



## **Guidelines and Testing for Optimal Routing - Service definition (Stage 1 Testing)**

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*This is a Non-binding Permanent Reference Document of the GSMA*

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# 1 Introduction

## 1.1 Scope of document

This document is the specification of MoU-IREG End-to-end Functional Capability tests relating to the international roaming of a Mobile Station, belonging to a home PLMN (a), to and within a visited PLMN (b) in case of Support of Optimal Routing (SOR).

The tests specified here do not replace the End-to-end Functionality Capability [IREG PRDIR24], because not all PLMNs will support OR. This document represents rather an extension of the IR.24 tests. The tests should be done after successful Stage4 testing.

Whilst it is expected that roaming will be a bilateral activity between two PLMNs, please note that this document is written in an unidirectional context. Hence Roaming is taking place by a MS (a) to VPLMN (b) only. There is no reference to a Mobile Station MS (b) visiting PLMN (a).

To complete MoU-IREG End-to-end Functional Capability tests for bilateral roaming, it is necessary to perform the tests in this document twice: the second time the real identities of PLMN (a) and PLMN (b) are swapped.

This document does not cover:

- SCCP testing [IREG PRD IR25]
- Exchange of PLMN numbering, addressing and routing data [IREG PRD IR23]
- testing of Transferred Account Procedure, billing applications and any inter-PLMN financial statement; [TADIG PRD TD06]. However the production of a Toll Ticketing file, for use in the MoU-TADIG Stage 3 testing is included.
- definition of operation and maintenance procedures such as contact points for fault reporting and notification of planned works. [IREG PRD IR23]
- IR24 International Roaming testing [IREG PRD IR24]
- IR32 CAMEL International Roaming testing [IREG PRD IR32]CAMEL

The Scope of this issue of the document extends to SOR Stage1.

## 1.2 Definitions and Abbreviations

### 1.2.1 Definitions

- **A subscriber:** The calling subscriber, who may be fixed or mobile.
- **B subscriber:** The mobile subscriber originally called by the A subscriber.
- **C subscriber:** The subscriber to whom the B subscriber has requested that calls be forwarded. The C subscriber may be fixed or mobile.
- **Direct route:** A call takes the direct route if the route from the serving PLMN of the A subscriber to the serving PLMN of the B subscriber is defined by the MSRN of the B subscriber rather than by the MSISDN of the B subscriber.
- **Early Call Forwarding :** Early Call Forwarding is Call Forwarding performed from the IPLMN before the call has been extended to the VPLMN of the forwarding subscriber (i.e. Call Forwarding Unconditional and Conditional Call Forwarding on Not Reachable known at the IPLMN before extension of the call)

- **HPLMN leg:** The portion of the HPLMN route from the serving MSC of the A subscriber to an MSC in the HPLMN of the B subscriber.
- **HPLMN route:** A call takes the HPLMN route if the route from the serving MSC of the A subscriber to the serving MSC of the B subscriber is defined by the MSISDN of the called subscriber. This forces the call to be routed via the HPLMN of the B subscriber.
- **Interrogating PLMN (IPLMN):** The PLMN which interrogates the HPLMN of the B subscriber to obtain information to route the call to that subscriber or to the forwarded-to destination defined by the called mobile subscriber. The IPLMN is also the VPLMN of the A subscriber.
- **Late Call Forwarding:** Late Call Forwarding is Call Forwarding performed after the call has been extended to the VPLMN of the forwarding subscriber (i.e. Conditional Call Forwarding on Busy, Conditional Call Forwarding on No Reply and Conditional Call Forwarding on Not Reachable detected in the VPLMN of the forwarding subscriber). Late Call Forwarding may be invoked in the IPLMN or in the VPLMN of the forwarding subscriber.
- **Reference address:** The address which defines the maximum charge which the A party is prepared to pay for the call leg which he originates.
- **Routing address:** The address which the GMSC uses to route a call towards the B subscriber or the C subscriber.

### 1.3 Abbreviations

Term	Description
FTN	Forwarded-To Number
GMSCA	The GMSC in the IPLMN, which may also be VMSCA
GMSCB	The GMSC in HPLMNB
GMSCC	The GMSC in HPLMNC
HLRB	The HLR of the B subscriber
HLRC	The HLR of the C subscriber
HPLMNB	The HPLMN of the B subscriber
HPLMNC	The HPLMN of the C subscriber
IAM	Initial Address Message
IPLMN	Interrogating PLMN
ORLCF	Optimal Routing for Late Call Forwarding
PRN	Provide Roaming Number
PSI	Provide Subscriber Information
RCH	Resume Call Handling
SIFIC	Send Information For Incoming Call
SIFOC	Send Information For Outgoing Call
SRI(B)	Send Routing Information (Basic call)
SRI(F)	Send Routing Information (Forwarding information)
VLRA	The VLR of the A subscriber

Term	Description
VLRB	The VLR of the B subscriber
VMSCA	The VMSC of the A subscriber
VMSCB	The VMSC of the B subscriber

## 1.4 Description of Optimal Routing

Support of Optimal Routing (SOR) is a network feature which enables the calls directed to a mobile subscriber to be routed directly to the mobile subscriber's actual location, or to her forwarded-to destination (instead of via the HPLMN or in the case of Late Call Forwarding via the VPLMN).

The IPLMN handling the call shall decide whether or not to optimize the routing of the call taking into account information provided by the called mobile subscriber's HPLMN. For given subscribers, as a network option, the HPLMN may permit or deny OR on a per call basis.

### 1.4.1 Objective of Tests

The fundamental objective of this testing is to confirm the capability of SOR services which GSM users will receive when roaming from their Home PLMN (a) to VPLMN (b).

Consequently the tests are restricted to top-level capability testing.

Because the testing is at a top-level, its scope includes checking the correct working of SOR features

The overall objective of the tests is to confirm that the SOR functions and features, which are already known to operate correctly within each separate PLMN, will also operate correctly for Inter-PLMN roaming.

