allowed;

(decision OR2:N), it returns an SRI negative response (shown in figure 3 as 'SRI error'). This causes GMSCA to construct an IAM using the B subscriber address and send it to GMSCB, as described in subclause 5.2.1.

If VLRB does not support optimal routing (decision OR4:N), it returns a PRN negative response (shown in figure 3 as 'PRN error'). This causes HLRB to return an SRI negative response (shown in figure 3 as 'SRI error'), which in turn causes GMSCA to construct an IAM using the B subscriber address and send it to GMSCB, as described in subclause 5.2.1.

****** Next modified section ******

7.1 Call forwarding

If an optimally routed call encounters early call forwarding, GMSCA attempts to route the call to the forwarded-to destination. The forwarded-to destination is the C subscriber if the C subscriber is not a mobile subscriber, or the HPLMN of the C subscriber if the C subscriber is a mobile subscriber. If GMSCA cannot route the call to the

forwarded-to destination without contravening the charging requirements for Support of Optimal Routeing given in subclause 9.1, the call is routed to a GMSC in the HPLMN of the B subscriber.

If an optimally routed call encounters late call forwarding, GMSCA attempts to route the call to the forwarded-to destination. The forwarded-to destination is the C subscriber if the C subscriber is not a mobile subscriber, or the HPLMN of the C subscriber if the C subscriber is a mobile subscriber. If GMSCA cannot route the call to the forwarded-to destination without contravening the charging requirements for Support of Optimal Routeing given in subclause 9.1, the call is routed from VMSCB to the forwarded-to destination.

The handling of call forwarding at HLRB for optimally routed calls is encapsulated in the procedures First_Forwarding_HLR, PRN_Error_HLR, Handle_CFB, Handle_CFNRC and Handle_CFNRY, which are specified in ~~3G-3GPP~~ TS 23.018 [6].

7.2 Closed User Group (CUG)

The handling of CUG checking for outgoing calls at VLRA is encapsulated in the process OCH_VLR, which is specified in ~~3G-3GPP~~ TS 23.018 [6].

The handling of CUG checking at HLRB is encapsulated in the procedures Subscription_Check_HLR and Forward_CUG_Check, which are specified in ~~3G-3GPP~~ TS 23.018 [6].

****** Next modified section ******

7.4 Call barring

It has been accepted in principle that all supplementary service call barring programmes except for BAIC are applied for cost control reasons, and that therefore barring should be applied on the basis of the cost of the actual route taken by the call. For phase 1 of Support of Optimal Routeing, this principle does not apply. Barring of outgoing calls is applied on the basis of the B subscriber number. Barring of all incoming calls will prevent a call to the served mobile subscriber, whether or not the call is optimally routed. If Barring of Incoming Calls when roaming outside the home PLMN country is active and operative it will prevent a call to the B subscriber even if the A subscriber pays to route the call to the VMSC of the B subscriber.

The handling of barring of outgoing calls at VLRA is encapsulated in the process OCH_VLR, which is specified in ~~3G-3GPP~~ TS 23.018 [6].

The handling of barring of incoming calls at HLRB is encapsulated in the procedure Subscription_Check_HLR, which is specified in ~~3G-3GPP~~ TS 23.018 [6].

The interactions between barring of outgoing calls and call forwarding for phase 1 of Support of Optimal Routeing are defined in ~~3G-3GPP~~ TS 22.082 [4].

The interactions between BIC-Roam and call forwarding for phase 1 of Support of Optimal Routeing are defined in ~~3G-3GPP~~ TS 22.082 [4].

7.5 Other supplementary services

The effects of the following supplementary services on optimally routed calls are identical to their effects on non-optimally routed calls, so they are omitted from the present document:

- CLIP, CLIR, COLP, COLR (~~3G-3GPP~~ TS 23.081);
- CW, HOLD (~~3G-3GPP~~ TS 23.083);
- MPTY (~~3G-3GPP~~ TS 23.084);
- ECT (~~3G-3GPP~~ TS 23.091).

