



Technical Implications of the Use of Optimal Routing

Version 3.4.0

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1 Introduction

This PRD highlights the technical and tariffing problems which have been identified by GSM-IREG when analyzing the optimal routing method.

1.1 Abbreviations

Term	Description
EG	Expert Group
HLR	Home Location Register
MNP	Mobile Number Portability
MSC	Mobile Switching Center
MSISDN	Mobile Subscriber ISDN" number
NP01	Network Provider 01 with Mobile Number Portability in place
NP02	Network Provider 02 with Mobile Number Portability in place
PLMN	Public Land Mobile Network
PSTN	Public Switched Telephone Network
RSS	Radio Sub-System
SO	Interrogating PLMN which is sending SEND OPERATION
SOR	Support of Optimal Routing

2 Routing of calls to a GSM Customer who roamed internationally

Figure 1 in section 2.3.3.1 shows the standard routing of a call to a GSM customer who has roamed internationally.

The customer in Country A knows the directory number (MSISDN) of the GSM customer who is a customer of a PLMN in Country B. The network in Country A, following examination of the number, will route the call to Country B. In Country B the customer's Home MSC, by interrogation of the HLR, will establish that the called customer has roamed to Country C. The call is then re-routed via the international network to Country C where the call is answered by the GSM customer. In this case the call is routed via two international connections. However, if the roaming customer had actually roamed to Country A, using the above routing method, a call between two customers in the same country would involve two international legs to and from Country B.

2.1 Tariffing principles for calls to GSM customers who have roamed

The general principle is that a customer should pay for the call he is expecting to make. Therefore the customer in Country A knows by the GSM customer's directory number that he subscribes in Country B. (It may not be possible to deduce from the number that the call is addressed to a GSM customer). The GSM customer is responsible for charges related to the re-routing of calls from the home network to the visited network.

- A pays for call A to B
- B pays for call B to C

Therefore, the originating network will collect the charges for the call A to B and the Home PLMN will be responsible for charging for the call B to C.

2.2 Optimal Routing

In order to optimise the routing, and reduce the number of international connections required in a call between the two customers, an optimal routing scenario could be envisaged (See Figure 2).

The customer in Country A calls the GSM customer who is a subscriber of one PLMN in Country B. One network in Country A interrogates the HLR in Country B to establish the location of the GSM customer. When the location of the GSM customer is established from the roaming number, the call is directly routed to Country C. In the case that the GSM customer had roamed to Country A, this call would involve no international connection.

This method of routing is termed "optimal routing". However, there are a number of technical and tariff issues which need to be highlighted, and resolved prior to utilisation of this type of routing.

2.3 Definition of SOR (Support of Optimal Routing):

Support of Optimal Routing (SOR) is a network feature, by which calls directed to a mobile subscriber, who has roamed away from his HPLMN, are routed directly (instead of via the HPLMN) to the mobile subscriber's actual location, or the forwarded-to destination.

The complete set of scenarios included in the phase 1 of SOR are described in the Stage-1 specification GSM 02.79.(transferred to 3G 22.079)

2.3.1 Tariff Issues

How is the call charged?The Calling Customer will be charged by the originating network based upon the directory number of the called party. At present networks do not differentiate charges based upon actual call routing. Therefore it is not normal for "the charging node" to have information concerning the actual routing of calls.

Billing information is also required to enable the roaming customer to be charged for the tail leg of the call from the home network to the network they have roamed to.

2.3.2 When using optimal routing the call does not cross a Home Network MSC. Therefore how will the call be charged?

Currently the visited network's MSC will generate a call record which is subsequently transferred to the Home network. Technical Issues

Whereas optimal routing is inherent within the GSM network, it is not generally utilized within the PSTN, except when using Intelligent Networks type solutions.

In general the majority of calls terminating on a GSM mobile will be originated from the PSTN. Therefore, the use of optimal routing depends more upon the capabilities of the PSTN than on the capabilities of the GSM network.

As mentioned earlier, the only information available to the originating node is the Directory Number of the called customer. To utilize optimal routing, the originating network must be able to determine that the call is actually destined to a GSM network. This would require that all GSM customer numbers can be easily differentiated from PSTN numbers.

Furthermore, the number of calls from one country destined to a GSM network in another country is likely to be a small percentage of the total international telephony traffic between the two countries and the percentage of calls destined to the GSM customers who have actually roamed is considered to be a small percentage of the total GSM traffic. However, to implement optimal routing one would have to

analyze every international call down to the depth required to establish if it was a call to a GSM network before being able to request routing information. Although, over time it may be possible to implement these capabilities within PSTNs, the additional call processing costs may be high, as digit examination is considered to be 3% of the processor load.

SOR shall be provided for all circuit switched Telecommunication Services, except emergency calls, Dedicated PAD and Dedicated Packet Access.

