

ETSI TS 123 094 V15.0.1 (2018-07)



**Digital cellular telecommunications system (Phase 2+) (GSM);
Universal Mobile Telecommunications System (UMTS);
Follow-Me (FM);
Stage 2
(3GPP TS 23.094 version 15.0.1 Release 15)**



Reference

RTS/TSGC-0423094vf01

Keywords

GSM,UMTS

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:

<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2018.

All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members.

3GPP™ and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

oneM2M logo is protected for the benefit of its Members.

GSM® and the GSM logo are trademarks registered and owned by the GSM Association.

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

Foreword

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under <http://webapp.etsi.org/key/queryform.asp>.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Contents

Intellectual Property Rights	2
Foreword.....	2
Modal verbs terminology.....	2
Foreword.....	4
1 Scope	5
2 References	5
3 Definitions and abbreviations.....	5
3.1 Definitions	5
3.2 Abbreviations	6
4 Handling of Follow Me	6
4.1 General	6
4.1.1 Provision	7
4.1.2 Registration	7
4.1.3 Erasure	7
4.1.4 Interrogation	7
4.2 Information Flows	7
4.2.1 Information Flow for the handling of FM by the initiating subscriber	7
4.2.2 Information Flow for the handling of FM by the remote party.....	10
4.3 Handling of FM control in HLRa and FFNb	10
4.3.1 Handling of FM control in HLRa	10
4.3.2 Handling of FM control in FFNb.....	13
4.4 USSD interworking and Cross-phase compatibility.....	22
5 Information stored in the network entities.....	22
5.1 Information stored in HLRa and FFNb	22
5.2 State transition model.....	23
5.3 Information stored in the VLR	24
5.4 Transfer of information from HLR to VLR.....	24
Annex A (informative): Checking matrix for FM-CFU interaction in FFNb	25
Annex B (normative): FM control Messages and their contents	27
B.1 General principles	27
B.2 Information Elements used in the messages.....	27
B.3 Messages Contents of the FM Request	27
B.4 Messages Contents of the HLR-FM-Request.....	28
B.5 Contents and Format of the USSD String of the USSD-Notify	31
B.6 Inter-process Message Init-Notify	32
Annex C (informative): Change history	33
History	34

Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document specifies the stage 2 description for the Follow Me feature.

The Follow Me feature enables a mobile subscriber A to manipulate the Follow Me data of a remote party B in such a way that subsequent calls directed to remote party B will be forwarded to subscriber A.

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. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "3G Vocabulary".
- [2] 3GPP TS 22.004: "General on Supplementary Services".
- [3] 3GPP TS 22.030: "Man-Machine Interface (MMI) of the Mobile Station (MS)".
- [4] 3GPP TS 22.082: "Call Forwarding (CF) supplementary services - Stage 1".
- [5] 3GPP TS 22.094: "Follow Me (FM) feature - Stage 1".
- [6] 3GPP TS 23.011: "Technical realisation of Supplementary Services - General Aspects".
- [7] 3GPP TS 23.015: "Technical realisation of Operator Determined Barring (ODB)".
- [8] 3GPP TS 23.090: "Unstructured Supplementary Services Data (USSD)- Stage 2".
- [9] 3GPP TS 23.082: "Call Forwarding (CF) supplementary services - Stage 2".
- [10] 3GPP TS 22.090: "Unstructured Supplementary Services Data (USSD)- Stage 1".
- [11] 3GPP TS 24.090: "Unstructured Supplementary Services Data (USSD)- Stage 3".
- [12] 3GPP TS 29.002: "Mobile Application Part (MAP)".

3 Definitions and abbreviations

3.1 Definitions

initiating subscriber: mobile subscriber who modifies the Follow Me data of the remote party.

initiating number: number (the MSISDN of the initiating subscriber) to which incoming calls, originally destined for the remote party, shall be forwarded. It is subsequently also referred to as **MSISDN_A**.

remote party: is characterised by the remote number which is defined in the numbering plan of a PLMN operator. The Follow Me feature enables the initiating subscriber to modify the Follow Me data of the remote party. In particular cases the remote party is a GSM subscriber of the PLMN and the remote number denotes her basic MSISDN.

Previously registered subscriber: Is the initiating service subscriber who has registered Follow Me with respect to a remote party. Her Registration can be erased by herself or by an FM service supervisor via forced erasure procedure.

FM service supervisor: is an initiating subscriber who is allowed to modify the Follow Me data of a remote party who has been registered to a previously registered subscriber for the Follow Me application. The FM service supervisor shall be authorised by her network operator.

remote number: is a number in E.164 format which identifies a remote party. In general this number is not assigned to a subscriber and can be regarded as a "dummy MSISDN". In particular cases the remote party is a GSM subscriber of the PLMN and the remote number denotes her basic MSISDN. The remote number is entered by the initiating subscriber for registration, interrogation, forced erasure and erasure of the Follow Me feature with respect to the remote party.

Follow Me function node: is a network node in the PLMN operator of the remote party. The FM data of the remote party are stored in this node. This node can be implemented in:

- an HLR;
- any other operator specific network node e.g.:
 - a gsmSCF;
 - an SCP.

3.2 Abbreviations

FFN	Follow Me function node
FM	Follow Me
SCP	Service Control Part

Other abbreviations used in this ETS are listed in 3GPP TR 21.905.

4 Handling of Follow Me

4.1 General

Follow Me enables an initiating mobile subscriber A to have control over the Follow Me data of a remote party B. The remote party B is characterised by the remote number which is defined in the numbering plan of a PLMN operator. Initiating Subscriber A shall be able to manipulate the Follow Me data of remote party B such that subsequent calls destined for remote party B are forwarded to initiating subscriber A. In the case of Forced Erasure by an FM service supervisor, the initiating subscriber is allowed to erase the Follow Me data of a remote party who has been registered to a different initiating subscriber for the Follow Me application.

Follow Me is a PLMN specific feature and the control operations of FM are based on USSD. All messages between the MS and the mobile network and internal to the mobile network are USSD messages.

The present document deals with the control operations of FM in HLRA and FFN. If the FFN is an HLR, the control of the requests for both FM and CFU services is specified (see subclause 4.3.2).

The functionality of forwarding calls for remote party B to initiating subscriber A (after successful registration of FM) is out of the scope of the present document. This functionality is the same as the functionality of the Call Forwarding Unconditional Supplementary Service applied to all telecommunication services of remote party B for which CFU is applicable.

NOTE 1: the "served mobile subscriber" in 3GPP TS 22.094 [5] corresponds to the "remote party" in the present document and the "forwarded-to subscriber" in 3GPP TS 22.094 [5] corresponds to the "initiating subscriber" in the present document.

NOTE 2: The forwarding of calls for remote party B to initiating subscriber A can be achieved by invoking the Call Forwarding Unconditional Supplementary Service or by making use of an equivalent operator specific service (e.g. via CAMEL).

The functionality of the control of Follow Me (registration, erasure, forced erasure and interrogation) is split between the HLR of the initiating subscriber A (HLRA) and the FFN of the remote party B (FFNb).

4.1.1 Provision

FM can be registered / erased / interrogated by an initiating subscriber A with respect to a remote party B if both parties are provisioned with FM.

To enable forced erasure by an FM service supervisor, the FM service shall be provisioned to the FM service supervisor. Additionally, she needs the subscription entitlement to perform the forced erasure.

NOTE: In general remote party B does not correspond to a GSM subscriber. In this case provisioning of FM for remote party B is operator specific.

If remote party B is a GSM subscriber and if the forwarding of calls for remote party B to initiating subscriber A is achieved by invoking the Call Forwarding Unconditional Supplementary Service, provision of CFU for remote party B is required.

4.1.2 Registration

The initiating subscriber registers the FM feature with respect to a particular remote party.

If an initiating subscriber A successfully registers FM with respect to a remote party B then FM becomes registered, active and operative for remote party B.

As a result of the registration subsequent calls directed to remote party B are forwarded to initiating subscriber A.

NOTE: The remote party cannot register FM with respect to herself.

4.1.3 Erasure

If an initiating subscriber A or the FM service supervisor successfully erases FM with respect to a remote party B then FM becomes not registered and not active for remote party B.

For forced erasure by the FM service supervisor the previously registered subscriber shall be informed of the successful forced erasure via a network initiated USSD Notify message with appropriate contents. This message is sent by the FFN.

If remote party B is a GSM subscriber and successfully erases FM then FM becomes not registered and not active for remote party B.

4.1.4 Interrogation

If an initiating subscriber A or the FM service supervisor successfully interrogates FM with respect to a remote party B then this procedure interrogates the FM data of subscriber B.

If remote party B is a GSM subscriber and successfully interrogates FM then this procedure interrogates her own FM data.

4.2 Information Flows

4.2.1 Information Flow for the handling of FM by the initiating subscriber

Figure 4.1 shows the Information Flow for the control of FM (registration, erasure, forced erasure and interrogation) by the initiating subscriber.