****** Next modified section ******

8.2 CAMEL

The principles for interactions between CAMEL services and optimal routing are specified in this subclause. The interworking between CAMEL processing and optimal routing in the GMSC and the terminating VMSC is specified in subclause 9.4 and ~~3G-3GPP~~ TS 23.018 [6].

If a mobile-originating CAMEL service modifies the number entered by the A subscriber, VMSCA treats the number returned by the ~~CAMEL server~~ gsmSCF in the same way as a number received in the SETUP message, i.e.:

- ~~If the gsmSCF indicated that the call is eligible for optimal routing, VMSCA~~ it sends an IAM a signal containing the modified number to the associated GMSC, which analyses it to find if it is an MSISDN sends a request for routing information to the appropriate HLR;
- ~~If the gsmSCF did not indicate that the call is eligible for optimal routing, VMSCA sends an IAM containing the modified number to a GMSC in HPLMNB, which sends a request for routing information to the appropriate HLR.~~

If a mobile-terminating CAMEL service modifies the number received by the GMSC, the GMSC treats the number returned by the CAMEL server in the same way as a forwarded-to number, i.e. it checks it against the optimal routing criteria in subclause 9.1 but does not analyse it to find if it can derive an HLR address. If the number returned by the CAMEL server does not satisfy the optimal routing criteria in subclause 9.1 and the GMSC is not in the same PLMN as HLRB, the GMSC will route the call to a GMSC in the same PLMN as HLRB. This will lead to a repetition of the mobile terminating CAMEL interaction.

If the call is to be forwarded at the GMSC (whether by a UMTS-standardised call forwarding service or by a CAMEL-based call forwarding service) and a mobile originating CAMEL service applies to the forwarding subscriber, the GMSC checks the number which results from the CAMEL service against the optimal routing criteria in subclause 9.1. If the number returned by the CAMEL server does not satisfy the optimal routing criteria in subclause 9.1, the GMSC will not route the call to the forwarded-to destination. For early call forwarding, the GMSC will route the call to a GMSC in the same PLMN as HLRB. This will lead to a repetition of the mobile originating CAMEL interaction. For optimal routing of late call forwarding, the GMSC will return a Resume Call Handling negative response towards VMSCB, which will forward the call. This will lead to a repetition of the mobile originating CAMEL interaction.

****** Next modified section ******

9.2 Functional behaviour of VMSCA

The functional behaviour of VMSCA is specified in ~~3G-3GPP~~ TS 23.018 [6]. The only functions ~~is~~ are specific to optimal routing ~~is~~ are:

- Routing the call to the associated GMSC function if the gsmSCF indicates that the call is eligible for optimal routing;
- ~~†~~ The transfer of the destination address, if it is received in the ISUP Answer message indication of the answer event, to the call data record, to allow the correct charge for the call to be made. This function is required only if VMSCA supports optimal routing of mobile-to-mobile calls.

9.3 Functional behaviour of VLRA

The functional behaviour of VLRA is specified in ~~3G-3GPP~~ TS 23.018 [6].

9.4 Functional behaviour of GMSC

It should be noted that if a call is being forwarded from VMSCB rather than from the MSC which acted as GMSC for the original call then VMSCB may use the services of an associated GMSC for the forwarding leg, i.e. the associated GMSC requests routing information from HLRC. In this case, the forwarding leg is processed in the same way as a mobile-originated call from mobile subscriber B.

The functional behaviour of a GMSC is specified in ~~3G-3GPP~~ TS 23.018 [6]. The procedures specific to Support of Optimal Routeing are specified in this subclause.

****** Next modified section ******

9.4.2 Procedure OR_Handle_RCH

Sheet 1: the procedure Activate_CF_Process is specified in ~~3G-3GPP~~ TS 23.018 [6].