This standard specifies the technical realization of the first phase of the network feature Support of Optimal Routing (SOR). The first phase of SOR provides:

- as a network operator option, a method to route a call from one mobile subscriber directly to another mobile subscriber who is in the same country as the calling mobile subscriber or in the called mobile subscriber's home country, without needing to connect the call via the HPLMN of the called subscriber, even though the called mobile subscriber has roamed outside his HPLMN;
- a method to forward calls when a called mobile subscriber who has roamed outside his home country is busy, or is not reachable, or does not reply, to a forwarded-to destination in the HPLMN country of the called subscriber or the VPLMN country of the called subscriber, without needing to connect the forwarded call via the VPLMN of the called subscriber;
- a method to combine the optimal routing described in the first bullet point above with the optimal routing described in the second bullet point above.

OR of a call is permitted only if all entities involved in handling the call support OR.

- Other cases of optimal routing (e.g. calls where the calling and called subscribers are in different countries, forwarding to a mobile subscriber or multiple forwarding) will be considered for inclusion in later phases.

## 1.5 Functional requirements

### 1.5.1 General

SOR shall be provided for all circuit switched Telecommunication Services, except emergency calls, Dedicated PAD and Dedicated Packet Access (GPRS is for further study).

The network feature shall be applied automatically for all calls except for those calls for which the HPLMN of the called party denies the optimal routing.

### 1.5.2 Normal operation

In the first phase of SOR, the routes of calls will be optimized for the cases of OR being performed within a country or towards the country where the call would have been routed normally.

Under all other circumstances, the GSM basic call routing is applied:

- If the HPLMN detects that SOR cannot be applied (e.g. calls to the specified subscriber are not allowed to be optimally routed), HPLMN sends an SRI\_Ack negative response to the IPLMN and IPLMN routes the call according to the dialled number
- If the IPLMN detects that basic OR cannot be applied, the IPLMN routes the call according to the dialled number.
- If the IPLMN detects that OR for Late Call Forwarding cannot be applied, the Call Forwarding will be performed in the VPLMN of the forwarding subscriber.

If the serving network of the ultimate destination supports SOR, the serving network of the caller shall be able to indicate to the network visited by the ultimate destination that the call has been optimally routed and to indicate the originating PLMN of the optimally routed leg.

The complete set of scenarios included in phase 1 of SOR is described below.

If one of those scenarios occurs, SOR shall be invoked.

The assumptions taken are the following :

- A subscriber A sets up a call to a mobile subscriber B, who may have forwarded her calls to a subscriber C.
- The C subscriber may be either a fixed subscriber or a mobile subscriber.

## 1.6 Strategy for Testing

In order to maximize the efficiency of testing, the test cases have been drawn up so as to minimize the requirement for simultaneous joint activity by both PLMN (a) and PLMN (b).

Accordingly, the program of testing forms three distinct components.

- i. HPLMN (a) issues SIMs appropriately configured in the HLR
- ii. PLMN (b) performs tests
- iii. PLMN (b) and HPLMN (a) discuss results

## 1.7 References

Ref	Doc Number	Title
[1]	GSM 01.04 (ETR 350)	Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms
[2]	GSM 02.79	Digital cellular telecommunications system (Phase 2+); Support of Optimal Routing (SOR); Service definition (Stage 1)
[3]	GSM 02.82	Digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) Supplementary Services Stage 1
[4]	GSM 03.03 (ETS 300 927)	Digital cellular telecommunications system (Phase 2+); Numbering, addressing and identification
[5]	GSM 03.04	Digital cellular telecommunications system (Phase 2+); Signaling requirements relating to routing of calls to mobile subscribers
[6]	GSM 03.18 (TS 101 043)	Digital cellular telecommunications system (phase 2+); Basic call handling; Technical realization
[7]	GSM 03.78 (TS 101 044)	Digital cellular telecommunications system (phase 2+); Customized Applications for Mobile network Enhanced Logic (CAMEL) - Stage
[8]	GSM 03.85	Digital cellular telecommunications system (Phase 2+); Closed User Group (CUG) supplementary services Stage 2

