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## Digital cellular telecommunications system (Phase 2+); Technical realization of operator determined barring (GSM 03.15 version 5.1.0)

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## Foreword

This Global System for Mobile communications Technical Specification (GTS) has been produced by the Special Mobile Group (SMG) Technical Committee (TC) of the European Telecommunications Standards Institute (ETSI).

This GTS describes the network feature Operator Determined Barring which allows a network operator or service provider to regulate access by subscribers to GSM services within the digital cellular telecommunications system (Phase 2/Phase 2+).

This GTS is a TC-SMG approved GSM technical specification version 5, which contains GSM Phase 2+ enhancements/features to the version 4 GSM technical specification. The ETS from which this Phase 2+ GTS has evolved is Phase 2 GSM ETS 300 533 (GSM 03.15 version 4.3.1).

GTSs are produced by TC-SMG to enable the GSM Phase 2+ specifications to become publicly available, prior to submission for the formal ETSI standards approval procedure to become European Telecommunication Standards (ETS). This ensures the earliest possible access to GSM Phase 2+ specifications for all Manufacturers, Network operators and implementors of the Global System for Mobile communications.

The contents of this GTS are subject to continuing work within TC-SMG and may change following formal TC-SMG approval. Should TC-SMG modify the contents of this GTS it will then be republished by ETSI with an identifying change of release date and an increase in version number as follows:

Version 5.x.y

where:

- y     the third digit is incremented when editorial only changes have been incorporated in the specification;
- x     the second digit is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.

The specification from which this GTS has been derived was originally based on CEPT documentation, hence the presentation of this GTS may not be entirely in accordance with the ETSI rules.

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## 1 Scope

The network feature Operator Determined Barring (ODB) allows a network operator or service provider to regulate access by subscribers to GSM services, by the barring of certain categories of incoming or outgoing traffic or of roaming. Operator Determined Barring applies to all bearer services and teleservices except the Emergency Call teleservice; the teleservice Short Message Point-to-Point is therefore subject to Operator Determined Barring in the same way as circuit-switched calls.

The application of specific categories of Operator Determined Barring to a subscription is controlled by the network operator or service provider, using administrative interaction at the HLR; this interface is not standardized.

### 1.1 Normative references

This GTS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this GTS only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

- [1] GSM 01.04 (ETR 350): "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".
- [2] GSM 02.41: "Digital cellular telecommunications system (Phase 2+); Operator determined barring".
- [3] GSM 03.40 (ETS 300 901): "Digital cellular telecommunications system (Phase 2+); Technical realization of the Short Message Service (SMS) Point-to-Point (PP)".

### 1.2 Abbreviations

Abbreviations used in this GTS are listed in GSM 01.04.

## 2 Method of realization

The GSM entities which control the application of Operator Determined Barring (ODB), and the methods used, are described in this clause. Two cases are considered for each type of barring: the effect of administrative action in the HLR to modify the application of the category to a particular subscription, and the effect of the category on the handling of calls or other traffic involving the subscriber.

### 2.1 Barring of Outgoing Calls or Mobile Originated Short Messages

Barring of outgoing calls or mobile originated short messages includes the categories "outgoing calls" and "outgoing premium rate calls" defined in GSM 02.41, and the "operator specific barring" category where this is defined by the PLMN operator to apply to outgoing calls or mobile originated short messages.

#### 2.1.1 Application or Change of Barring in the HLR

If barring of outgoing calls or mobile originated short messages is applied to a subscription (or existing barring of outgoing calls or mobile originated short messages is modified or removed) by administrative action in the HLR, the HLR will update the subscription information accordingly, and transfer the updated subscription information to the VLR using one or more Insert Subscriber Data operations, as shown in figure 1.

If operator specific barring is applied to a subscription (or existing operator specific barring is modified or removed) by administrative action in the HLR, the HLR will update the subscription information accordingly. If the mobile subscriber is registered in the home PLMN, the HLR will transfer the updated subscription information to the VLR using one or more Insert Subscriber Data operations, as shown in figure 1.

If the VPLMN does not support Operator Determined Barring of outgoing calls, the VLR shall indicate this in the acknowledgement of the Insert Subscriber Data message. The HLR shall then, as an operator option, apply the Outgoing Calls Barred supplementary service, apply barring of roaming as described in subclause 2.3 or take any other action decided by the operator of the HPLMN.