Sheet 1: if the GMSC interrogates the HLR for a Forwarded-to number, the Routeing address is the Forwarded-to number received in the Send Routeing Info ack; otherwise the Routeing address is the Forwarded-to number received in the Resume Call Handling.

Sheet 2: the procedure CAMEL_MT_GMSC_Notify_CF is specific to CAMEL phase 2 or higher; it is specified in ~~3G-3GPP~~ TS 23.078 [7]. If the GMSC does not support CAMEL phase 2 or higher, processing continues from the "Continue" exit of the test "Result".

Sheet 2: the task "Destination address:=FTN" is executed only if the GMSC supports optimal routeing of basic mobile-to-mobile calls.

Sheet 2: the process MT_CF_MSC is specified in ~~3G-3GPP~~ TS 23.018 [6].

Sheet 2: the procedure UUS_GMSC_Check_Forwarding is specific to UUS; it is specified in ~~3G-3GPP~~ TS 23.087 [9].

Sheet 2: the procedure CAMEL_Store_Destination_Address is specific to CAMEL phase 3; it is specified in ~~3G-3GPP~~ TS 23.078 [7].

Sheet 2: the called party address sent in the IAM to the process MT_CF_MSC is the Forwarded-to number received in the Perform Call Forwarding ack.

****** Next modified section ******

9.5 Functional behaviour of HLR

The functional behaviour of an HLR is specified in ~~3G-3GPP~~ TS 23.018 [6]. The procedures specific to Support of Optimal Routeing are specified in this subclause.

9.5.1 Procedure OR_HLR_CF

Sheet 1: if the HLR does not support optimal routeing of basic mobile-to-mobile calls, the test "Optimal routeing allowed" takes the "No" exit.

Sheet 2: the procedures Handle_CFB, Handle_CFNRC and Handle_CFNRY are specified in ~~3G-3GPP~~ TS 23.018 [6].

9.5.2 Procedure OR_HLR_Interrogate_VLR

If the HLR does not support optimal routeing of basic mobile-to-mobile calls, this procedure will be executed only if the Send Routeing Info was from a GMSC in the same PLMN as the HLR, i.e. this was not an Optimal Routeing enquiry.

The procedure Handle_CFNRC is specified in ~~3G-3GPP~~ TS 23.018 [6].

****** Next modified section ******

9.6.1 Functional behaviour of VLRB for provision of subscriber information

The functional behaviour of VLRB for provision of subscriber information is specified in ~~3G-3GPP~~ TS 23.018 [6].

9.6.2 Functional behaviour of VLRB for roaming number allocation

The functional behaviour of VLRB for roaming number allocation is specified in ~~3G-3GPP~~ TS 23.018 [6]. The only function specific to Support of Optimal Routeing is the storage of the OR indicator, the 'OR not supported in GMSC' indicator, the GMSC address and the call reference number if VLRB receives them in the Provide Roaming Number request.

9.6.3 Functional behaviour of VLRB when handling an incoming call

The functional behaviour of VLRB when handling a request for information to handle an incoming call is specified in ~~3G-3GPP~~ TS 23.018 [6]. The only functions specific to Support of Optimal Routeing are:

- the inclusion in the Complete Call or Process Call Waiting, if the call is to be offered to the B subscriber, of the OR indicator and the GMSC address if VLRB received them in the Provide Roaming Number request;
- the inclusion in the Send Info For Incoming Call response, if the call is to be forwarded, of:
 - the OR indicator, the 'OR not supported in GMSC' indicator, the GMSC address and the call reference number if VLRB received them in the Provide Roaming Number request;
 - the basic service which applies for this call.

9.7 Functional behaviour of VMSCB

The functional behaviour of VMSCB when it handles an incoming call is described in ~~3G-3GPP~~ TS 23.018 [6]. The procedure specific to Support of Optimal Routeing is specified in this subclause.