## 2 Architecture

### 2.1 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.

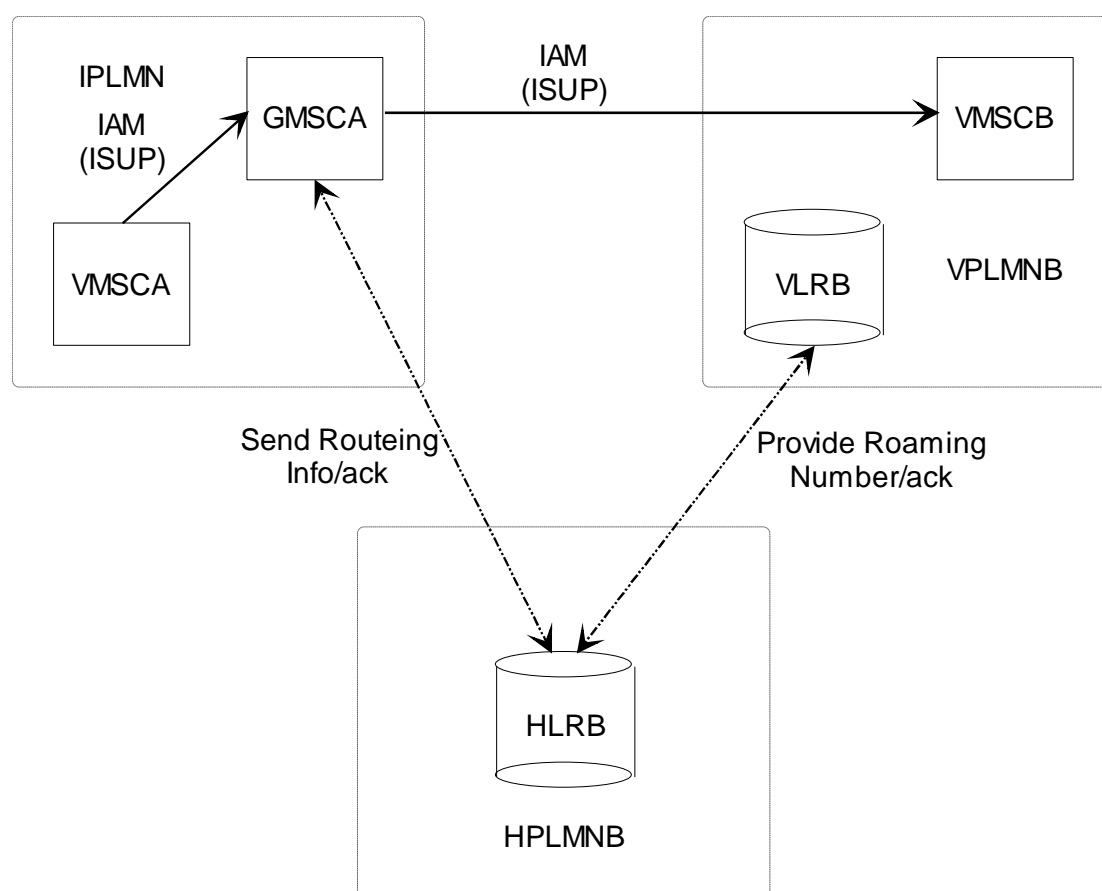
The existing GSM architecture supports the primary technical requirement of optimal routing for mobile-to-mobile calls (basic OR): that a GMSC can interrogate an HLR in a different PLMN to obtain routing information for a mobile terminated call (see GSM 03.04 [5]). Three logically distinct PLMNs are 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 this specification, 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 the VMSC of the calling mobile subscriber (VMSCA) is distinct from the GMSC, it constructs an ISUP Initial Address Message (IAM) using the MSISDN of the called subscriber and sends it to the GMSC. 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, 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 existing GSM procedures, except that if the call is answered GMSCA inserts in the ISUP Answer message the

destination address which it used to route the call, to allow VMSCA to generate the correct charging record.

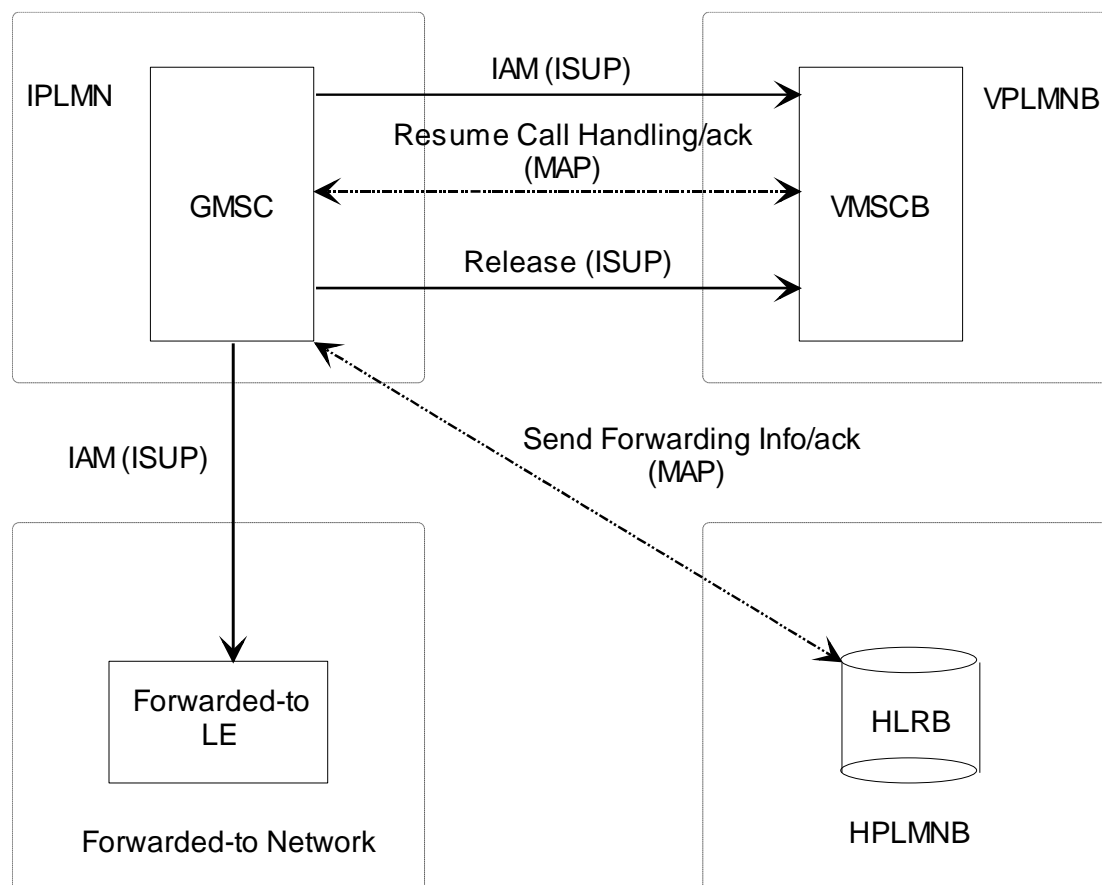
NOTE: If the GMSC returns an ISUP Answer message before it has received an Answer message from the final destination (e.g. because of an interaction with a Specialized Resource Function) an incorrect destination address (or no destination address) can be sent to VMSCA, even though the call is eventually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

## **2.2 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 this specification as Early Call forwarding, the forwarding is already optimally routed.

When a call has been extended from the GMSC to VMSCB, the current GSM procedures 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, it acknowledges the request, clears the traffic connection to VMSCB and sends an ISUP IAM to the forwarded-to local exchange.