For any control operation on FM, the initiating subscriber (MSa) enters a Follow Me Request (FM-Request). This is a USSD string containing the requested FM operation and the remote number. The Follow Me Request is routed via the MSC/VLR to the HLR of the initiating subscriber (HLRa).

The HLRa performs a series of checks as described in the SDLs (subclause 4.3). If these checks fail, the MSa receives a response (FM-Response) indicating the error.

If the checks pass, the HLRa forwards the operation request (HLR-FM-Request) to the FFN of the remote party (FFNb).

FFNb carries out the appropriate control operation and checks as described in the SDLs (subclause 4.3) for the remote party.

The result of this operation (success or error) is reported back in a USSD Response to the initiating subscriber.

For successful forced erasure by a service supervisor, the FFN shall send a Network Initiated USSD notify message with the corresponding USSD string to the HLR of the previously registered subscriber who had registered the Follow Me data. The HLR shall forward the USSD notify to VLR which will relay the USSD Notify towards the MS.

Upon receipt of the USSD Notify, the MS shall respond by sending a FACILITY message with empty return result component.

An error response with corresponding reason can be returned from any entity, when error happens at the entity 3GPP TS 23.090 [8].

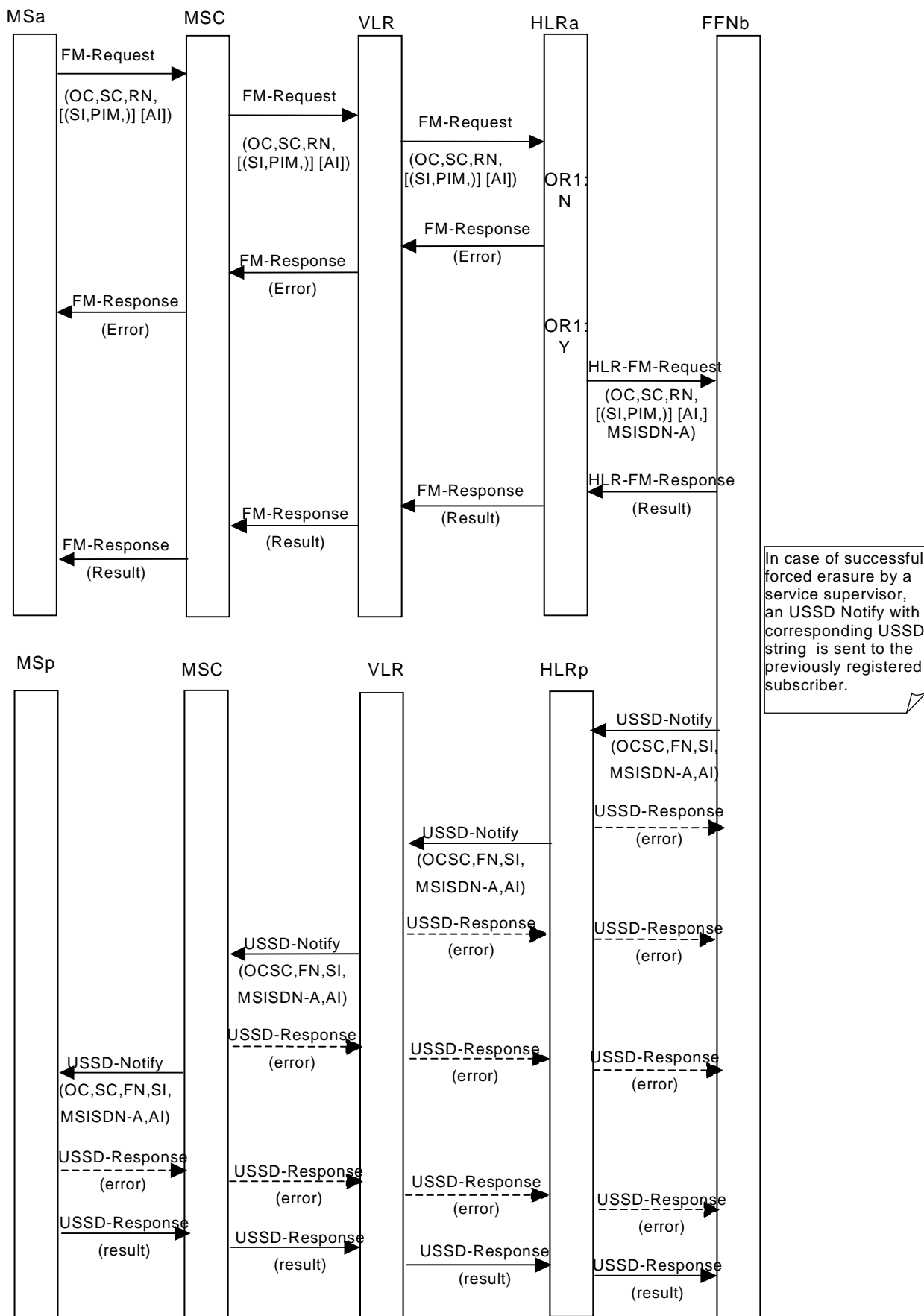


Figure 4.1: Information flow for the control of FM by the initiating subscriber or service supervisor

NOTE 1:	OR1:N:	The case where the checks in the HLR result in a negative outcome, e.g. FM is not provisioned for the initiating subscriber or the initiating subscriber is not allowed to operate FM for the remote party.
	OR1:Y:	The case where all the checks in the HLR are successful, e.g. FM is provisioned for the initiating subscriber and the initiating subscriber is allowed to operate FM for the remote party.
NOTE 2:	[...]	Optional parameter.
	(...)]	Conditional parameter.
	OC	Operation Code (Register, Erase or Interrogate).
	SC	Service Code for FM.
	RN	Remote Number.
	SI	Supervisor Indicator. This parameter is conditional and only used for forced erasure by a FM service supervisor.
	PIM	MSISDN of previously registered subscriber who has registered the FM to remote number. This parameter is conditional and only used for forced erasure by a FM service supervisor..
	AI	Supplementary Information containing additional information.
	MSISDN-A	initiating number in international format. It is not a part of the USSD string, but is sent from HLRa to the FFNb together with the HLR-FM-Request within the MAP operation. For forced erasure, the MSISDN-A corresponds to the supervisor's MSISDN and will be part of the USSD-notify.
	MSp	MS of previously registered service subscriber.
	HLRp	HLR of the previously registered service subscriber.

4.2.2 Information Flow for the handling of FM by the remote party

Control of FM by the remote party is possible if the remote party is a GSM subscriber.

The information flow for control of FM by the remote party (erasure and interrogation of her own FM data) is the same as the information flow for control of FM by the initiating subscriber.

If a remote party tries to register FM to herself the registration is rejected and an error is reported.

4.3 Handling of FM control in HLRa and FFNb

HLRa and FFNb can both receive FM control messages, based on USSD. The USSD handler in each entity analyses the Service Code contained in the USSD string and, recognising the Service Code for FM, invokes the FM USSD application.

The FM control messages and their contents are given in Annex B (normative).

4.3.1 Handling of FM control in HLRa

The FM USSD application in HLRa is the process **FM_initiating_subscriber_handling_in_HLR** (figure 4.2). It receives the FM-Request from the initiating subscriber. This FM-Request is an USSD-string containing:

- the operation code (register, erase, interrogate);
- the remote number;
- an additional operator specific information field.

The HLR checks:

- the provisioning of FM to the initiating subscriber;
- whether the FFN can be deduced from the remote number;
- whether any operator specific restrictions to engage in FM activity with the remote party apply;
- if the initiating subscriber requires forced erasure, the HLR checks Whether the initiating subscriber is entitled to do it, i.e. Whether the initiating subscriber is a FM service supervisor.

The basic MSISDN of the initiating subscriber is sent together with the original USSD string to the FFN of the remote party.

The HLR forwards the response from the FFN to the initiating subscriber.

For successful forced erasure by a service supervisor, the HLR of the previously registered subscriber (HLRp) shall relay the USSD Notify to the VLR when the USSD Notify from the FFN is received. The VLR will then forward the USSD Notify towards the MS of the previously registered service subscriber.

On receipt of an USSD response from the MS of the previously registered subscriber, the HLRp shall relay it to the FFN.