9.7.1 Procedure Handle_ORLCF_VMSC

The procedure UUS_ICH_Handle_LCF is specific to UUS; it is specified in ~~3G-3GPP~~ TS 23.087 [9].

****** Next modified section ******

10 Contents of messages

This clause specifies the changes to the content of each message shown in clauses 5, 6 and 9, including those messages which are already specified for UMTS but which require changes for Optimal Routeing. It should be read as a 'delta' on the corresponding clause of ~~3G-3GPP~~ TS 23.018 [6]; those information elements which are the same for SOR as for the basic call without OR are not specified in this clause.

In the tables which follow, information elements are shown as mandatory (M) or conditional (C). 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.

10.1 Messages on the B interface (MSC-VLR)

10.1.1 Send Info For Outgoing Call

This message is specified in ~~3G-3GPP~~ TS 23.018 [6].

10.1.2 Send Info For Outgoing Call negative response

This message is specified in ~~3G-3GPP~~ TS 23.018 [6].

10.1.3 Send Info For Incoming Call

This message is specified in [3G-3GPP](#) TS 23.018 [6].

10.1.4 Send Info For Incoming Call ack

This message is specified in [3G-3GPP](#) TS 23.018 [6]. The following additional information elements are required:

Information element name	Required	Description
OR indicator	C	Indicates whether the call has been routed directly from a GMSC not in the same PLMN as the HLR. Shall be present if it was received in the Provide Roaming Number, otherwise shall be absent.
GMSC address	C	E.164 address of the GMSC. Shall be present if it was received in the Provide Roaming Number, otherwise shall be absent.
Call reference number	C	Call reference number used by the GMSC for this call. Shall be present if it was received in the Provide Roaming Number, otherwise shall be absent.
Originating CSI	C	Originating CAMEL subscription information. Shall be present if the B subscriber has subscribed to originating CAMEL service and VMSCB supports CAMEL; otherwise shall be absent.
OR not supported in GMSC	C	Indicates that the GMSC does not support Optimal Routeing. Shall be present if it was received in the Provide Roaming Number, otherwise shall be absent.

10.1.5 Send Info For Incoming Call negative response

This message is specified in [3G-3GPP](#) TS 23.018 [6].

10.1.6 Complete Call

This message is specified in [3G-3GPP](#) TS 23.018 [6]. The following additional information elements are required:

Information element name	Required	Description
OR indicator	C	Indicates whether the call has been routed directly from a GMSC not in the same PLMN as the HLR. Shall be present if it was received in the Provide Roaming Number, otherwise shall be absent.
GMSC address	C	E.164 address of the GMSC. Shall be present if it was received in the Provide Roaming Number, otherwise shall be absent.

10.1.7 Process Call Waiting

This message is specified in [3G-3GPP](#) TS 23.018 [6]. The following additional information elements are required:

Information element name	Required	Description
OR indicator	C	Indicates whether the call has been routed directly from a GMSC not in the same PLMN as the HLR. Shall be present if it was received in the Provide Roaming Number, otherwise shall be absent.
GMSC address	C	E.164 address of the GMSC. Shall be present if it was received in the Provide Roaming Number, otherwise shall be absent.

10.2 Messages on the C interface (MSC-HLR)

10.2.1 Send Routeing Info

This message is specified in [3G-3GPP](#) TS 23.018 [6]. The following additional information elements are required:

Information element name	Required	Description
Interrogation type	M	Indicates the type of interrogation: basic(for routeing information for an MT call) or forwarding (when the GMSC has been asked to resume call handling for OR of late call forwarding).
OR interrogation indicator	C	Indicates that the interrogation is from a GMSC not in the same PLMN as the HLR. Shall be present if the interrogation is from a GMSC not in the same PLMN as the HLR, otherwise shall be absent.
OR capability	C	Indicates the phase of OR which the GMSC supports. Shall be present if the GMSC supports OR, otherwise shall be absent.
GMSC address	M	E.164 address of the GMSC.
Call reference number	C	Call reference number used by the GMSC for this call. Shall be present if the interrogation type=basic call, otherwise shall be absent.
Forwarding reason	C	Indicates the reason for forwarding (on busy, on no subscriber reply, or on mobile subscriber not reachable). Shall be present if the Interrogation type=forwarding, otherwise shall be absent.
Basic service group	C	Basic service group which applies for this call. Shall be present if the Interrogation type=forwarding, otherwise shall be absent.