Two cases of conditional call forwarding are described in this clause:

1. Early call forwarding to a fixed destination;
2. Late call forwarding to a fixed destination;

For phase 1 of SOR, no attempt is made to route a call directly from the GMSC to a forwarded-to mobile subscriber; if the forwarded-to subscriber is mobile, the call is routed from the GMSC to a GMSC in the HPLMN of the forwarded-to subscriber.

### 2.2.1 Early call forwarding

Early call forwarding is defined as call forwarding from the IPLMN before the call has been extended to the VPLMN of the forwarding subscriber. CFU and CFNRc when the forwarding mobile subscriber is IMSI detached are examples of early call forwarding. Early call

forwarding is effectively optimally routed, because the call takes the most direct route possible from the IPLMN to the forwarded-to destination.

### 2.2.2 Late call forwarding

Late call forwarding is defined as call forwarding after the call has been extended to the VPLMN of the forwarding subscriber. CFB, CFNRc on no response to paging and CFNRy are examples of late call forwarding. In the absence of OR, late call forwarding occurs in the VPLMN of the forwarding party; if OR applies, late call forwarding occurs in the IPLMN.

## 3 Test Cases

This Stage 1 description of the first phase of Support of Optimal Routing (SOR):

- compiles the basic service requirements for SOR;
- describes the interactions for Supplementary Services (SS) in order to cater for SOR;
- refers to modifications to network features required by SOR.

This specification does not address the following:

- There is no need for optimization of the routing of calls originally directed to a fixed network subscriber, because the physical address of a fixed network terminating line cannot differ from its logical address.
- SOR in non-GSM mobile networks is not a subject of this PRD, but might be possible by bilateral arrangement between GSM network operators and those non-GSM mobile network operators.

The purpose of SOR is to reduce the number of unnecessary inter-PLMN call legs.

The first phase of SOR applies to :

- OR performed within a country (i.e. Mobile to mobile calls where both mobile subscribers are located in the same country);
- OR performed towards the country where the call would have normally been routed without OR (e.g. Conditional Call Forwarding towards the Home Country of the called party).

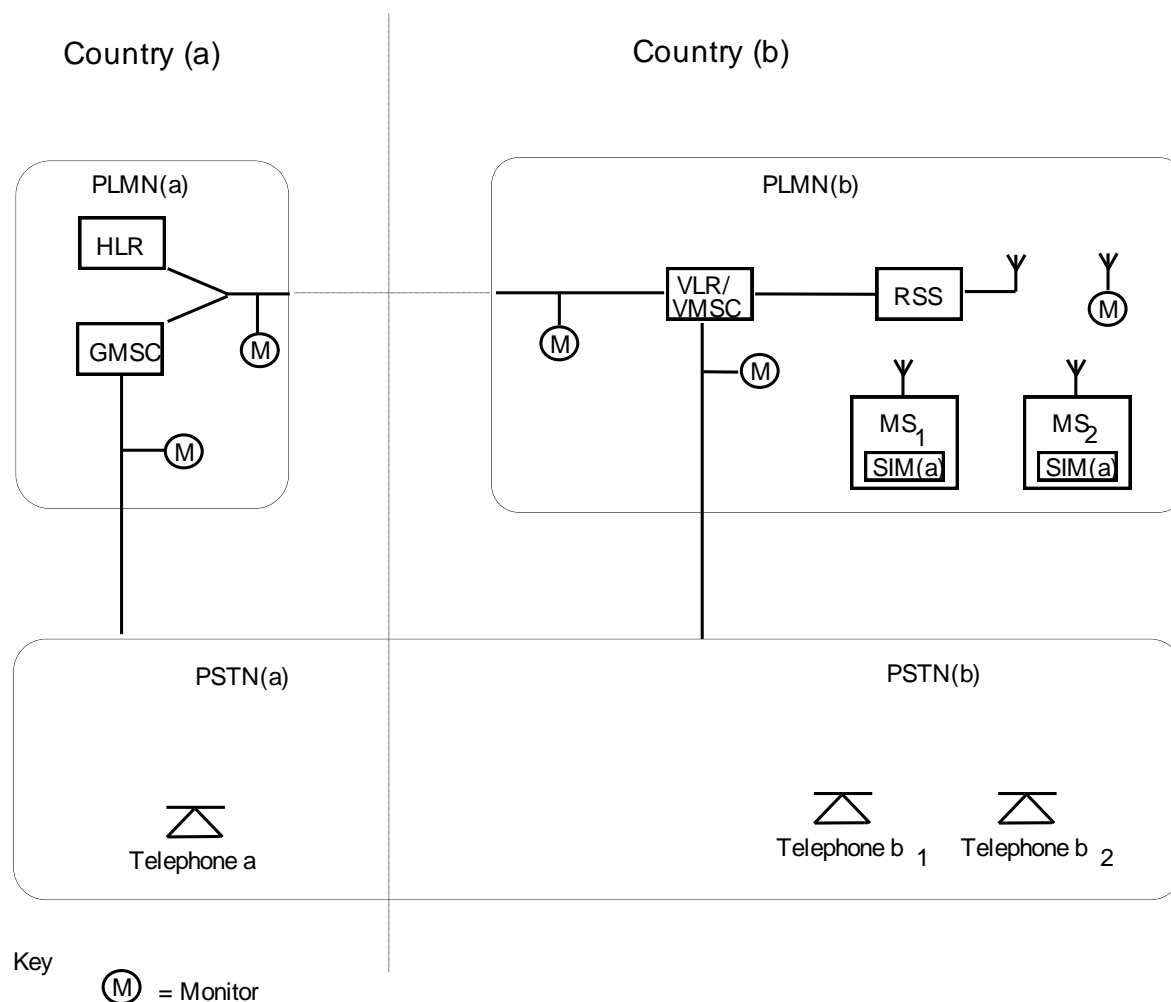
The complete set of scenarios included in the phase 1 of OR is presented in the paragraph for normal procedures. All other scenarios are excluded from Phase 1 of OR.