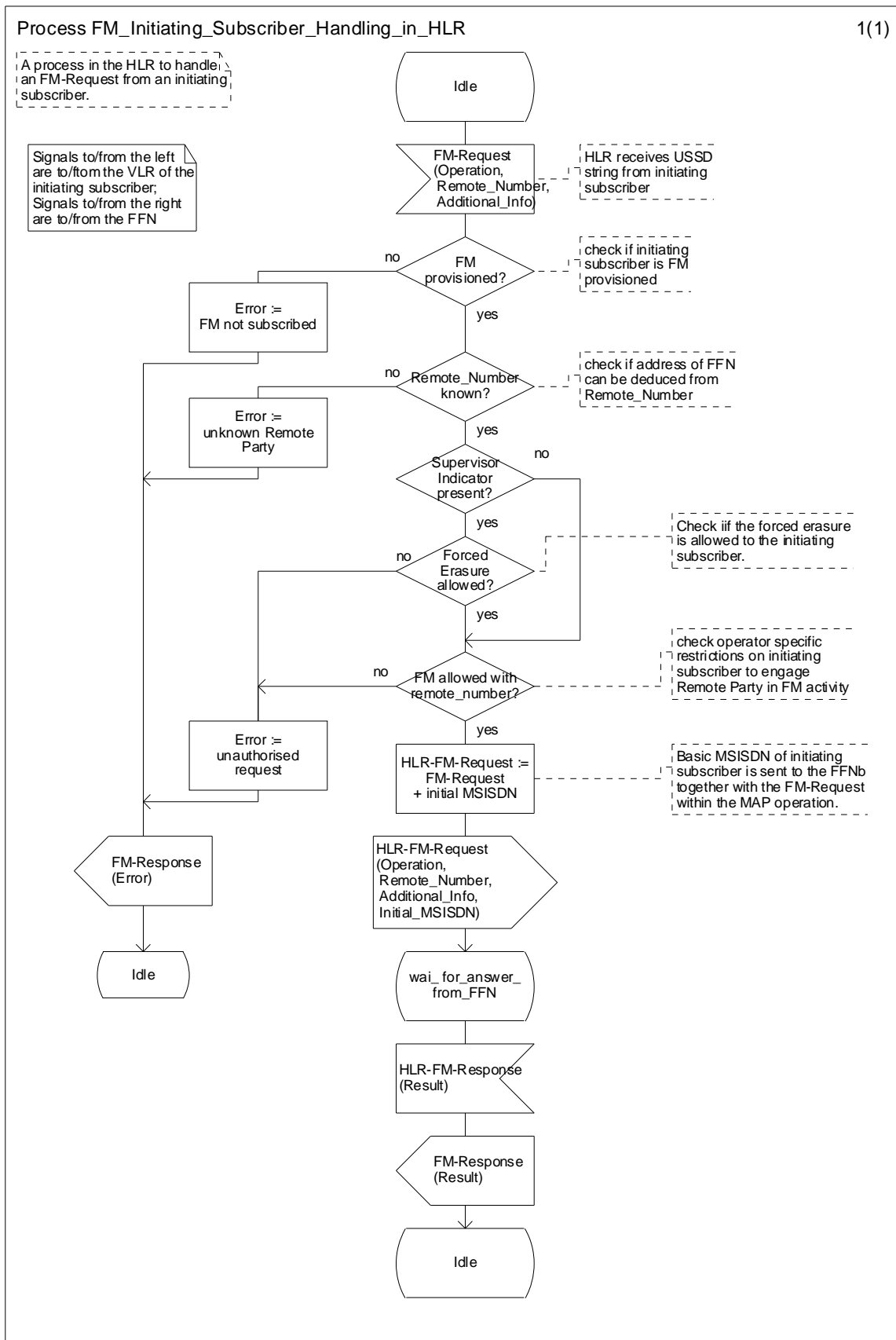


Figure 4.2: Process: FM_Initiating_Subscriber_Handling_in_HLR

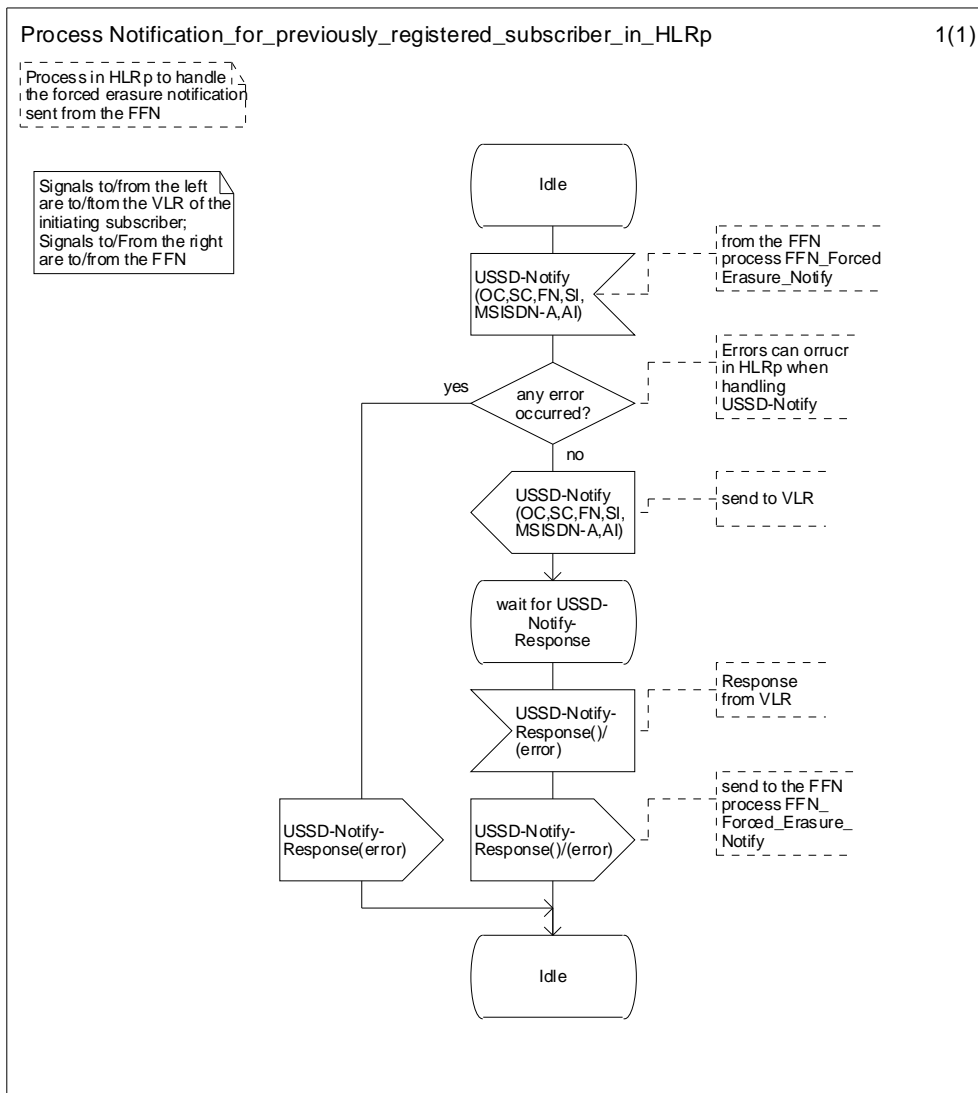


Figure 4.2a: Process Notification_for_previously_registered_subscriber_in_HLRp

4.3.2 Handling of FM control in FFNb

If the FFN is an HLR, the FFN is responsible for handling the interactions between FM and CFU. Two kinds of request may be received in an FFN which deals with forwarding services:

- CFU requests sent by the VLR for CFU operations (only if the FFN is a HLR);
- FM-HLR-Requests which are USSD strings sent by HLRA for FM operations.

When the control process in the FFN receives a CFU request, it shall either pass the CFU operation request directly to a CFU process or reject it depending on the registration and/or activation states of both FM and CFU services (see Table A.1 for permission checks).

On receipt of an HLR-FM request, the control process in the FFN performs a series of FM specific checks and checks the states of both FM and CFU. If the checks are successful, a CFU operation request is sent to a CFU process. On receipt of an HLR-FM-Request from HLRA, the FFN performs a series of checks. e.g.:

- if the remote party is a GSM subscriber:
 - provisioning of FM to the remote party;
 - provisioning of CFU to the remote party;
 - illegal interaction with CFU registered or active to remote party.

- if the remote number is registered in the FFN;
- if any operator specific restrictions to engage in FM activity with the initiating subscriber apply;
- specific checks for forced erasure.

Depending on the requested operation, one of the following procedures is performed:

- registration with implicit Activation (procedure Handle_Remote_Party_Registration, figure 4.6);
- erasure with implicit Deactivation (procedure Handle_Remote_Party_Erasure, figure 4.7);
- interrogation (procedure Handle_Remote_Party_Interrogation, figure 4.8).

For successful forced erasure by a service supervisor, the FFN shall generate an USSD-Notify message and send it to the HLRp, which will relay the USSD Notify towards the MS of the previously registered subscriber (MSp). On receipt of an error response that the USSD Notify message could not be transferred to the MS, the FFN shall check the error code of the response. Depending on the error types and the specific implementation the process shall decide to resend the USSD message after a predefined time.

For the resend procedure the process shall start a timer. On timer expiry it shall send the message again. The FFN shall repeat the messages up to 5 times.

The length of the timer is defined by operator and has the value in the range of 1 – 10 minutes.

Figure 4.3 shows the message flow between the process Forwarding_Service_Control and the processes handling CFU operation requests, defined in 3GPP TS 23.082 [9].