10.2.2 Send Routeing Info ack

This message is specified in [3G-3GPP](#) TS 23.018 [6]. Two new information elements are required, and the condition for the presence of one existing information element is changed, as shown in the following table.

Information element name	Required	Description
Forwarding interrogation required	C	Indicates that the GMSC shall interrogate the HLR for routeing information for late call forwarding. Shall be present if the SRI ack contains an MSRN and GMSC has to interrogate the HLR for routeing information for late call forwarding, otherwise shall be absent.
VMSC address	C	E.164 address of the VMSC in whose area the B subscriber is currently registered. Shall be present in the Send Routeing Info ack if the OR interrogation indicator in the Send Routeing Info was present and the HLR supports optimal routeing of basic mobile-to-mobile calls and the HLR has not determined that the call is to be forwarded, otherwise shall be absent.
Roaming number	C	E.164 address required to route the call to the VMSC of the B party. Shall be present in the Send Routeing Info ack which is sent in response to a Send Routeing Info with Interrogation type=basic if the HLR has determined that the charging requirements for optimal routeing are not contravened and that the call is not to be forwarded, otherwise shall be absent.

10.2.3 Send Routeing Info negative response

This message is specified in [3G-3GPP](#) TS 23.018 [6]. The negative response information element can take the following values in addition to those specified in [3G-3GPP](#) TS 23.018 [6]:

- OR not allowed.
- Busy subscriber.
- No subscriber reply.

10.3 Messages on the D interface (VLR-HLR)

10.3.1 Provide Roaming Number

This message is specified in [3G-3GPP](#) TS 23.018 [6]. The following additional information elements are required:

Information element name	Required	Description
GMSC address	C	E.164 address of the GMSC. Shall be present if it was received by the HLR in the Send Routeing Info, otherwise shall be absent.
Call reference number	C	Call reference number used by the GMSC for this call. Shall be present if it was received by the HLR in the Send Routeing Info, otherwise shall be absent.
OR interrogation indicator	C	Indicates that the HLR received the corresponding Send Routeing Info from a GMSC not in the same PLMN as the HLR. Shall be present if the HLR received the Send Routeing Info from a GMSC not in the same PLMN as the HLR, otherwise shall be absent.
OR not supported in GMSC	C	Indicates that the GMSC does not support OR, and that RCH shall not be sent. Shall be present if the HLR received the Send Routeing Info from the GMSC without the OR-capability information Element, otherwise shall be absent.

10.3.2 Provide Roaming Number ack

This message is specified in [3G-3GPP](#) TS 23.018 [6].

10.3.3 Provide Roaming Number negative response

This message is specified in [3G-3GPP](#) TS 23.018 [6].

10.3.4 Provide Subscriber Information

This message is specified in [3G-3GPP](#) TS 23.018 [6].

10.3.5 Provide Subscriber Information ack

This message is specified in [3G-3GPP](#) TS 23.018 [6].