The description of the test cases are built up as detailed below:

- Title
- Short textual text overview
- Informative message flow (message flows are not claimed to be complete)
- Textual description of preconditions, actions, results and comments

The test configuration is shown in Figure 3 below. It is anticipated that it may be necessary to monitor both signalling messages and voice calls on any of the Network Entity interfaces shown in the diagram. However this is not a firm requirement for this test specification.

The results of the test cases shall be recorded in Appendix A.



**Figure 3: Test case Configuration**

To provide valid toll ticketing recording, then both the clock used to note call start and finish times for the test result sheets, and the internal VMSC clock must be checked against each other and set to an accuracy of better than five seconds. Note the VMSC clock must only be altered in conjunction with local operating rules and procedures because all Toll Tickets will be affected by any alteration.

#### 4 Call scenarios handled in OR phase 1

Note2.Verification of the correct results of OR Functionality could be done in 2 ways:

monitoring the Signalling links (MAP and TUP-ISUP) with Protocol Analyzer

- i. verifying the correct message flows

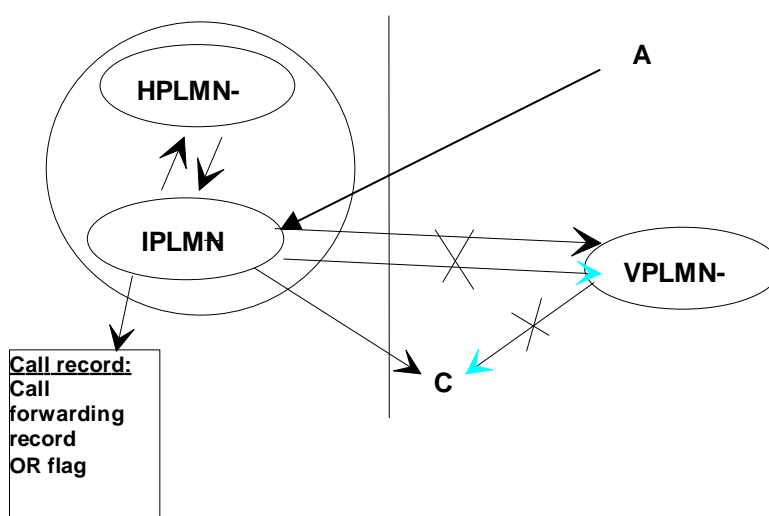
- ii. verifying the correct production of CDRs from the GMSC

#### 4.1 A is a fixed subscriber who may not benefit from OR

As the originating network does not have the ability to interrogate the HPLMN of the B subscriber, the normal GSM call handling is applied.

Once the HPLMN of the B subscriber has the control of the call, the call may be optimised in the case of a forwarded call towards a party located in the VPLMN

##### 4.1.1 Late call forwarding. C is in the same country as VPLMN



**Figure 4: Scenario 1: OR for Late Call Forwarding, C is in the same country as VPLMN**

**Preconditions:** A is a fixed subscriber PSTN telephone( $b_1$ ).  
C is a fixed subscriber PSTN telephone( $b_2$ )  
MS<sub>1</sub>(a) has location updated successfully in VPLMN(b). HLR entry for MS<sub>1</sub>(a) contains SS : CFNRy : Active : Forwarded-to-address is PSTN telephone ( $b_2$ ). [Set by MS]

**Action:** Attempt a call from PSTN telephone( $a_1$ ) to MS<sub>1</sub>(a)  
Answer resultant call to PSTN( $b_2$ ),

**Result:** Successful result if indicate the call is directly routed to C-subscriber  
**Comments:** This test case confirms that the call has been optimally routed between HPLMN(a).and VPLMN(b).

#### 4.2 A is a mobile subscriber who may benefit from OR

If A sets up a call to B, then the originating PLMN shall interrogate the HPLMN of the mobile subscriber B in order to know how to route the call.

If B is registered in the same country as A, then the call shall be routed directly to B as described below.

If B has activated a Call Forward to a destination located in the Home Country of B or in the country where A is registered and this leads to the invocation of Early Call Forwarding, then the call shall be routed directly from A to the forwarded-to-party.

In any other cases, the call shall be routed to the mobile subscriber B via HPLMN(B).

If the call cannot be completed, the originating PLMN shall receive an indication of the reason of the failure of the call completion.

Thereafter, if the mobile subscriber B has activated a Conditional Call Forward to a destination located in her Home Country or to a destination in the country where A is registered and this leads to the invocation of Late Call Forwarding, then the originating PLMN shall route the call directly to the forwarded-to-party.

The remaining leg of the call from the intermediate point to the ultimate destination may be optimally routed.

In the following scenarios, the IPLMN is VPLMN-A.

#### 4.2.1 The call from the A subscriber to the B subscriber is completed (Basic OR). B is located in the same country as A