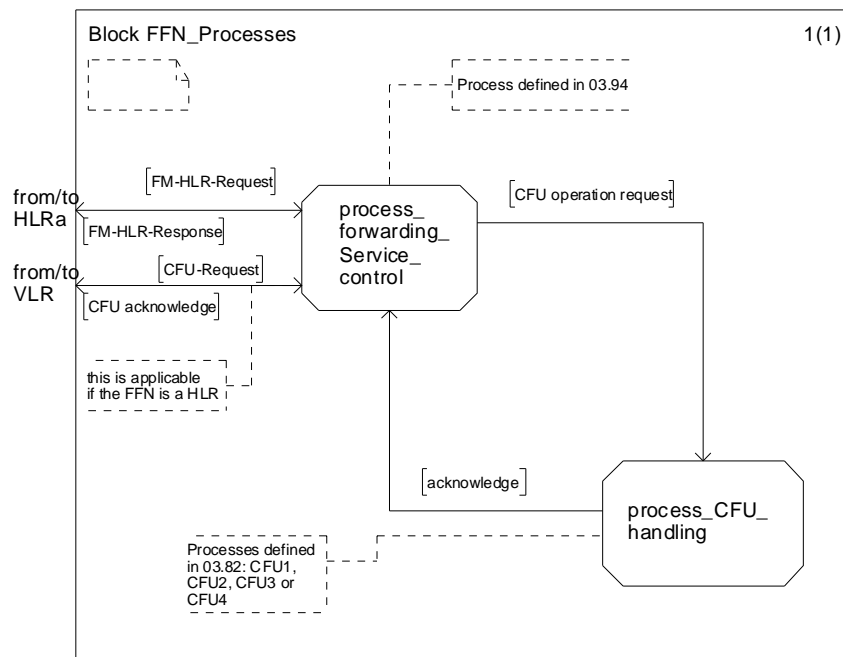
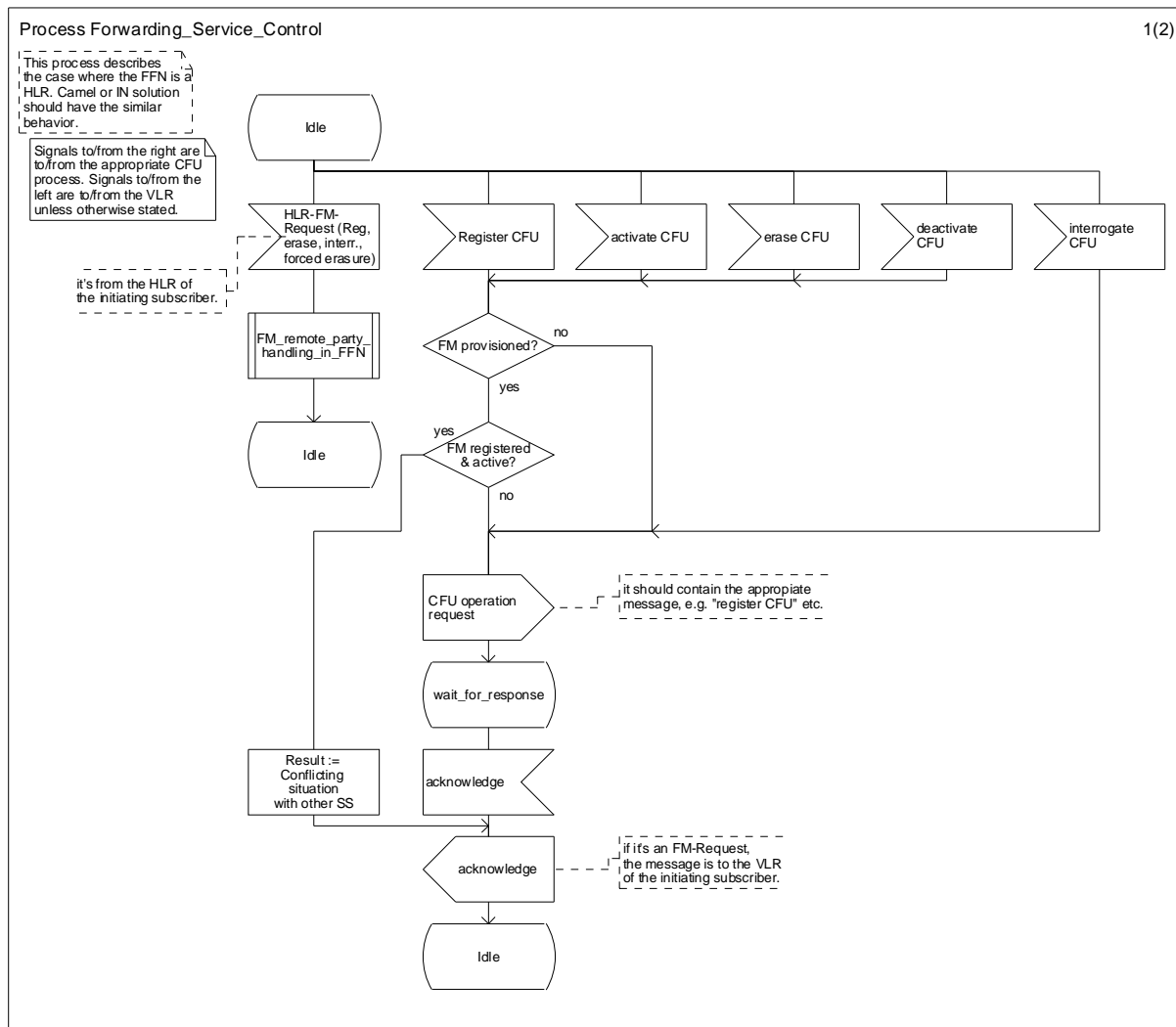