In general following call scenarios will be supported by the SOR feature:

- Mobile-to-Mobile calls
- Early Call forwarding call scenarios
- Late Forwarding call scenarios
- Fixed to Mobile calls portion in the PLMN

The GSM specifications for Optimal Routing (GSM 02.79, 03.79) will not consider the following:

- There is no need for optimisation of the routing of the 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 the GSM-specification for SOR, but might be possible by bilateral arrangements between GSM network operators and non-GSM mobile network operators.

2.3.2.1 Actual status in standardisation:

The actual status (due date March 2000) in the standardization is :

The GSM-specifications for SOR 02.79 and 03.79 were moved to the 3GPP specifications 3G 22.079, 3G 23.079 and 3G 29.079. They were not changed as approved in SMG-TC#25. These specifications are covering the whole scenarios.

Nevertheless on MoU#38 it was decided that it is possible for operators to implement only the late call forwarding scenarios (conditional call forwarding on busy and on not reachable) with the SOR-feature according to the standard specified in 02.79 and 03.79. It was recommended to move the rest of the scenarios to be implemented in conjunction with the CAMEL-features, because CAMEL overcomes the number issues.

The actual status is that the Mobile Originated SOR-functionalities are no longer part of CAMEL-Phase 3 specification (Release 99). These functionalities were moved to CAMEL-Phase 4 which is part of Release 2000.

2.3.3 Technical implications of SOR with MNP

Following the description of interactions between MNP and SOR when MNP is implemented between NP01 and NP02.

Two main scenarios have to be differentiated:

1. NP01 and NP02 have the same SCCP Gateway
2. NP01 and NP02 have different SCCP Gateways

2.3.3.1 NP01 and NP02 have the same SCCP Gateway

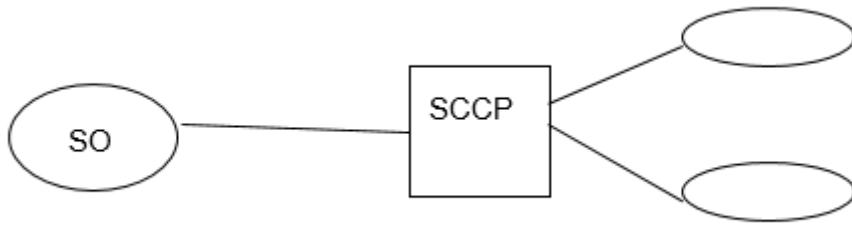


Figure 1: Same SCCP Gateway Schema

NP01 and NP02 have the same GSCCP

Subscriber ported from NP02 to NP01 or vice versa

SOR agreement between	IREG recommendation	Notes
SO and NP01	SO have to introduce SOR-data for NP02.	Actions in NP Cluster If SOR is for NP02 subscriber, SOR will be aborted by NP02 and normal IAM call will be established If SOR is for NP01 subscriber (Ported), SOR will be routed in NP Cluster
SO and NP02	SO have to introduce SOR-data for NP01.	Actions in NP Cluster If SOR is for NP02 subscriber, SOR will be aborted by NP02 and normal IAM call will be established If SOR is for NP01 subscriber, SOR will be routed in NP Cluster
SO and NP01 SO and NP02		Actions in NP Cluster Call is always completed and managed from NP Cluster

Table 1: SOR agreements table for same SCCP gateway

Note : With SOR-data E.164-addresses are meant.

2.3.3.2 P01 and NP02 have different SCCP Gateways

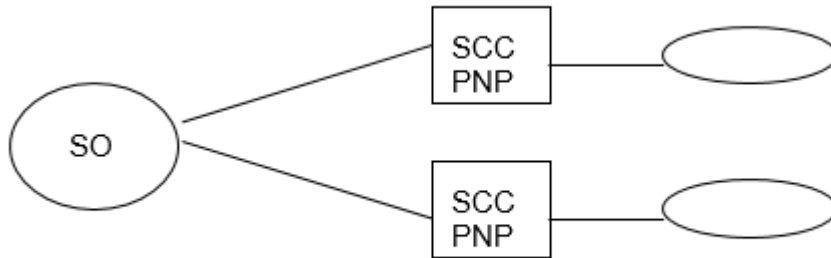


Figure 2: Different SCCP Gateway Schema

NP01 and NP02 have different GSCCP

Subscriber ported from NP02 to NP01 or vice versa

SOR agreement between	IREG recommendation	Notes
SO and NP01	SO have to introduce SOR-data for NP02.	Actions in NP Cluster If SOR is for NP02 subscriber, SOR will be aborted by NP02 and normal IAM call will be established If SOR is for NP01 subscriber (Ported), SOR will be routed in NP Cluster
SO and NP02	SO have to introduce SOR-data for NP01.	Actions in NP Cluster If SOR is for NP02 subscriber, SOR will be aborted by NP02 and normal IAM call will be established If SOR is for NP01 subscriber (Ported), SOR will be routed in NP Cluster
SO and NP01 SO and NP02		Actions in NP Cluster Call is always completed and managed from NP Cluster

Table 2: SOR agreements table for same SCCP gateways

Note : With SOR-data E.164-addresses are meant.