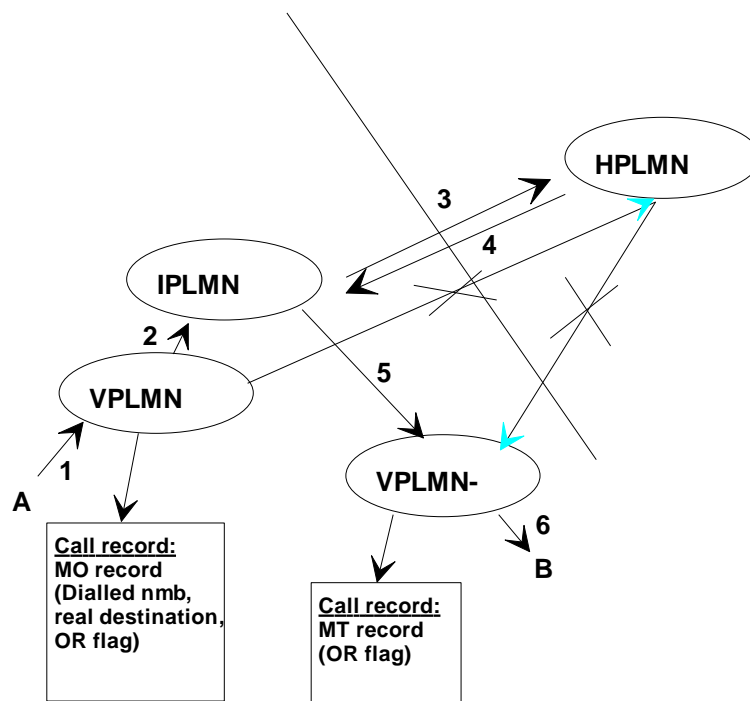


Figure 5: Scenario 2: BASIC OR, B in the same country as A

Preconditions:	A is a mobile subscriber MS <sub>1</sub> (a) B is a mobile subscriber MS <sub>2</sub> (a) MS <sub>1</sub> (a) and MS <sub>2</sub> (a) have location updated successfully in VPLMN(b).
Action:	Attempt a call from MS <sub>1</sub> (a) to MS <sub>2</sub> (a) Answer resultant call to MS <sub>2</sub> (a)
Result:	Successful result if indicate the call is completed to MS <sub>2</sub> (a) and correctly routed
Comments:	This test case confirms that the call has been optimally routed between HPLMN(a).and VPLMN(b).

#### 4.3 The call set up by the subscriber A is being forwarded to a C party. Early Call Forward



### 4.3.1 Early Call Forward. The C party is in the same country as the A subscriber

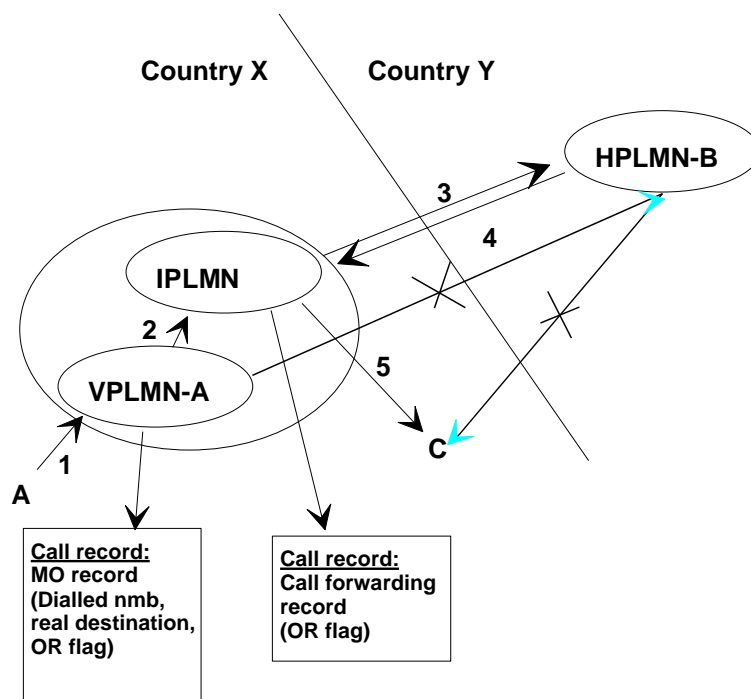


Figure 6: Scenario 3: Early CF, C in the same country as A

Preconditions:	A is a mobile subscriber MS <sub>1</sub> (a) B is a mobile subscriber MS <sub>2</sub> (a) C is a fixed subscriber PSTN telephone(b <sub>1</sub> ) MS <sub>1</sub> (a) and MS <sub>2</sub> (a) have location updated successfully in VPLMN(b). HLR entry for MS <sub>2</sub> (a) contains SS : CFU: Active : Forwarded-to-address is PSTN telephone (b <sub>1</sub> ). [Set by MS]
Action:	Attempt a call from MS <sub>1</sub> (a) to MS <sub>2</sub> (a) Answer resultant call to PSTN(b <sub>1</sub> ),
Result:	Successful result if indicate the call is completed to PSTN(b <sub>1</sub> ) and correctly routed to C subscriber
Comments:	This test case confirms that the call has been optimally routed between HPLMN(a).and VPLMN(b).

#### 4.4 The call set up by the subscriber A is being forwarded to a C party. Late Call Forward

##### 4.4.1 Late Call Forward. B and C are in the same country as A

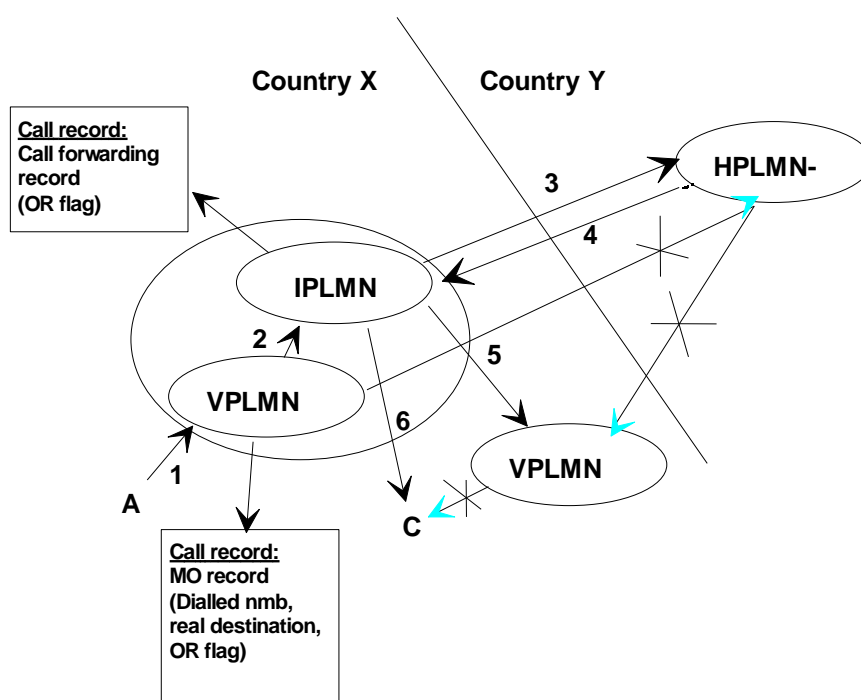


Figure 7: Scenario 4: BASIC OR + OR for Late Call Forwarding, B in the same country as A, C in the same country as A