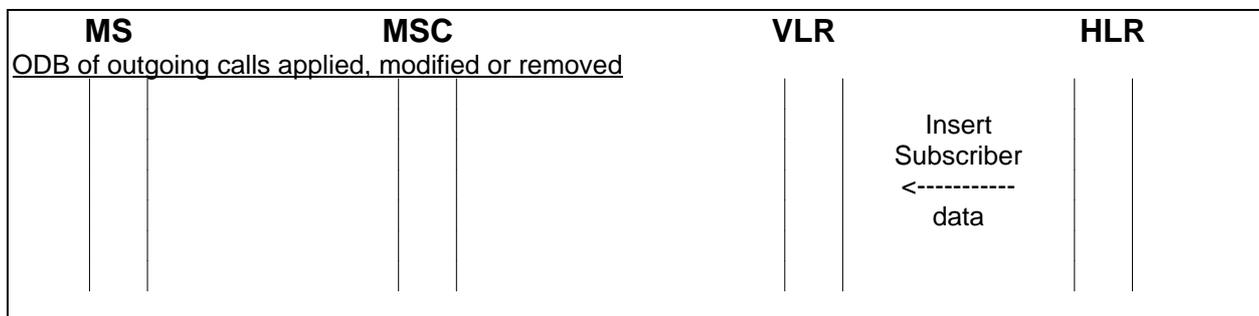


Figure 1: Transfer of updated subscription information to VLR

#### 2.1.2 Invocation of Barring

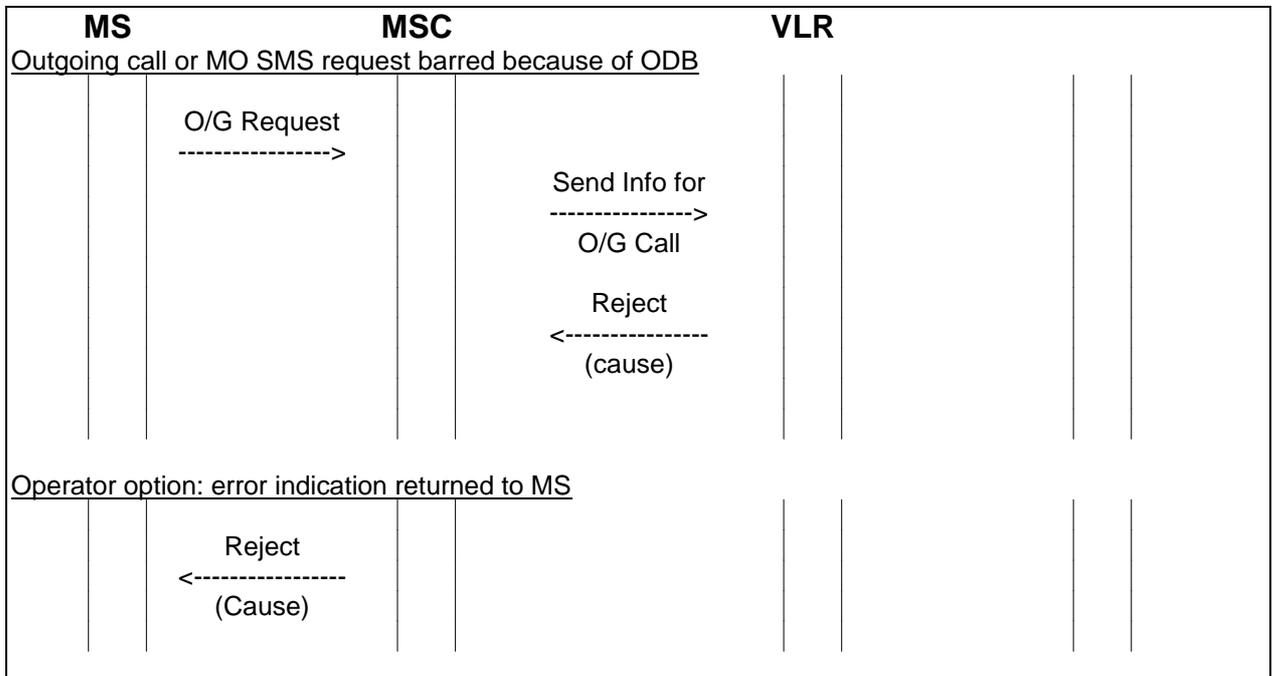
Barring of outgoing calls or mobile originated short messages is invoked in the VLR. If the VLR receives a request for subscription information for an outgoing call or mobile originated short message which is prohibited by Operator Determined Barring, the VLR will return a negative response to the request for subscription information, with an appropriate error indication. The MSC may relay this error indication via the BSS to the mobile station over the radio path, or (in the case of an outgoing call) may connect the mobile station to an address to be determined by the network operator.

Barring of all international calls, barring of all international calls except those directed to the home PLMN country, barring of all premium rate (information) calls or barring of all premium rate (entertainment) calls requires the VLR to analyse the called number to determine whether the requested call is barred.

Barring of all outgoing calls when roaming outside the home PLMN country requires the HLR to determine whether a request for location updating originates from a PLMN outside the home PLMN country. If the request does originate from a PLMN outside the home PLMN country, the HLR will transfer subscription information to the VLR to indicate that the mobile station is subject to barring of all outgoing calls.

Operator Specific Barring may apply to outgoing or incoming calls, or mobile originated or mobile terminated short messages; if it applies to outgoing calls or mobile originated short messages, it is invoked in the VLR, as described above. If the barring applies to calls directed to a specific class of destination, the VLR must analyse the called number to determine whether the requested call is barred.

An indicative message flow diagram for the handling of Operator Determined Barring of outgoing calls or mobile originated short messages is given in figure 2. For the case where the mobile station is connected to an address determined by the network operator, this address is assumed to be directly connected to the MSC, so that no inter-MSC signalling is required.



**Figure 2: Operator Determined Barring of Outgoing Calls or Mobile Originated Short Messages**

## 2.2 Barring of Incoming Calls or Mobile Terminated Short Messages

### 2.2.1 Application or Change of Barring in the HLR

If barring of incoming calls or mobile terminated short messages is applied to a subscription (or existing barring of incoming calls or mobile terminated short messages is modified or removed) by administrative action in the HLR, the HLR will update the subscription information accordingly. It is not necessary to transfer the updated subscription information to the VLR.