Figure 4.3: FFN_processes



4.4 Process Forwarding_Service_Control

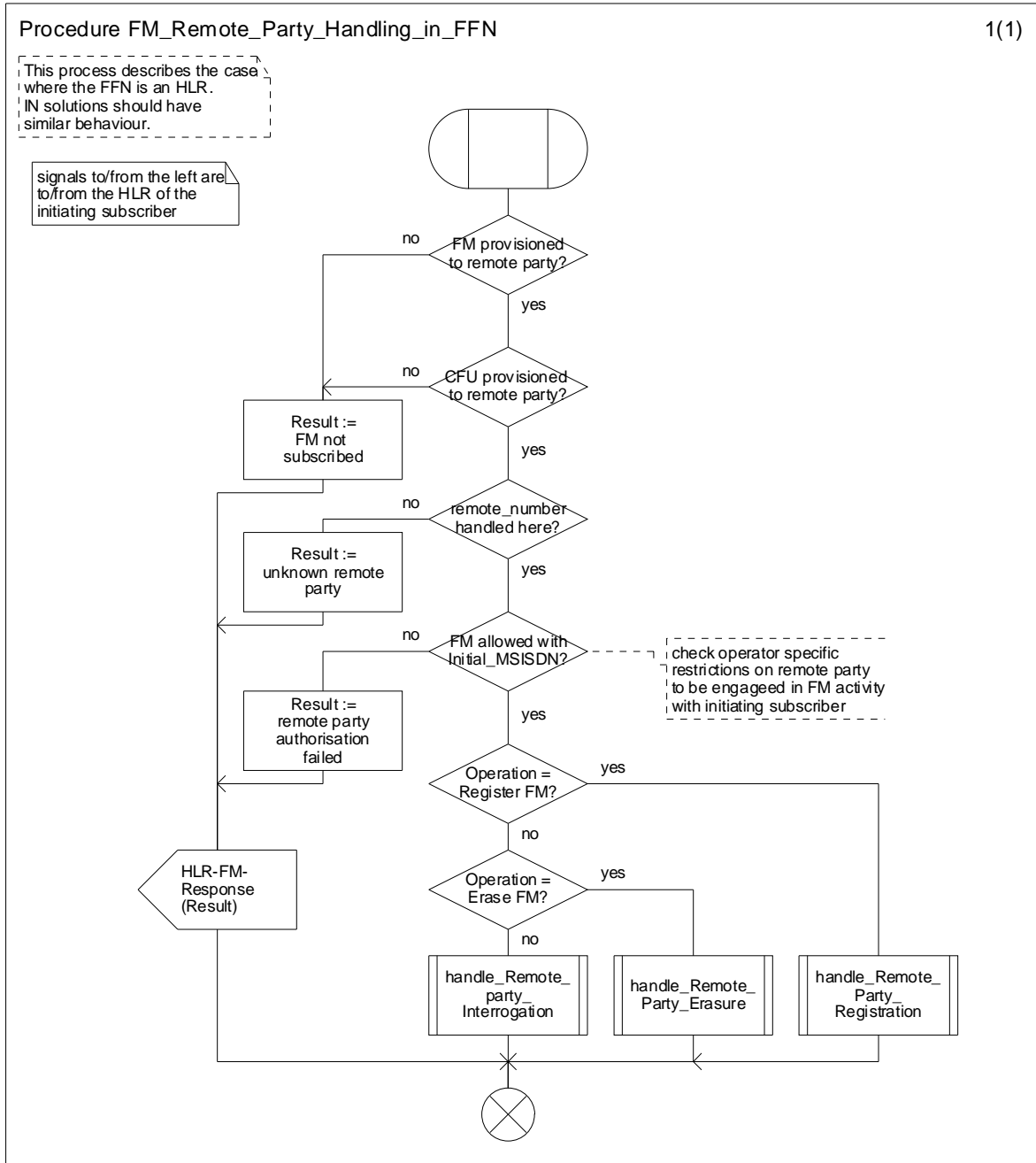


Figure 4.5: Procedure: FM_Remote_Party_Handling_in_FFN

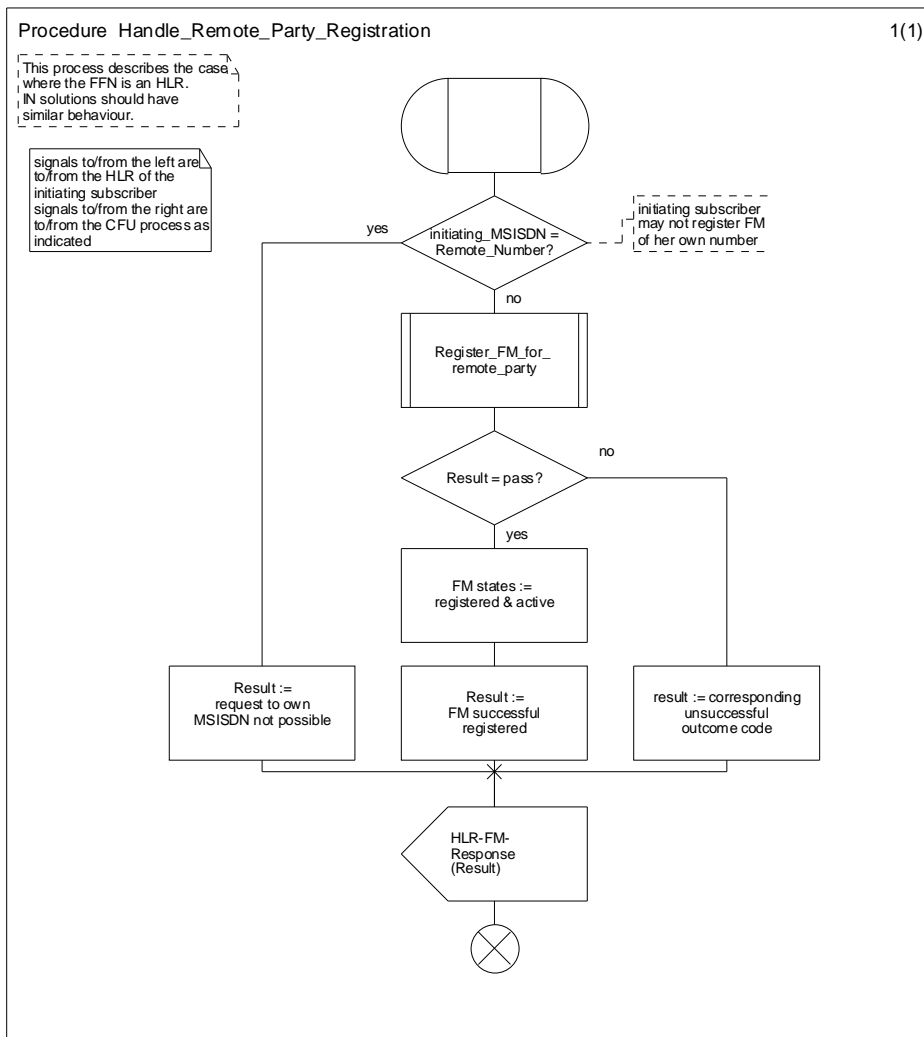


Figure 4.6: Procedure: Handle_Remote_Party_Registration

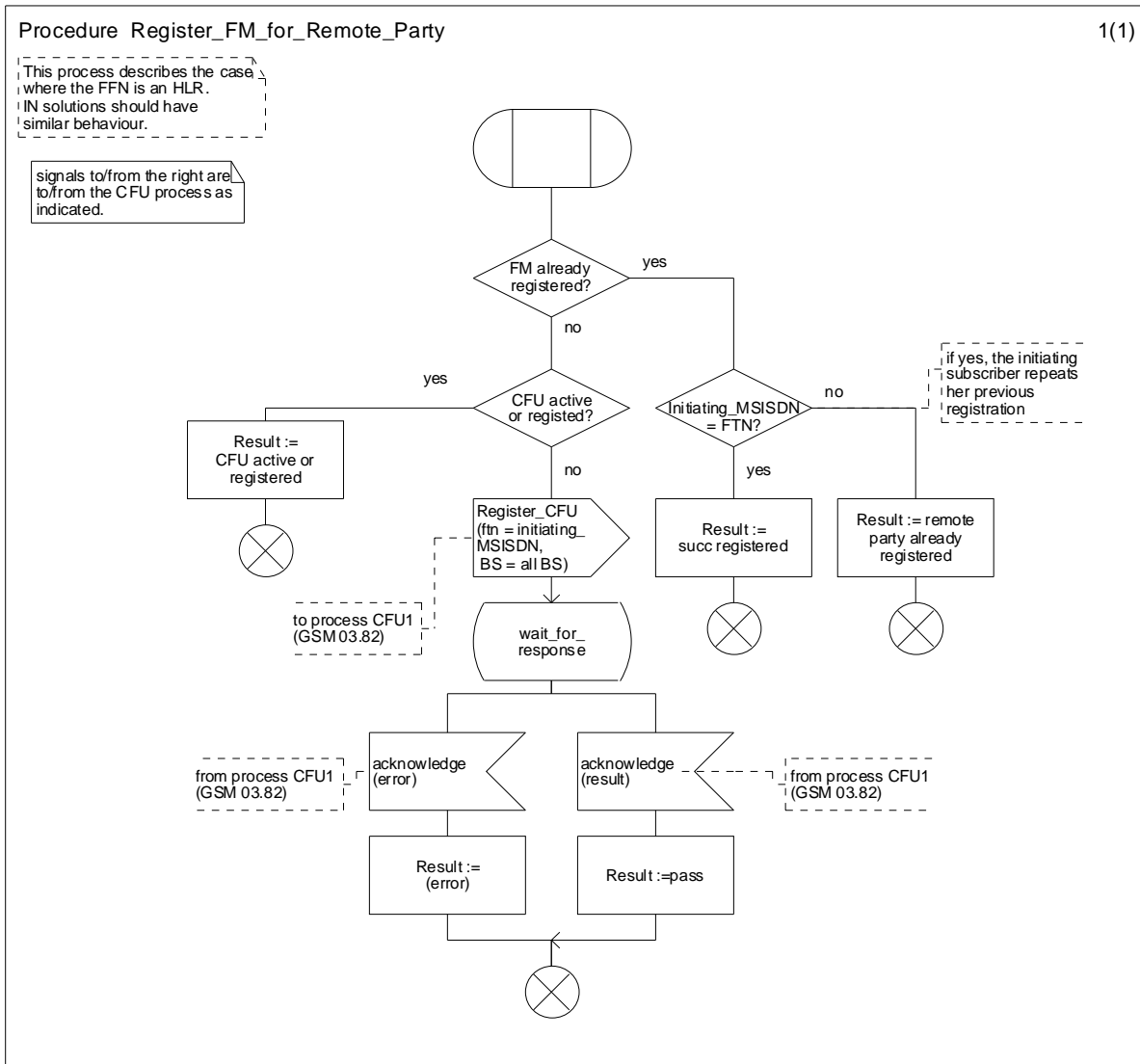


Figure 4.6a: Procedure Register_FM_for_Remote_Party

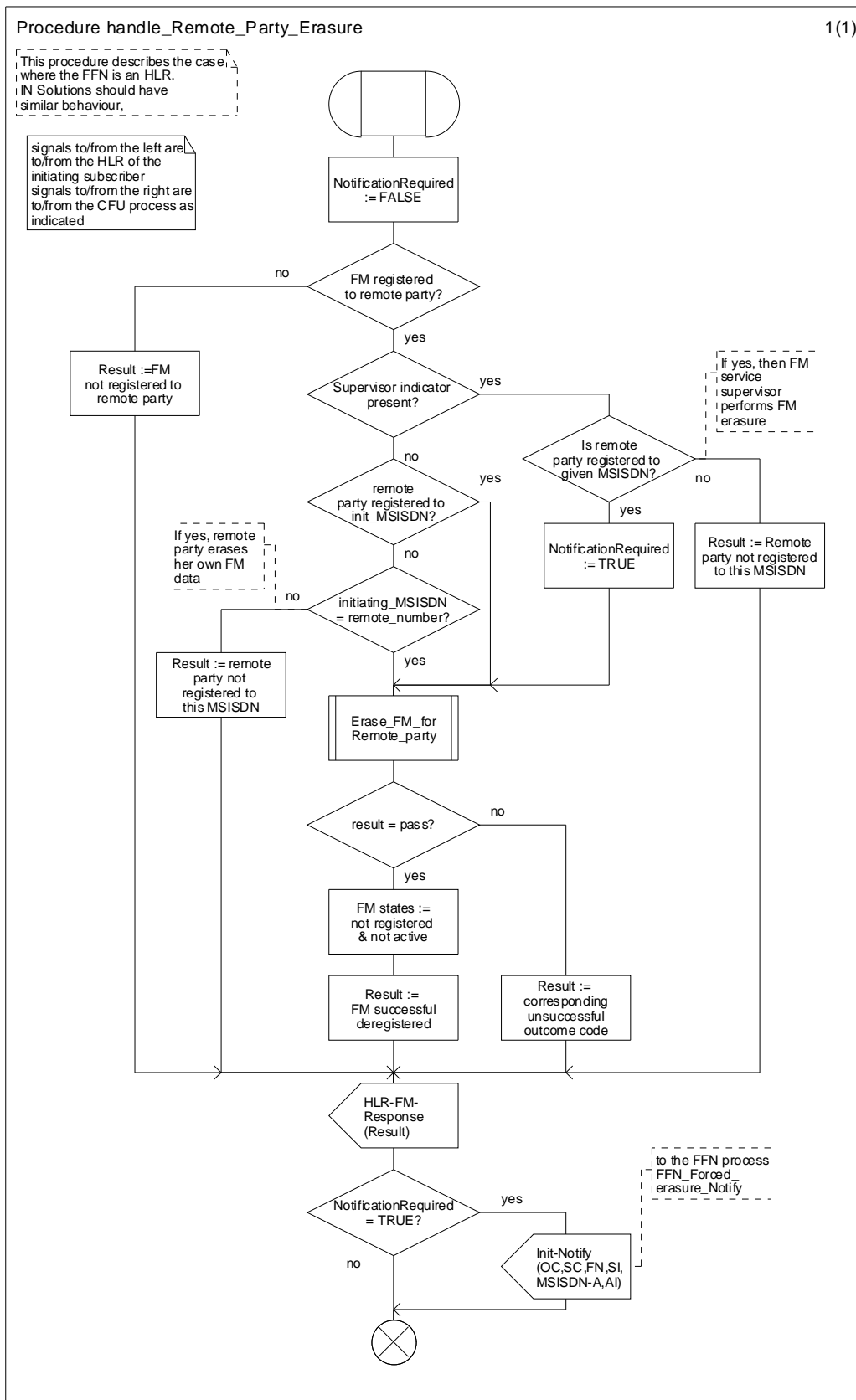


Figure 4.7: Procedure: Handle_Remote_Party_Erasure

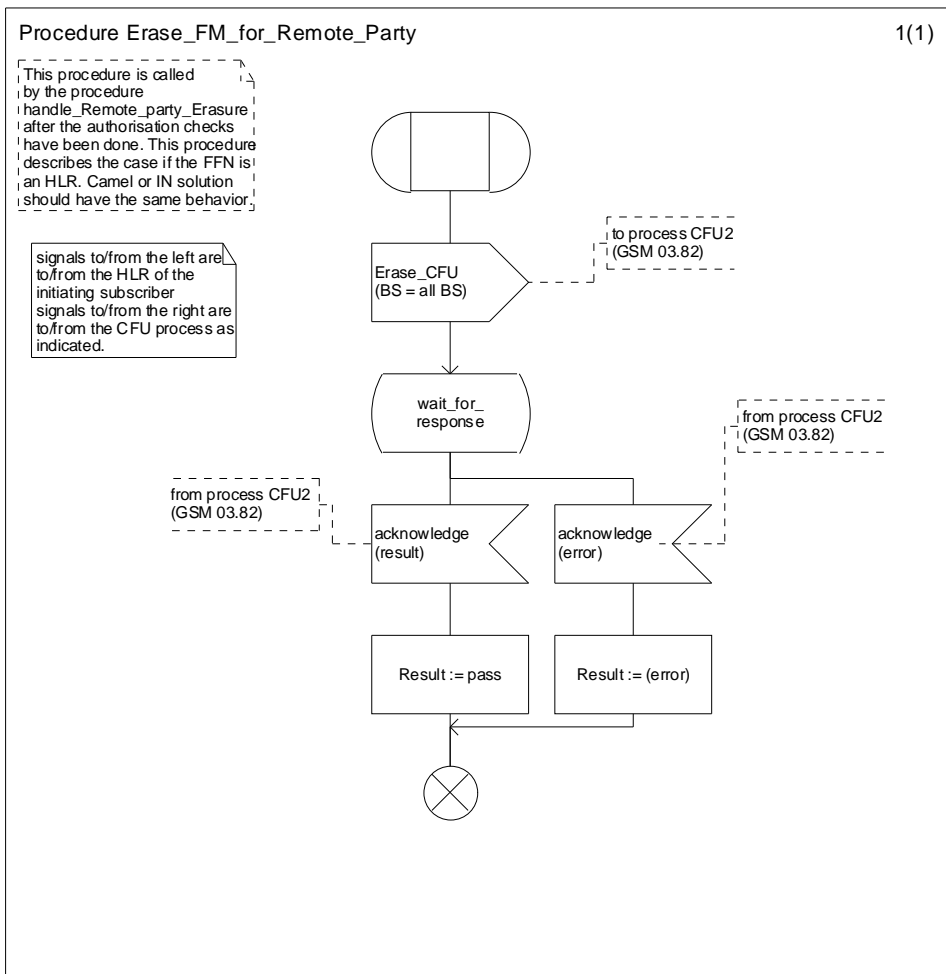


Figure 4.7a: Procedure Erase_FM_for_Remote_party

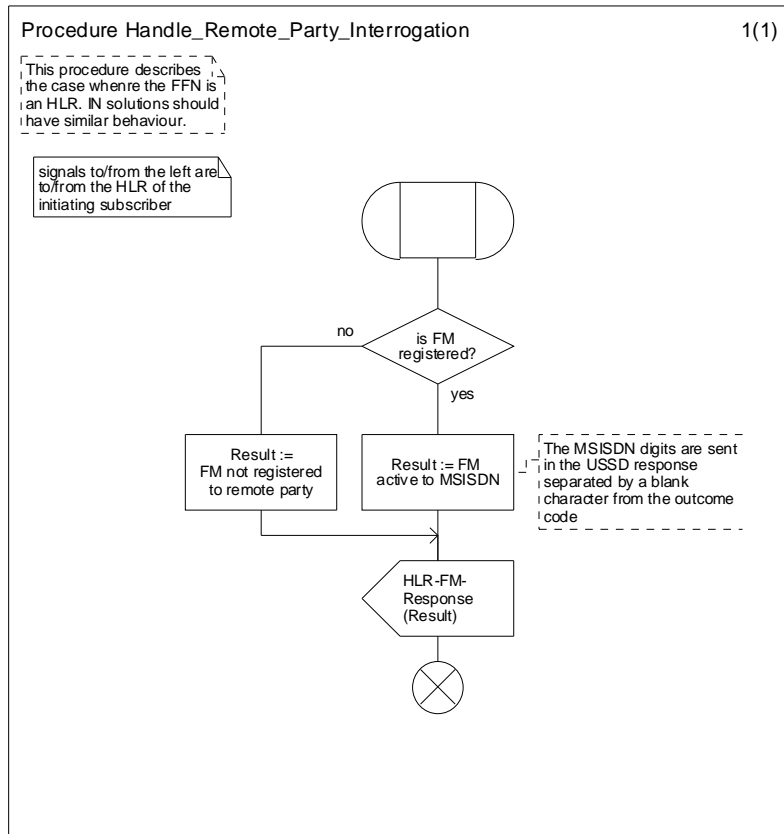


Figure 4.8: Procedure Handle_Remote_Party_Interrogation

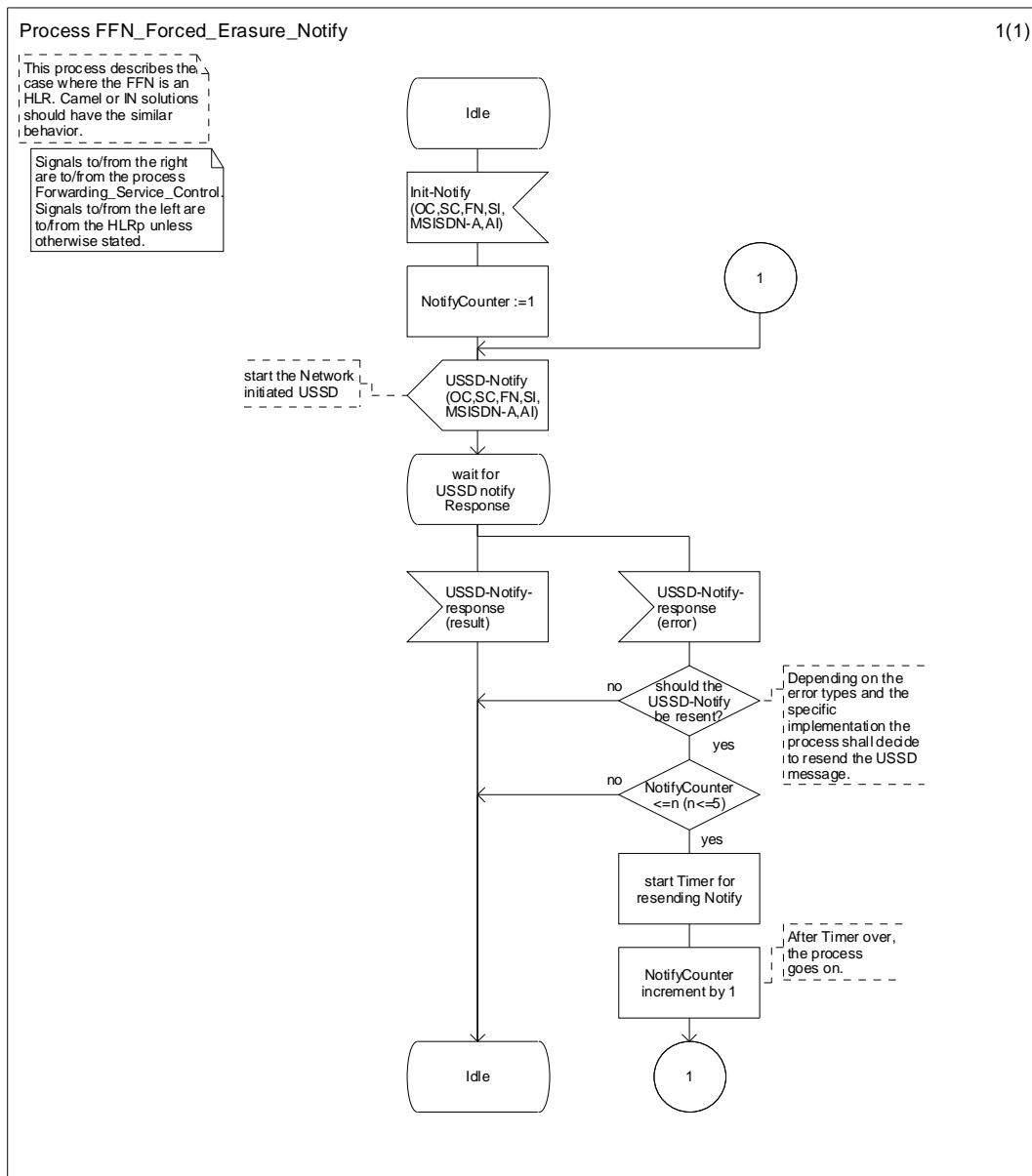


Figure 4.9: Process FFN_Forced_Erasure_Notify

4.4 USSD interworking and Cross-phase compatibility

All the messages between MS and the mobile network and internal to the mobile network, which are used for control of Follow Me, are USSD Phase 2 messages.

A Cross-phase compatibility mechanism specified in 3GPP TS 23.011 [6] for networks or MS not supporting USSD Phase 2 is not required.

Networks subject to the Interoperability Directive have to implement FM using USSD Phase 2.

NOTE: As an option, these networks may also implement FM using USSD Phase 1.

5 Information stored in the network entities

5.1 Information stored in HLRa and FFNb

The HLRa shall store:

- the state of FM (which shall be one of the valid states listed below).

The FFNb shall store:

- the state of FM if the remote party is a GSM subscriber;
- the registration parameter:
 - the initiating number (MSISDN_A).

The following logical states are applicable for FM (refer to TS 23.011 for an explanation of the notation):

In HLRa (for the initiating subscriber)

Provisioning State	Registration State	Activation State	HLR Induction State
(Not Provisioned,	Not Registered,	Not Active,	Not Induced)
(Provisioned,	Not Registered,	Not Active,	Not Induced)

The registration and activation state is the same for each applicable elementary basic service group.