Preconditions: A is a mobile subscriber  $MS_1(a)$   
 B is a mobile subscriber  $MS_2(a)$   
 C is a fixed subscriber PSTN telephone( $b_1$ )  
 $MS_1(a)$  and  $MS_2(a)$  have location updated successfully in VPLMN( $b$ ).  
 HLR entry for  $MS_2(a)$  contains SS : CFNRy: Active : Forwarded-to-address is PSTN telephone ( $b_1$ ). [Set by MS]

Action: Attempt a call from  $MS_1(a)$  to  $MS_2(a)$   
 Answer resultant call to PSTN( $b_1$ ),

Result: Successful result if indicate the call is completed to PSTN( $b_1$ ), and correctly routed to C subscriber

Comments: This test case confirms that the call has been optimally routed between HPLMN(a).and VPLMN(b).

## **5 Exceptional procedures or unsuccessful outcome**

### **5.1 Non-support of SOR in the VPLMN of the caller**

If subscriber A roams into a network not supporting OR, she may not benefit from OR and only scenario 1 and scenario 2 of SOR are supported.

### **5.2 Non-support of SOR in the HPLMN of the B subscriber**

If the HPLMN of the called party does not support SOR, SOR cannot be invoked and the route of the call as far as the called party's VPLMN cannot be optimised (the call would normally be routed via the HPLMN of the called party).

The same procedure shall be followed if the HPLMN operator denies OR on a subscriber basis.

### **5.3 Calls to special mobile network numbers**

If the called number is a special mobile network number of the HPLMN, the HPLMN has to guarantee that the call terminates at its correct destination. This can be achieved by denying OR for this call by sending an appropriate error cause or by implementing a special handling.

## **6 Interactions of Optimal Routing with Supplementary Services**

No Interaction unless it is stated differently below.

### **6.1 Call Forwarding**

Interactions between SOR and Call Forwarding are dealt with 3G 22.079 and 3G 23.079

### **6.2 Call Barring**

Outgoing Call Barring services are applied according to the dialled number.

Barring of Incoming calls when Roaming outside the HPLMN country will prevent calls to a mobile subscriber who has roamed outside her HPLMN country even if OR would result in no chargeable roaming leg.

The existing interactions between Call Forwardings and Call Barrings are not changed by the introduction of OR.

### **6.3 Call Transfer**

A transferred call is considered as a set of two separate calls which may be separately optimally routed.

Optimal Routing shall not be invoked as a result of the invocation of Call Transfer.

#### **6.4 Call Deflection**

A deflected call is considered as a late forwarded call and as such may be optimally routed.

#### **6.5 Advice of Charge**

Depending on call scenarios, AoC may not work properly.

### **7 Interactions of Optimal Routing with Operator Determined Barring (ODB)**

The principles for the interaction between operator determined barring and SOR are the same as those for the interaction between Supplementary Service Call Barring and SOR.

### **8 Interactions of Optimal Routing with CAMEL**

If CAMEL has to be applied to the Mobile Originating part of the call and if CAMEL modifies the destination of the call, the OR applies to any destination introduced by CAMEL.

If CAMEL has to be applied to the Mobile Terminating part of the call or a forwarding leg, the modified destination is treated for optimal routing in the same way as a forwarded-to number.

If Barring services are also applicable to the call then they have to be handled first together with CAMEL before SOR is applied.

### **9 Pre-Testing Data Exchange**

All the Pre-Testing data defined in IR24 and IR21 are applicable for OR testing

In particular attention has to be done about:

- MSC/VLR and HLR E164 addresses.
- MSRN number ranges.
- International Signalling Point Codes (if applicable)

## Appendix A

### MoU-IREG Stage 4 Test Results for Mobile Stations of PLMN(a) Roaming to PLMN(b)

#### A.1 Network Operator Information

HPLMN (a) .....

VPLMN (b) .....

Date of Tests .....

Testing personnel PLMN(a) .....

Tel/Fax: .....

Testing personnel PLMN(b) .....

Tel/Fax: .....

HLR Identity/Identities .....

.....

HLR Manufacturer(s) .....

.....

HLR Software Build Level(s) .....

.....

GMSC Identity/Identities .....

.....

GMSC Manufacturer(s) .....

.....

GMSC Software Build Level(s) .....

.....

VMSC Identity/Identities .....

.....

VMSC Manufacturer(s) .....

.....

VMSC Software Build Level(s) .....

Comments

## A.2 Toll Ticket Configuration

Call Toll Ticketing in use at VMSC? [Yes/No] .....

Supplementary Service activity Toll Ticketing in use at VMSC ?  
[Yes/No] .....

Toll Ticketing in use at GMSC for Roaming call legs ? [Yes/No] .....

Will VMSC Toll Ticket file be transfered to VPLMN Computing Centre ?  
[Yes/No] .....

Will VMSC Toll Ticket file be transfered to the HPLMN from VPLMN ?  
[Yes/ No] .....

Method of transfer of TollTicket File to HPLMN  
[via TADIG mechanism/other] .....

Comments

### Notes:

1. If Toll Ticketing is not in use then the line items marked with an asterisk (\*) may be omitted from these Test Result Sheets.
2. If Supplementary Service activity Toll Ticketing is not in use there is no need to write the time at the lines marked with a plus (+).