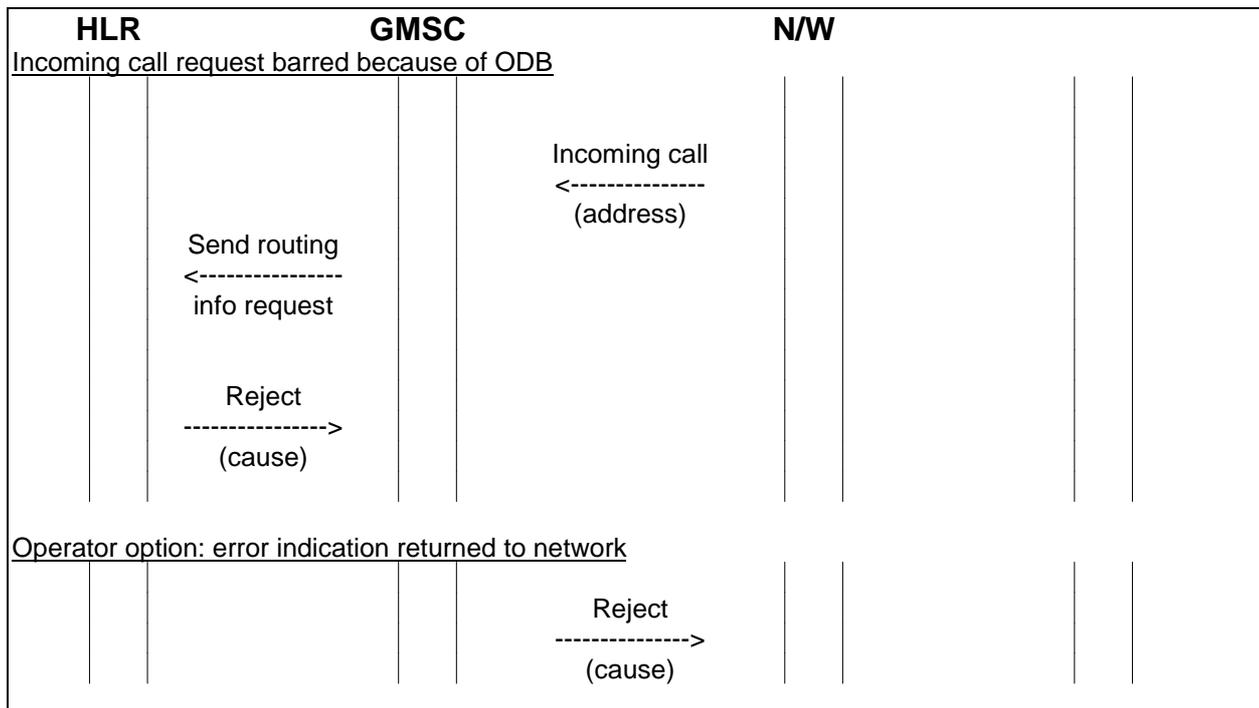
### 2.2.2 Invocation of Barring

Barring of incoming calls is invoked in the HLR. If the HLR receives a request for routing information for a call directed to a mobile station which is subject to barring of incoming calls, the HLR will return a negative response to the request for routing information, with an appropriate error indication. The Gateway MSC may relay this error indication to the originating network using the appropriate telephony signalling system, or may connect the call to a recorded announcement to be determined by the network operator.

Barring of mobile terminated short messages is invoked in the HLR. If the HLR receives a request for routing information for a short message directed to a mobile station which is subject to barring of incoming calls, the HLR will return a negative response to the request for routing information, with an appropriate error indication. This error indication will be relayed to the originating Short Message service centre by the Gateway MSC using the protocol defined in GSM 03.40.

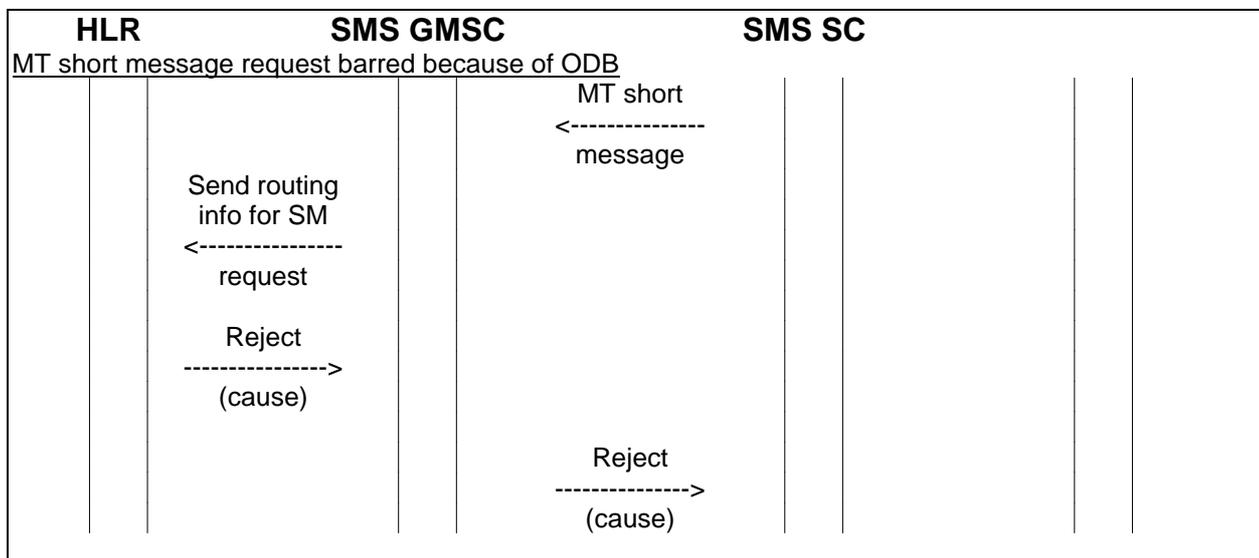
Operator Specific Barring may apply to outgoing or incoming calls, or mobile originated or mobile terminated short messages; if it applies to incoming calls or mobile terminated short messages, it is invoked in the HLR, as described above.