Annex A Standart vs. Optimized Routing

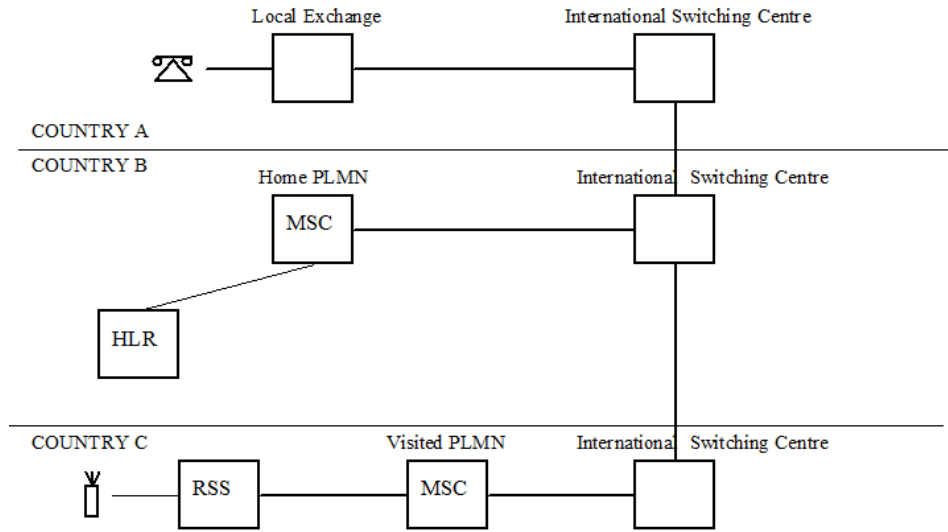


Figure 3: Standard Routing to Customer who has Roamed Internationally

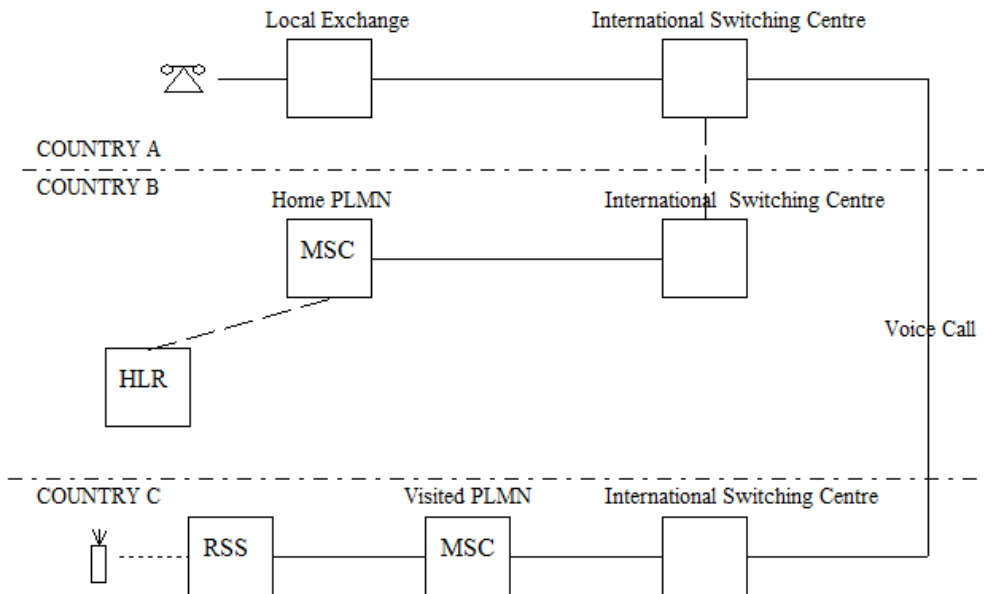


Figure 4: Optimised Routing to customer who has roamed internationally

Annex B Document Management

B.1 Document History

Version	Date	Brief Description of Change	Approval Authority	Editor / Company
Version 3.4.0	27 April 2000	Highlights the technical and tariffing problems which have been identified by GSM-IREG when analyzing the optimal routing method.	Networks Group	Javier Sendin (GSMA)
3.4.0	27 September 2012	Change of IC platform	Networks Group	Javier Sendin (GSMA)

B.2 Other Information

Type	Description
Document Owner	Networks Group/SIGNAL
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