The provisioning state shall be per subscriber, and hence the same for all basic service groups.

In FFNb (for the remote party).

Provisioning State	Registration State	Activation State	HLR Induction State
(Not Provisioned,	Not Registered,	Not Active,	Not Induced)
(Provisioned,	Not Registered,	Not Active,	Not Induced)
(Provisioned,	Registered,	Active and Operative,	Not Induced)

The registration and activation state is the same for each applicable elementary basic service group.

The provisioning state shall be per subscriber, and hence the same for all basic service groups.

5.2 State transition model

The following figure shows the successful cases of transition between the applicable logical states of FM. The state changes are caused by actions of the service provider, the mobile user or the network.

NOTE: Error cases are not shown in the diagram as they do not normally cause a state change. Successful requests that do not cause a state change are not shown in the diagram.

The diagram only shows operations on an elementary basic service group.

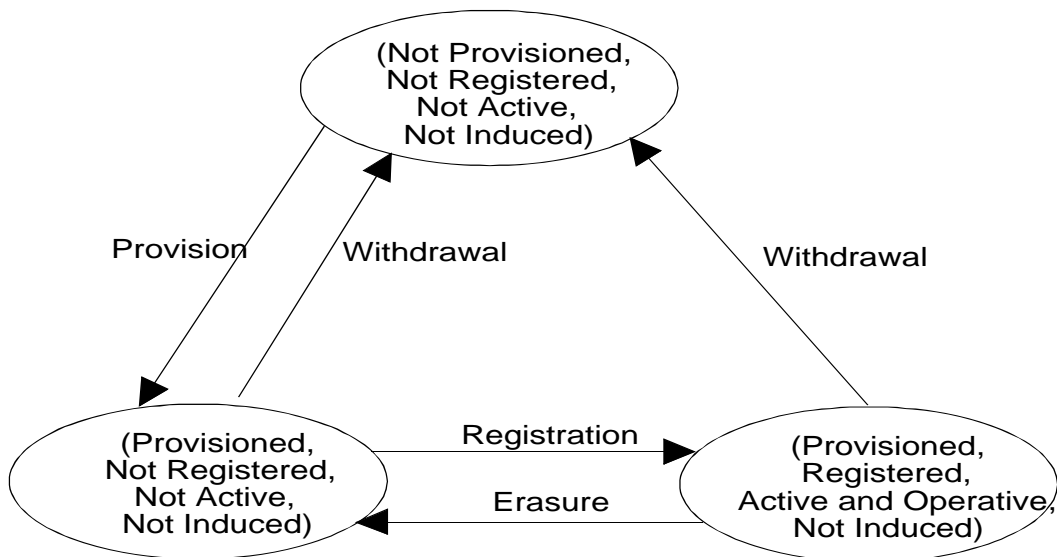


Figure 5.1: State transition model for FM

5.3 Information stored in the VLR

There is no FM information stored in the VLR.

5.4 Transfer of information from HLR to VLR

There is no FM information transferred from HLR to VLR.

Annex A (informative): Checking matrix for FM-CFU interaction in FFNb

The following table is applicable under the assumption that FM and CFU are always provisioned to the remote party.

If FM is not provisioned then there is no interaction between FM and CFU.

If FM is Registered and Active, CFU must also be Registered and Active.

Interrogation of both FM and CFU is allowed in any registration state.

Table A.1: Operation allowance check according registration states of FM and CFU (informative)

Operation	Registration States		Outcome
	FM	CFU	
Registration FM	Not registered	Not registered	FM: Registered and Active CFU: Registered and Active operation not allowed
		Registered, not active	operation not allowed
	Registered, active	Registered, active	operation not allowed