An indicative message flow diagram for the handling of Operator Determined Barring of incoming calls is given in figure 3. For the case where the call is connected to an address determined by the network operator, this address is assumed to be directly connected to the GMSC, so that no inter-MSC signalling is required.



**Figure 3: Operator Determined Barring of Incoming Calls**

An indicative message flow diagram for the handling of Operator Determined Barring of mobile terminated short messages is given in figure 4.



**Figure 4: Operator Determined Barring of Mobile Terminated Short Messages**

## 2.3 Barring of Roaming

### 2.3.1 Application or Change of Barring in the HLR

If barring of roaming is applied to a subscription (or modified or removed) by administrative action in the HLR, the HLR will update the subscription information accordingly. If the HLR determines from the identity of the VLR that the mobile subscriber is currently registered in a barred PLMN, the HLR will put the barring into effect by using a Cancel Location operation to the VLR, as shown in figure 5. If the mobile subscriber is not currently registered in a barred PLMN, the HLR will take no further action.



Figure 5: Immediate Application of Barring of Roaming

### 2.3.2 Invocation of Barring

Barring of roaming is invoked in the HLR. If the HLR receives a request for location updating for a mobile which is attempting to roam to an area prohibited by Operator Determined Barring, the HLR will reject the location updating request with an appropriate error indication. This error indication will be relayed by the MSC and the BSS to the mobile station over the radio path.

An indicative message flow diagram for the handling of Operator Determined Barring of roaming is given in figure 6.

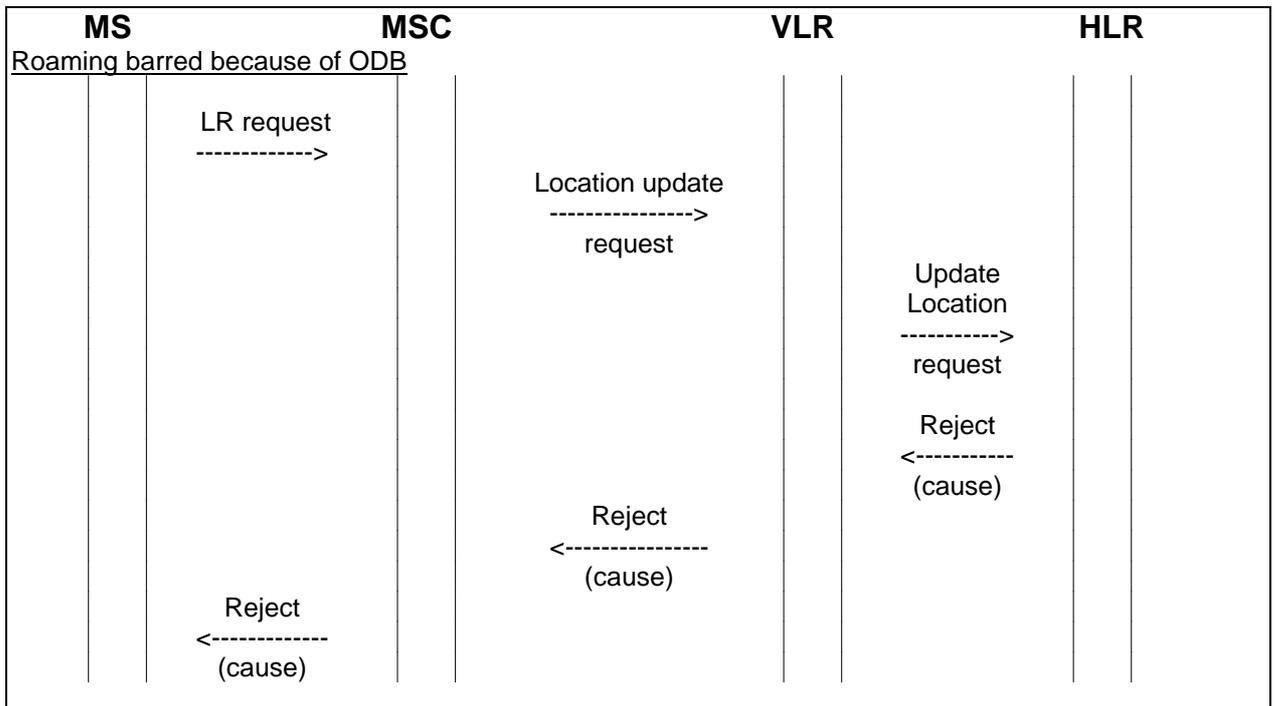


Figure 6: Operator Determined Barring of Roaming

**2.4 Barring of Supplementary Services Access**

Barring of supplementary services access encompasses the general barring of supplementary services management category specified in GSM 02.41 and the specific categories of barring of registration of a call forwarded-to number and barring of invocation of call transfer.

