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Abstract of document:

This TS describes the technical realisation of the Follow-Me feature within the digital cellular telecommunications system. 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.

Changes since last presentation to TSG CN Meeting #5:

Introduction of the Functionality FM Forced Erasure; Editorial Revision; Alignment Corrections.

Outstanding Issues:

Not known

Contentious Issues:

Not known

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Technical Specification

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Follow-Me (FM) Feature;
Stage 2
(GSM 03.94 version 2.0.0)

GLOBAL SYSTEM FOR
MOBILE COMMUNICATIONS

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Foreword

This ETSI Technical Specification (TS) has been produced by the Special Mobile Group (SMG) of the European Telecommunications Standards Institute (ETSI).

This TS describes the technical realisation of the Follow-Me feature within the digital cellular telecommunications system.

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

Version 8.x.y

where:

- 8 indicates GSM Phase 2+ Release 1999;
- 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.

1 Scope

This ETSI Technical Specification 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 Normative references

This ETS 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 ETS 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 100): "Digital cellular telecommunications system (Phase 2+); "Abbreviations and acronyms".

[2] GSM 02.04 (ETS 300 503): "Digital cellular telecommunications system (Phase 2+); General on features".

[3] GSM 02.30 (ETS 300 511): "European digital cellular telecommunication system (Phase 2+); Man-Machine Interface (MMI) of the Mobile Station (MS)".

[4] GSM 02.82 (ETS 300 515): "European digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 1".

[5] GSM 02.94 (ETS 300 xxx): "Digital cellular telecommunications system (Phase 2+); Follow Me (FM) feature - Stage 1".

[6] GSM 03.11 (ETS 300 529): "Digital cellular telecommunications system (Phase 2+); Technical realisation of features".

[7] GSM 03.15 (ETS 300 533): "Digital cellular telecommunications system (Phase 2+); Technical realisation of operator determined barring".

[8] GSM 03.90 (ETS 300 549): "European digital cellular telecommunications system (Phase 2+); Unstructured supplementary services operation - Stage 2".

[9] GSM 03.82 (ETS TS 100 543): "European digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 2".

3 Definitions and Abbreviations

3.1 Definitions

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

initiating number: The 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.

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 another initiating 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

FM Follow Me

FFN	Follow Me function node
SCP	Service Control Part

Other abbreviations used in this ETS are listed in GSM 01.04.

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.

This Technical Specification 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 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 this specification. 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: the “served mobile subscriber” in [5] corresponds to the “remote party” in this document and the “forwarded-to subscriber” in [5] corresponds to the “initiating subscriber” in this document.

NOTE: 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.

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 (4.3.1). 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 (4.3.2) for the remote party. The result of this operation (success or error) is reported back in a USSD Response to the initiating subscriber.

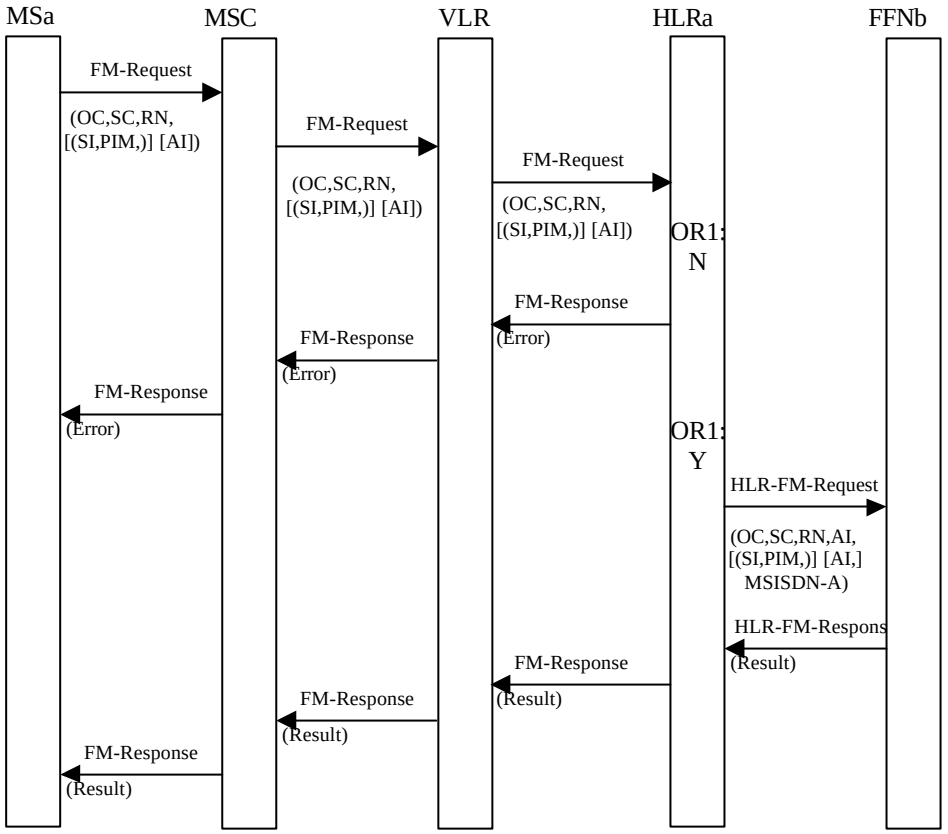


Figure 4.1: Information flow for the control of FM by the initiating subscriber

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 previous initiating 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

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.