	registered and active	Registered, active	see note 1
Erasure FM	Not registered	Not registered	operation not allowed, see note 2
		Registered, not active	operation not allowed
	Registered, active	Registered, active	operation not allowed
	registered and active	Registered, active	FM: Not Registered CFU: Not Registered
Registration CFU	Not registered	Not registered	FM: Not registered CFU: Registered, active see note 3
		Registered, not active	FM: Not registered CFU: Registered, active see note 3
		Registered, active	FM: Not registered CFU: Registered, active see note 3
	registered and active	Registered, active	operation not allowed, see note 4
Erasure CFU	Not registered	Not registered	operation not allowed, see note 3
		Registered, not active	FM: Not registered CFU: Not registered note 3
		Registered, active	FM: Not registered CFU: Not registered see note 3
	registered and active	Registered, active	operation not allowed, see note 4
Activation CFU	Not registered	Not registered	operation not allowed, see note 3
		Registered, not active	FM: Not registered CFU: Registered, active see note 3
		Registered, active	FM: Not registered CFU: Registered, active see note 3
	registered and active	Registered, active	operation not allowed, see note 4
Deactivation CFU	Not registered	Not registered	operation not allowed, see note 3
		Registered, not active	operation not allowed, see note 3
	Registered, active	Registered, active	FM: Not registered CFU: Registered, not active see note 3

Operation	Registration States		Outcome
	FM	CFU	
	registered and active	Registered, active	operation not allowed, see note 4

NOTE 1: The operation is only allowed when the registration is made by the same initiating subscriber. The registration states of FM and CFU shall not be changed by the operation.

NOTE 2: The outcome code should be "Remote party not registered".

NOTE 3: Refer to TS 23.082 for CFU handling.

NOTE 4: Conflicting situation with other supplementary service (see TS 22.082: Exceptional procedures or unsuccessful outcome).