**2.4.1 Application or Change of Barring in the HLR**

If barring of supplementary services access is applied to a subscription (or existing barring of supplementary services access is modified or removed) by administrative action in the HLR, the HLR will update the subscription information accordingly, and, if necessary, transfer the updated subscription information to the VLR using one or more Insert Subscriber Data operations, as shown in figure 1.

If the VPLMN does not support Operator Determined Barring of supplementary service access, the VLR shall indicate this in the acknowledgement to the Insert Subscriber Data message. The HLR shall then, as an operator option, apply barring of roaming as described in subclause 2.3 or take any other action decided by the operator of the HPLMN.

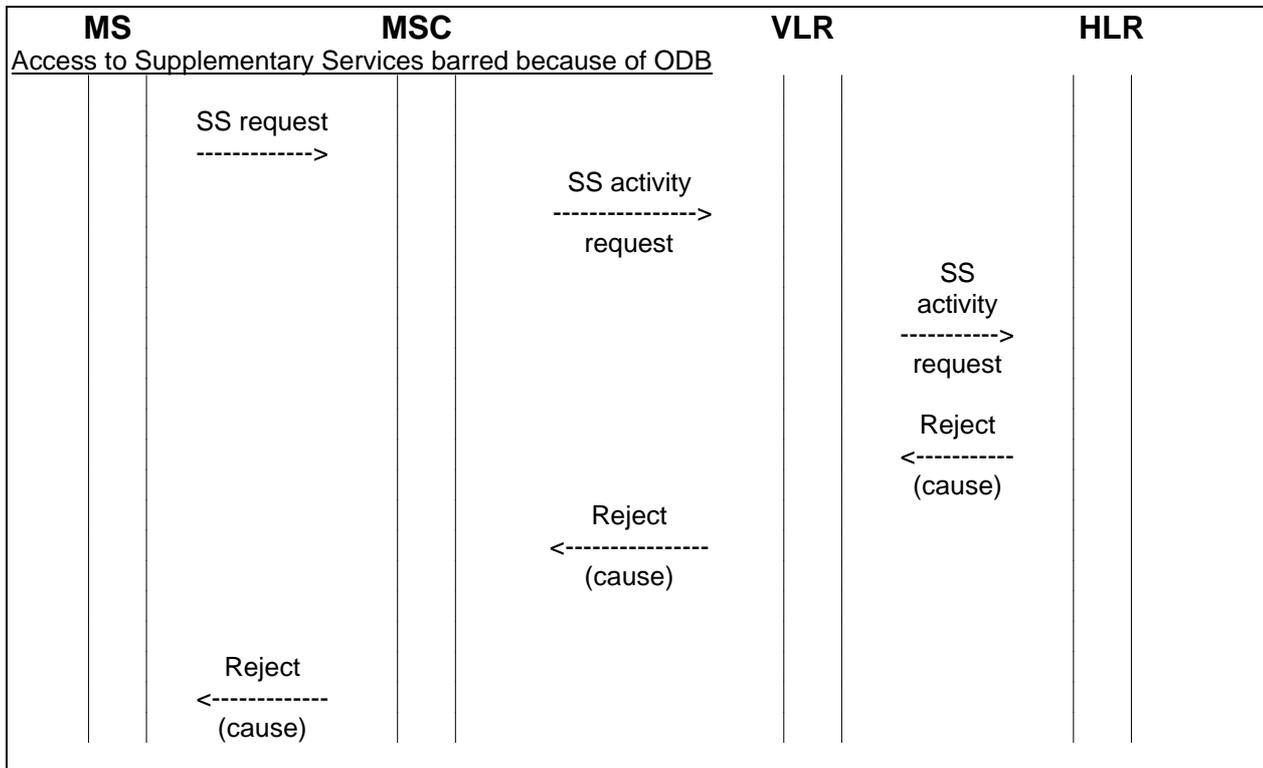
**2.4.2 Invocation of Barring**

Barring of supplementary services access is invoked in the HLR or the VLR, depending on the supplementary service operation.

Barring of access to the following supplementary service operations is invoked in the HLR:

- registration;
- erasure;
- activation;
- deactivation;
- password registration;
- processing unstructured SS data.

An indicative message flow diagram for the handling in the HLR of Operator Determined Barring of access to supplementary services is given in figure 7.