10.4 Messages on the E interface (MSC-MSC)

10.4.1 Resume Call Handling

The following information elements are required:

Information element name	Required	Description
Call reference number	M	Call reference number used by the GMSC for this call.
Forwarding reason	M	Indicates the reason for forwarding (on call deflection, on busy, on no subscriber reply, or on mobile subscriber not reachable).
Basic service group	M	Basic service group which applies for this call.
IMSI	M	IMSI of the B subscriber.
Forwarded-to number	M	E.164 number of the C subscriber.
Notification to calling party	M	Indication of whether the calling party is to be notified that the call has been forwarded.
Forwarded-to subaddress	C	Subaddress of the C subscriber (see 3G 3GPP TS 23.003 [5]). Shall be present if a forwarded-to subaddress is stored in the VLR in association with the forwarded-to number; otherwise shall be absent.
Redirecting presentation	C	Indication of whether the MSISDN of the B subscriber shall be presented to the C subscriber. Shall be present if VMSCB supports the handling of the redirecting number, otherwise shall be absent.
MSISDN	C	E.164 number which identifies the B subscriber. It will be used to create the redirecting number presented to the C subscriber. Shall be present if VMSCB supports the handling of the redirecting number, otherwise shall be absent.
CUG interlock	C	For the definition of this IE, see 3G 3GPP TS 23.085 [8]. Shall be present if the VLR has determined that the forwarded call is to be treated as a CUG call in accordance with the rules in 3G 3GPP TS 23.085 [8], otherwise shall be absent.
CUG outgoing access	C	For the definition of this IE, see 3G 3GPP TS 23.085 [8]. Shall be present if the VLR has determined that the forwarded call is to be treated as a CUG call with outgoing access in accordance with the rules in 3G 3GPP TS 23.085 [8], otherwise shall be absent.
Originating CSI	C	Originating CAMEL subscription information excluding triggering criteria. Shall be present if the B subscriber has subscribed to originating CAMEL service, VMSCB supports CAMEL and the triggering criteria are satisfied for the forwarding leg; otherwise shall be absent.

****** Next modified section ******

Annex A (informative): Handling of an IAM at an MSC

An MSC which receives an IAM from an originating exchange may react in three different ways:

- It acts as a transit exchange, i.e. it relays the IAM to a destination exchange determined by analysis of the called party address, and thereafter relays other ISUP signalling between the originating and destination exchange until the connection is released. This behaviour is not specific to UMTS or GSM.
- It acts as a terminating exchange, i.e. it attempts to connect the call to an MS currently registered in the service area of the MSC.
- It acts as a GMSC, i.e. it interrogates an HLR for information to route the call. If the HLR returns routing information, the MSC uses the routing information from the HLR to construct an IAM, which it sends to a destination exchange determined by analysis of the routing information from the HLR.

The method which the MSC uses to determine how to handle the IAM is described in ~~3G~~3GPP TS 23.018 [6]. However, the number analysis required to derive the address of an HLR in a different PLMN from the MSC is much more extensive than that required to derive the address of an HLR in the same PLMN as the MSC - the MSC needs to be able to recognise the combination of country code and national destination code for every subscriber of every PLMN

to which calls are to be optimally routed. In order to avoid the need to maintain the tables required to support this extensive number analysis, and the run-time processing load of performing the number analysis, optimal routing of mobile-to-mobile calls is handled as a mobile originating CAMEL service; the gsmSCF analyses the destination address (after possible modification of the number by other MO CAMEL services) to determine whether the call is eligible for optimal routing. If the call is eligible for optimal routing, the gsmSCF indicates this to VMSCA, which routes the call to an associated GMSC function, which in turn sends a request for routing information to the appropriate HLR.

~~A PLMN operator may decide to implement the ability to recognise a called party address as belonging to a UMTS or GSM PLMN which is not the PLMN of the MSC in only a subset of the MSCs in his PLMN. Other MSCs will route international calls to one of the MSCs which have the capability for extra number analysis.~~

When a GMSC has interrogated an HLR and received an MSRN, the GMSC may need to route the call to the HPLMN of the called subscriber. If the call is routed through an MSC which has the capability to analyse an address to derive an HLR address, a method must be provided to prevent the transit MSC from performing a further interrogation of the HLR, using the MSRN as an MSISDN. The method used to prevent this further interrogation is a matter for the PLMN operator.

****** End of document ******