Annex B (normative): FM control Messages and their contents

B.1 General principles

All messages used for the control of FM are based on mobile initiated USSD. The principles of USSD can be found in 3GPP TS 22.090, 3GPP TS 23.090, 3GPP TS 24.090 and 3GPP TS 29.002.

The present document is only concerned with the contents of the USSD strings.

B.2 Information Elements used in the messages

The operation code

The operation code is defined in 3GPP TS 22.030 for the control of Supplementary Services and consists of the two characters:

- ** for Registration;
- ## for Erasure;
- *# for Interrogation.

The Service Codes

The Service Code is service specific for FM.

The remote number

The remote number is the basic MSISDN of the remote party if the remote party is a GSM subscriber. It is entered by the initiating subscriber as part of the registration request. It is a number in international format.

Additional information field

An additional information field which does not exceed 30 octets may be optionally included in all FM control messages to convey operator specific information to the FFNB. The content and use of this additional information is operator specific and out of scope of the present document.

The initiating number

The initiating number is the basic MSISDN of the initiating subscriber. It is derived by HLRa from the IMSI of the initiating subscriber.

This parameter is used in international format according to the scheme:

- country code, national (significant) number.

B.3 Messages Contents of the FM Request

Contents of the USSD string of FM-Request:

- all parameters are entered by the initiating subscriber and transported transparently to HLRa.

Table B.1: Contents of the USSD string of FM-Request

Parameter number	Value	Parameter mandatory (M) or optional (O)	Comment
1	OC	M	Operation Code: OC = ** ... for Registration OC = ## ... for Erasure OC = *# ... for Interrogation
2	SC	M	Service Code for Follow Me. SMG1 Refer to 22.030 for the Service Code for Follow Me.
3	*	M	Delimiter
4	REMOTE NUMBER	M	remote number
5	*	M	Delimiter.
6	Supervisor Indicator	C	Supervisor Indicator = 88. Used for Forced Erasure by FM Service Supervisor.
7	*	M	Delimiter
8	MSISDN	C	MSISDN of previous initiating subscriber who has registered the FM to remote number. This parameter is conditional, only used for forced erasure.
9	*	M	Delimiter
10	Additional information field	O	For operator specific use
last	#	M	End of USSD string

B.4 Messages Contents of the HLR-FM-Request

Contents of the USSD string of HLR-FM- Request is the same of FM-Request described in clause B.3. Additionally, the MSISDN_a is sent to the FFN_b together with the FM-Request within the MAP operation. Contents of the FM-Response Messages.

The FM-Response messages which are generated by the HLR, as well as the HLR-FM-Response messages which are received by the HLR from the FFN and are forwarded unchanged as FM-Response messages to the MS, contain the following two parts:

- mandatory part: two digit outcome codes, which are interpreted in the MS according to operator specific requirements;
- optional part: the response texts.

The optional part is separated by a space character as separator which occurs together with the optional part.

These outcome codes indicating success or error of the requested FM operation are 2 USSD characters according to the following table (table B.2).

Table B.2 Outcome codes for FM-Response

Scenario	Text examples for MS display	Reg	Era	Interro	Outcome Code
Outcome codes for successful cases					00 series
Success registration Case	Follow Me activated	X			01
Success erasure Case	Follow Me deactivated		X		02
Success interrogation Case	Follow Me active to <MSISDN> The MSISDN digits are sent in the USSD response separated by a <i>blank</i> character from the outcome code.			X	03
Operator Specific outcome codes					04-06
Reserved for future enhancement					07-09
Spare outcome code					10
Reserved for GSM-Railway					11-12
Spare outcome codes					13-19
Outcome codes generated at the HLRa in non-successful cases					20, 30 series
Incoming barrings	Illegal interaction with incoming barring	X	X	X	21
Unauthorised request	Unauthorised request	X	X	X	22
Operator Specific outcome codes					23-30
Reserved for future enhancement					31-39
Outcome codes generated at both the HLRa and the FM function node in non-successful cases					40 series
Unknown remote party	Unknown remote party	X	X	X	41
FM not subscribed	FM not subscribed	X	X	X	42
Operator Specific outcome codes					43-45
Reserved for future enhancement					46-49
Spare unsuccessful outcome codes					50 series
Outcome codes generated at the FM function node in non-successful cases					60, 70 series
Remote party already registered	Remote party already registered	X			61
FM not registered to remote party	FM not registered to remote party		X	X	62
Remote party not registered to this MSISDN	Remote party not registered to this MSISDN		X		63
Remote Party Authorisation failed	Unauthorised changes to remote party	X	X		64

Scenario	Text examples for MS display	Reg	Era	Interro	Outcome Code
Call Forwarding active or registered	Illegal interaction with call forwarding	X			65
Incoming or outgoing barrings	Illegal interaction with call barrings	X	X		66
Request to own MSISDN not possible	Request to own MSISDN not possible	X			67
Operator Specific outcome codes					68-72
Reserved for future enhancement					73-79
Outcome codes could be sent back by CFU processes in unsuccessful cases					
forwarded-to number is invalid directory number	forwarded-to number is invalid directory number	X			80
insufficient information	insufficient information	X	X		81
forwarded-to number is a special service code	forwarded-to number is a special service code (e.g. police)	X			82
Conflicting situation with other supplementary services	Conflicting situation with other supplementary services (e.g. incoming call barring has been activated)	X		X	83
Inconsistent with registration	Inconsistent with registration		X		84
Spare unsuccessful outcome codes					85 - 99

B.5 Contents and Format of the USSD String of the USSD-Notify

The Contents and the format of the USSD string of the USSD-Notify are described in the following table.

Table B.3: Contents of the USSD string of the USSD-Notify for forced de-registration

Parameter number	Value	Parameter mandatory (M), optional (O) or conditional (C)	Comment
1	OC	M	Operation Code: OC = ## ... for Erasure
2	SC	M	Service Code for Follow Me. SMG1 Refer to 22.030 for the Service Code for Follow Me.
3	*	M	Delimiter
4	REMOTE NUMBER (forced deregistered number)	M	remote number
5	*	M	Delimiter.
6	Supervisor Indicator	C	Supervisor Indicator = 88. This parameter is mandatory used for Forced Erasure by FM Service Supervisor (see also parameter number 8).
7	*	M	Delimiter
8	MSISDN	C	<ul style="list-style-type: none"> - This parameter is mandatory as MSISDN of supervisor who initiated the forced deregistration request. - This parameter shall not be included if initiated by an administrative terminal connected to the FFN.
9	*	M	Delimiter
10	Additional information field	O	Additional information field
last	#	M	End of USSD string

Note: USSD Notification for Forced deregistration done by administrative terminal in general is optional.

B.6 Inter-process Message Init-Notify

The Init-Notify message is an inter-process message in FFN. It is sent from the process Handle_Remote_Party_Erasure to process FFN_Forced_Erasure_Notify.

This message consists of the parameter USSD String. On receipt of the Init-Notify message, the process FFN_Forced_Erasure_Notify will pack the USSD String into the USSD-Notify message and send it to the HLRp. Refer to Table B.3 for the contents and format of the USSD String.

This message is only required where the FFN is based on an HLR. If the FFN is based on an IN system it is not required.

Annex C (informative): Change history

Change history					
TSG CN#	Version	CR	Rel.	New Version	Subject/Comment
CN#06	-		R99	3.0.0	Approved at TSG CN#06 and placed under Change Control
CN#07	3.0.0	001	R99	3.1.0	Some corrections and further clear formulations to FM stage 2 specification
CN#09	3.1.0	002	R99	3.2.0	Correction of the wrong Service Code
CN#11	3.2.0		Rel-4	4.0.0	Release 4 after CN#11
CN#16	4.0.0		Rel-5	5.0.0	Release 5 after CN#16
Jun 2002	5.0.0		Rel-5	5.0.1	Corrupted figure 5.1 fixed
Dec 2003	5.0.1	003	Rel-6	6.0.0	Notify of forced erasure to previously registered subscriber of his deregistration
Dec 2006	6.0.0	004	Rel-7	7.0.0	Reservation of outcome codes for GSM-Railway
Dec 2008	7.0.0		Rel-8	8.0.0	Upgraded unchanged from Rel-7
Dec 2009	8.0.0	-	Rel-9	9.0.0	Update to Rel-9 version (MCC)
2011-03	9.0.0	-	Rel-10	10.0.0	Update to Rel-10 version (MCC)
2012-09	10.0.0	-	Rel-11	11.0.0	Update to Rel-11 version (MCC)
2014-09	11.0.0	-	Rel-12	12.0.0	Update to Rel-12 version (MCC)
2015-12	12.0.0	-	Rel-13	13.0.0	Update to Rel-13 version (MCC)
2017-03	13.0.0	-	Rel-14	14.0.0	Update to Rel-14 version (MCC)
2018-06	14.0.0		Rel-15	15.0.0	Update to Rel-15 version (MCC)

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2018-07						Editorial correction to cover page title line; correction of logo and copyright year; use of latest style Change history table.	15.0.1

History

Document history		
V15.0.1	July 2018	Publication