**Figure 7: Operator Determined Barring of Access to Supplementary Services in the HLR**

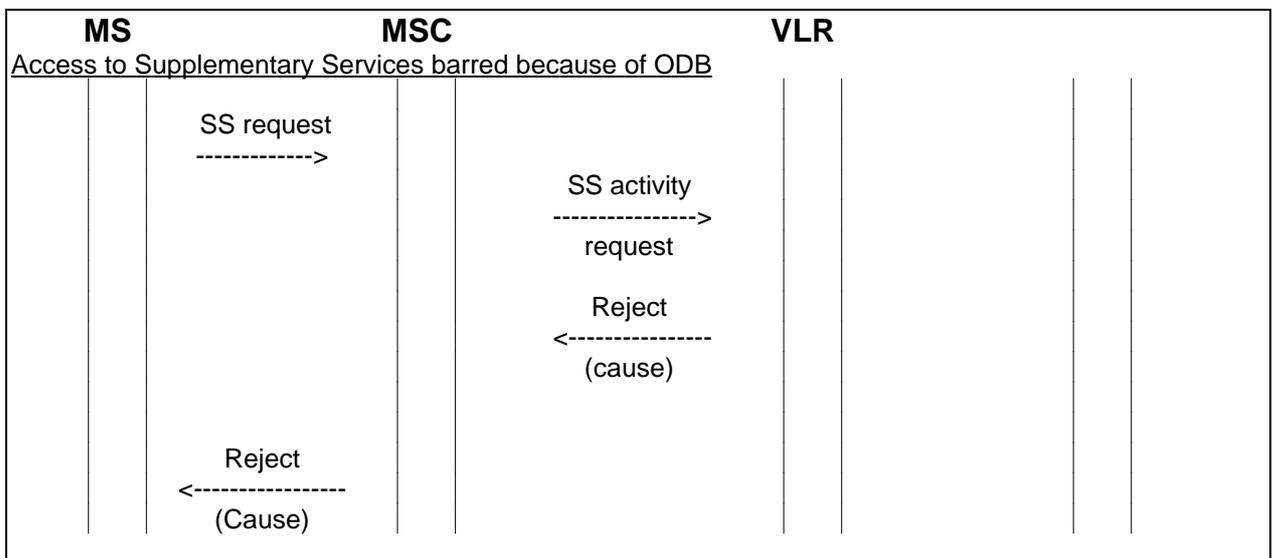
NOTE 1: Although the HLR handles interrogation of some supplementary services, Operator Determined Barring of interrogation of all supplementary services is invoked in the VLR. This reduces the amount of analysis which the VLR must perform on supplementary service requests before deciding whether to relay a supplementary service request to the HLR or reject it because of Operator Determined Barring of access to supplementary services. Operator Determined Barring of control of PLMN specific supplementary services is invoked in the VLR for the same reason.

NOTE 2: Although the VLR handles some processing of unstructured SS data, and therefore has to check for Operator Determined Barring of access to supplementary services, a check is also specified in the HLR to guard against the case where the VLR does not support Operator Determined Barring of access to supplementary services.

Barring of access to the following supplementary service operations is invoked in the VLR:

- interrogation;
- invocation;
- control of PLMN specific supplementary services;
- processing unstructured SS data.

An indicative message flow diagram for the handling in the VLR of Operator Determined Barring of access to supplementary services is given in figure 8.



**Figure 8: Operator Determined Barring of Access to Supplementary Services in the VLR**

#### **2.4.3 Operator Determined Barring of access to supplementary service not supported in VLR**

If the VLR does not support Operator Determined Barring of access to supplementary services the HLR shall take the following actions:

The VLR supports only phase 1:

If the HLR receives a request which should normally be barred by the VLR the HLR shall reject the request with the appropriate phase 1 error (illegal SS operation or system failure).

The VLR supports phase 2 but does not support this Operator Determined Barring category:

If the HLR receives a request which should normally be barred by the VLR the HLR shall reject the request instead of the VLR.

Note that requests handled locally by the VLR (e.g. interrogation) will not be barred.

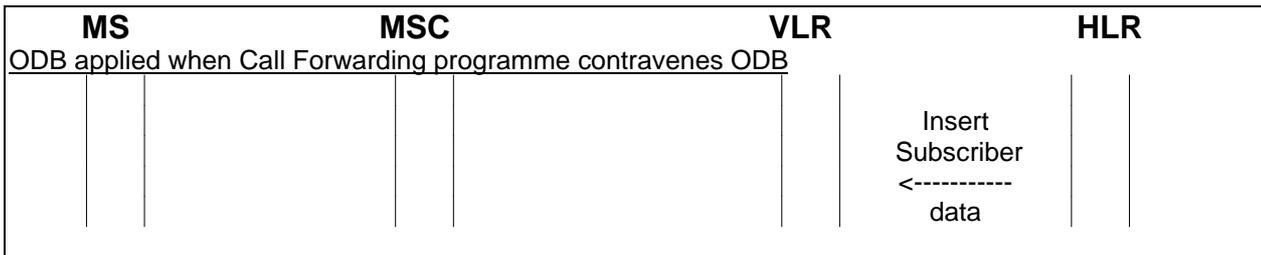
**2.5 Interactions of Operator Determined Barring with Supplementary Services**

The following interactions of Operator Determined Barring with supplementary services have been identified:

**2.5.1 Call Forwarding**

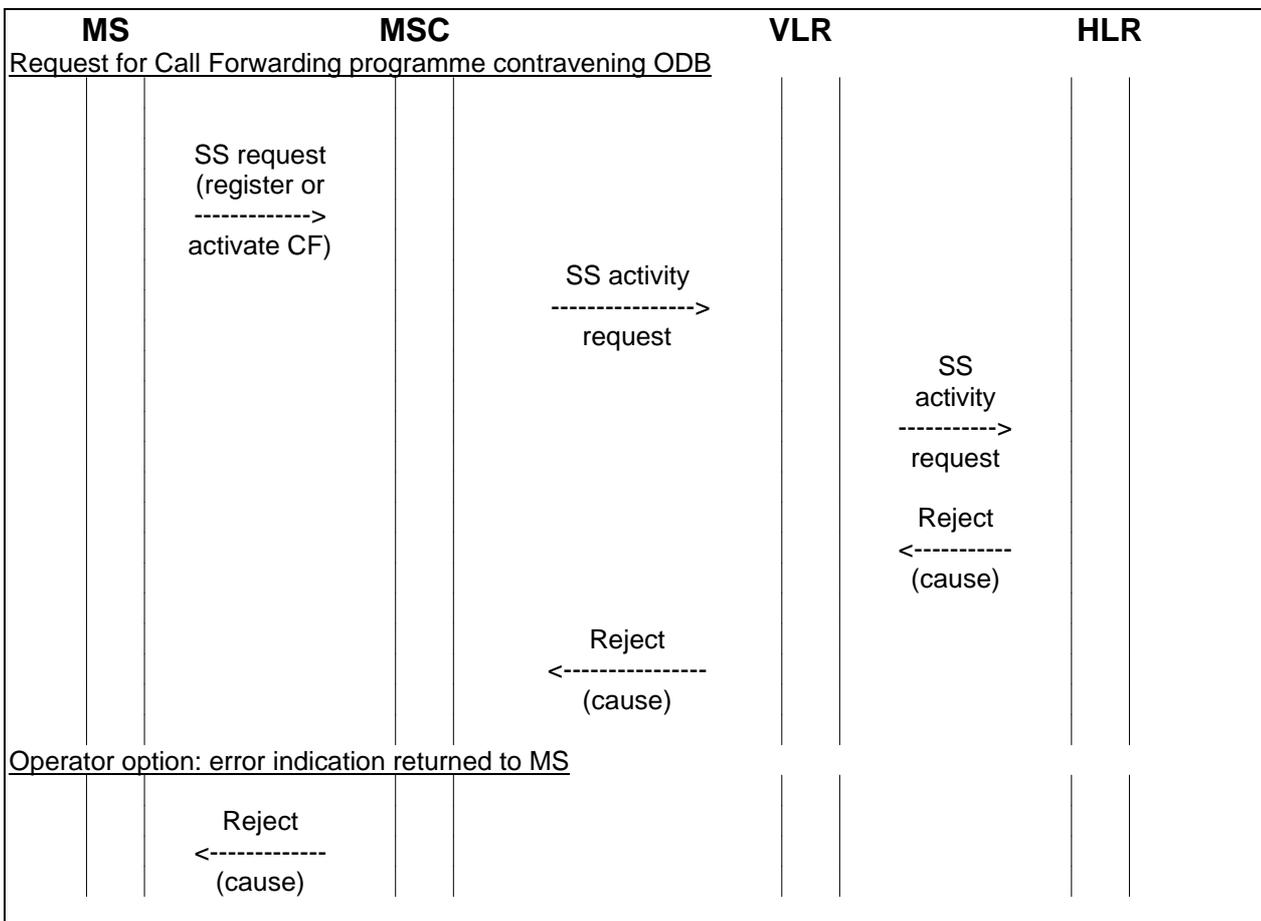
The interactions between Operator Determined Barring and Call Forwarding are specified in GSM 02.41.

The interaction where Operator Determined Barring is applied when there is an existing Call Forwarding programme which is in contravention of the Operator Determined Barring programme is shown in the message flow diagram in figure 9. The HLR modifies the subscription information for the mobile subscriber to show that the contravening call forwarding programme is quiescent, and forwards the modified subscription information to the VLR. No indication is forwarded to the mobile station or the user.



**Figure 9: Effect of Operator Determined Barring on Call Forwarding programme**

The interaction where the user attempts to activate or register a call forwarding programme which is in contravention of an operator determined barring category is shown in the message flow diagram in figure 10.



**Figure 10: Interaction between Operator Determined Barring and Call Forwarding**

## 2.5.2 Closed User Group

The interaction between Operator Determined Barring and Closed User Group is specified in GSM 02.41. In order to meet the service requirement, the checks of a call request in the HLR (for incoming calls) or VLR (for outgoing calls) against the Operator Determined Barring programme shall be carried out before the checks for Closed User Group.

## 2.5.3 Call Barring

The interaction between Operator Determined Barring and the Call Barring supplementary service is specified in GSM 02.41. In order to meet the service requirement, the checks of a call request in the HLR (for incoming calls) or VLR (for outgoing calls) against the Operator Determined Barring programme shall be carried out before the checks for the Call Barring supplementary service.

# 3 Information stored in location registers

## 3.1 Information stored in the HLR

The HLR must store subscription information for each mobile subscriber to define which of the following categories of barring is to be applied, independently of each other:

Barring of outgoing calls (including mobile originated short messages) - one of:

- Barring of all outgoing calls;
- Barring of all outgoing international calls;
- Barring of all outgoing international calls except those directed to the home PLMN country;
- Barring of all outgoing calls when roaming outside the home PLMN country;
- Barring of all outgoing inter-zonal calls;
- Barring of all outgoing inter-zonal calls except those directed to the home PLMN country;
- Barring of all outgoing international calls except those directed to the home PLMN country AND barring of all outgoing inter-zonal calls.