**A.3 Call scenarios handled in OR phase 1**

The numbering of the test result sections within this appendix is identical to the associated Test case from section 2 of the main document.

**A.3.1.1 Late call forwarding. C is in the same country as VPLMN**

- (a) MSISDN of MS(a<sub>1</sub>) .....
- (b) DN of calling PSTN telephone(b<sub>1</sub>) .....
- (c) DN of forwarded - to - PSTN telephone(b<sub>2</sub>) .....
- (d) Time of start of call .....hrs.....mins....secs
- (e) Delay between dialling last digit of MSISDN of MS(a<sub>1</sub>) at PSTN telephone(b<sub>1</sub>) and PSTN telephone(b<sub>2</sub>) ringing. ....secs
- (f) Length of time for which MS(a<sub>1</sub>) "rings" .....secs
- \*(g) Time of perceived answer of call .....hrs.....mins.....secs
- \*(h) Chargeable Call Duration (i.e. perceived answer until end of call)  
..... secs
- (i) Was an announcement that call was being forwarded ?  
Yes/No].....
- (j) Comments
- (k) Testcase Result [Pass/Fail/Not performed] .....

Signature of Tester..... Date .....



**A.3.2 A is a mobile subscriber who may benefit from OR****A.3.2.1 The call from the A subscriber to the B subscriber is completed (Basic OR). B is located in the same country as A**

- (a) MSISDN of MS(a<sub>1</sub>) .....
- (b) MSISDN of MS(a<sub>2</sub>) .....
- (c) Number keyed into MS<sub>1</sub>(a) .....
- (d) Time of start of call (i.e. SEND key operation).....hrs .....mins ....secs
- (e) Delay between SEND key operation at MS<sub>1</sub>(a) and MS<sub>2</sub>(a) alerting  
..... secs
- \* (f) Time of perceived answer of call ..... hrs ..... mins ..... secs
- \* (g) Time of perceived answer of call .....hrs.....mins.....secs
- \* (h) Chargeable Call Duration (i.e. perceived answer until end of call)  
..... secs
- (i) Comments
- (j) Testcase Result [Pass/Fail/Not performed] .....

Signature of Tester..... Date .....

### A.3.3 The call set up by the subscriber A is being forwarded to a C party. Early Call Forward

#### A.3.3.1 Early Call Forward. The C party is in the same country as the A subscriber

- (a) MSISDN of MS(a<sub>1</sub>) .....
- (b) MSISDN of MS(a<sub>2</sub>) .....
- (c) DN of forwarded - to - PSTN telephone(b<sub>1</sub>) .....
- (d) Time of start of call .....hrs.....mins....secs
- (e) Delay between dialling last digit of MSISDN of MS(a<sub>2</sub>) at MS(a<sub>1</sub>) and PSTN telephone(b<sub>1</sub>) ringing. ....secs
- (f) Length of time for which MS(a<sub>1</sub>) "rings" .....secs
- \*(g) Time of perceived answer of call .....hrs.....mins.....secs
- \*(h) Chargeable Call Duration (i.e. perceived answer until end of call)  
..... secs
- (i) Was an announcement that call was being forwarded ?  
Yes/No].....
- (j) Comments
- (k) Testcase Result [Pass/Fail/Not performed] .....

Signature of Tester..... Date .....

### A.3.4 The call set up by the subscriber A is being forwarded to a C party. Late Call Forward

#### A.3.4.1 Late Call Forward. B and C are in the same country as A

- (a) MSISDN of MS(a<sub>1</sub>) .....
- (b) MSISDN of MS(a<sub>2</sub>) .....
- (c) DN of forwarded - to - PSTN telephone(b<sub>1</sub>) .....
- (d) Time of start of call .....hrs.....mins....secs
- (e) Delay between dialling last digit of MSISDN of MS(a<sub>2</sub>) at MS(a<sub>1</sub>) and PSTN telephone(b<sub>1</sub>) ringing. ....secs
- (f) Length of time for which MS(a<sub>1</sub>) "rings" .....secs
- \*(g) Time of perceived answer of call .....hrs.....mins.....secs
- \*(h) Chargeable Call Duration (i.e. perceived answer until end of call)  
..... secs
- (i) Was an announcement that call was being forwarded ?  
Yes/No].....
- (j) Comments
- (k) Testcase Result [Pass/Fail/Not performed] .....

Signature of Tester..... Date .....

## Appendix B

### Completion Certificate for MoU-IREG Stage 4 Testing for Inter-PLMN Roaming

This certificate confirms the successful completion of MoU-IREG OR Stage 1 Tests for Mobile

Subscribers of.....PLMN visiting.....PLMN.

The Services tested were:-

B. 3.1 A is a fixed subscriber who may not benefit from OR

[Pass / Fail / Not applicable].....

B.3.2 A is a mobile subscriber who may benefit from OR

[Pass / Fail / Not applicable].....

B.3.3 The call set up by the subscriber A is being forwarded to a C party. Early Call Forward

[Pass / Fail / Not applicable].....

B.3.4 The call set up by the subscriber A is being forwarded to a C party. Late Call Forward

[Pass / Fail / Not applicable].....

Other comments.....

**Toll Ticket file is being forwarded from ..... PLMN to .....PLMN**

via MOU TADIG procedures.

(Delete if not applicable)

The tests were completed on.....(date).

The testing team in PLMN.....

were:.....

The testing team in PLMN.....

were:.....

Signed..... Date.....  
of PLMN.....

Signed..... Date.....  
of PLMN.....

## Annex B Document Management

### B.1 Document History

Version	Date	Brief Description of Change	Approval Authority	Editor / Company
3.0.0	07 April 2005	Specification of MoU-IREG End-to-end Functional Capability tests relating to the international roaming	Networks Group	Javier Sendin GSMA

### B.2 Other Information

Type	Description
Document Owner	Networks Group - SIGNAL
Editor / Company	Mark McGinley (AT&T Mobility)

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