Barring of incoming calls (including mobile terminated short messages) - one of:

- Barring of all incoming calls;
- Barring of all incoming calls when roaming outside the home PLMN country;
- Barring of all incoming calls when roaming outside the zone of the home PLMN country.

Barring of roaming - one of:

- Barring of roaming outside the home PLMN;
- Barring of roaming outside the home PLMN country.

Barring of outgoing premium rate calls - one or both of:

- Barring of outgoing premium rate (information) calls;
- Barring of outgoing premium rate (entertainment) calls.

Barring specific to the home PLMN - when the mobile station is registered in its home PLMN, any one or more of:

- Operator Specific Barring (Type 1);
- Operator Specific Barring (Type 2);
- Operator Specific Barring (Type 3);
- Operator Specific Barring (Type 4).

Barring of Supplementary Services Management.

Barring of registration of call forwarding - one of:

- Barring of registration of any forwarded-to number;
- Barring of registration of any international forwarded-to number;
- Barring of registration of any international forwarded-to number except a number within the HPLMN country;
- Barring of registration of any inter-zonal forwarded-to number;
- Barring of registration of any inter-zonal forwarded-to number except a number within the HPLMN country.

Barring of invocation of call transfer:

one of:

- Barring of invocation of any call transfer;
- Barring of invocation of call transfer where at least one of the two calls is a call charged to the served subscriber;
- Barring of invocation of call transfer where at least one of the two calls is a call charged to the served subscriber at international rates, i.e. the call is either an outgoing international call or an incoming call when the served subscriber roams outside the HPLMN country;
- Barring of invocation of call transfer where at least one of the two calls is a call charged to the served subscriber at inter-zonal rates, i.e. the call is either an outgoing inter-zonal call or an incoming call when the served subscriber roams to a VPLMN in a different zone from the HPLMN;

and independently:

- Barring of invocation of call transfer where both calls are calls charged to the served subscriber;

and independently:

- Barring of invocation of call transfer when there is an existing transferred call for the served subscriber in the same MSC/VLR.

### 3.2 Information stored in the VLR

The VLR must store subscription information for each mobile subscriber to define which of the following categories of barring is to be applied, independently of each other:

Barring of outgoing calls (including mobile originated short messages) - one of:

- Barring of all outgoing calls;
- Barring of all outgoing international calls;
- Barring of all outgoing international calls except those directed to the home PLMN country;
- Barring of all outgoing inter-zonal calls;
- Barring of all outgoing inter-zonal calls except those directed to the home PLMN country;
- Barring of all outgoing international calls except those directed to the home PLMN country AND barring of all outgoing inter-zonal calls.

Barring of outgoing premium rate calls - one or both of:

- Barring of outgoing premium rate (information) calls;
- Barring of outgoing premium rate (entertainment) calls.

Barring specific to the home PLMN - when the mobile station is registered in its home PLMN, any one or more of:

- Operator Specific Barring (Type 1);
- Operator Specific Barring (Type 2);
- Operator Specific Barring (Type 3);
- Operator Specific Barring (Type 4).

Barring of Supplementary Services Management.

Barring of invocation of call transfer:

one of:

- Barring of invocation of any call transfer;
- Barring of invocation of call transfer where at least one of the two calls is a call charged to the served subscriber;
- Barring of invocation of call transfer where at least one of the two calls is a call charged to the served subscriber at international rates, i.e. the call is either an outgoing international call or an incoming call when the served subscriber roams outside the HPLMN country;
- Barring of invocation of call transfer where at least one of the two calls is a call charged to the served subscriber at inter-zonal rates, i.e. the call is either an outgoing inter-zonal call or an incoming call when the served subscriber roams to a VPLMN in a different zone from the HPLMN.

and independently:

- Barring of invocation of call transfer where both calls are calls charged to the served subscriber;

and independently:

- Barring of invocation of call transfer when there is an existing transferred call for the served subscriber in the same MSC/VLR.

### **3.3 Transfer of Subscription Information**

The following subscription information for Operator Determined Barring must be transferred from the HLR to the VLR when a mobile station registers in a VLR:

- Barring of outgoing calls;
- Barring of outgoing premium rate calls;
- Barring of supplementary services management;
- Barring of invocation of call transfer.

In addition, when a mobile station registers in a VLR in its home PLMN the subscription information for Operator Determined Barring specific to the home PLMN must be transferred from the HLR to the VLR.

**Annex A (informative): Status of Technical Specification GSM 03.15**

<b>Status of Technical Specification GSM 03.15</b>		
<b>date</b>	<b>version</b>	<b>remarks</b>
January 1994	Version 4.3.0	CR agreed at SMG #10: CR 03.15-004
September 1994	Version 4.3.1	ETS 300 533
December 1995	Version 5.0.0	CR agreed at SMG #13: CR 03.15-A001 CR agreed at SMG #14: CR 03.15-A002
February 1997	Version 5.1.0	CRs agreed at SMG #21: CR 03.15-A003 rev 4 CR 03.08-A004
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