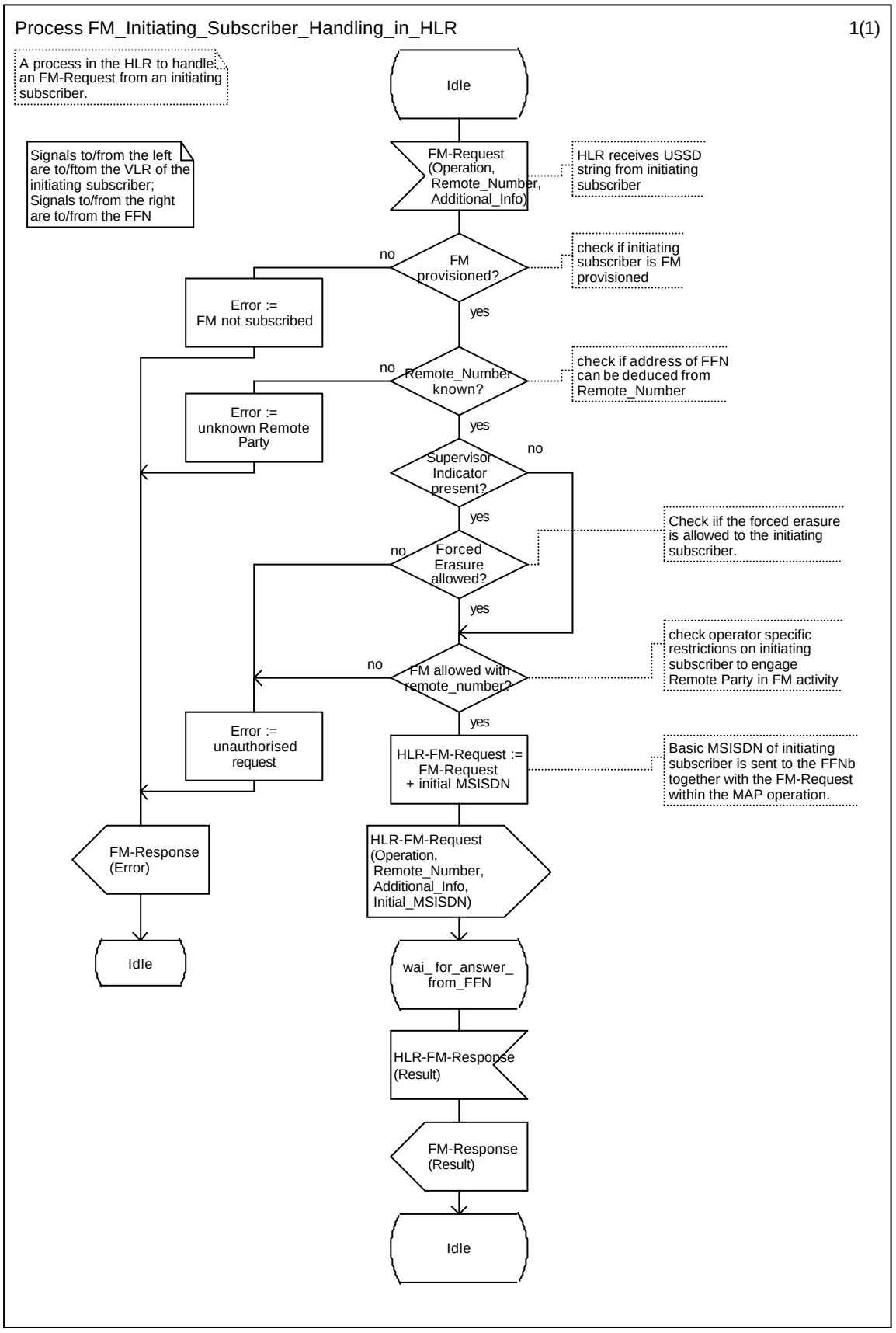


Figure 4.2: Process: FM_Initiating_Subscriber_Handling_in_HLR

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)

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

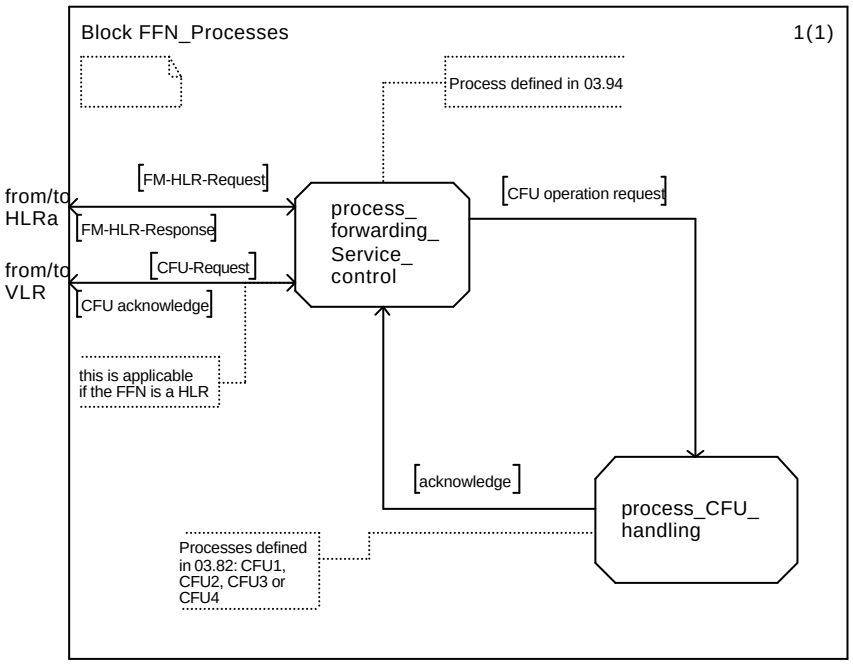
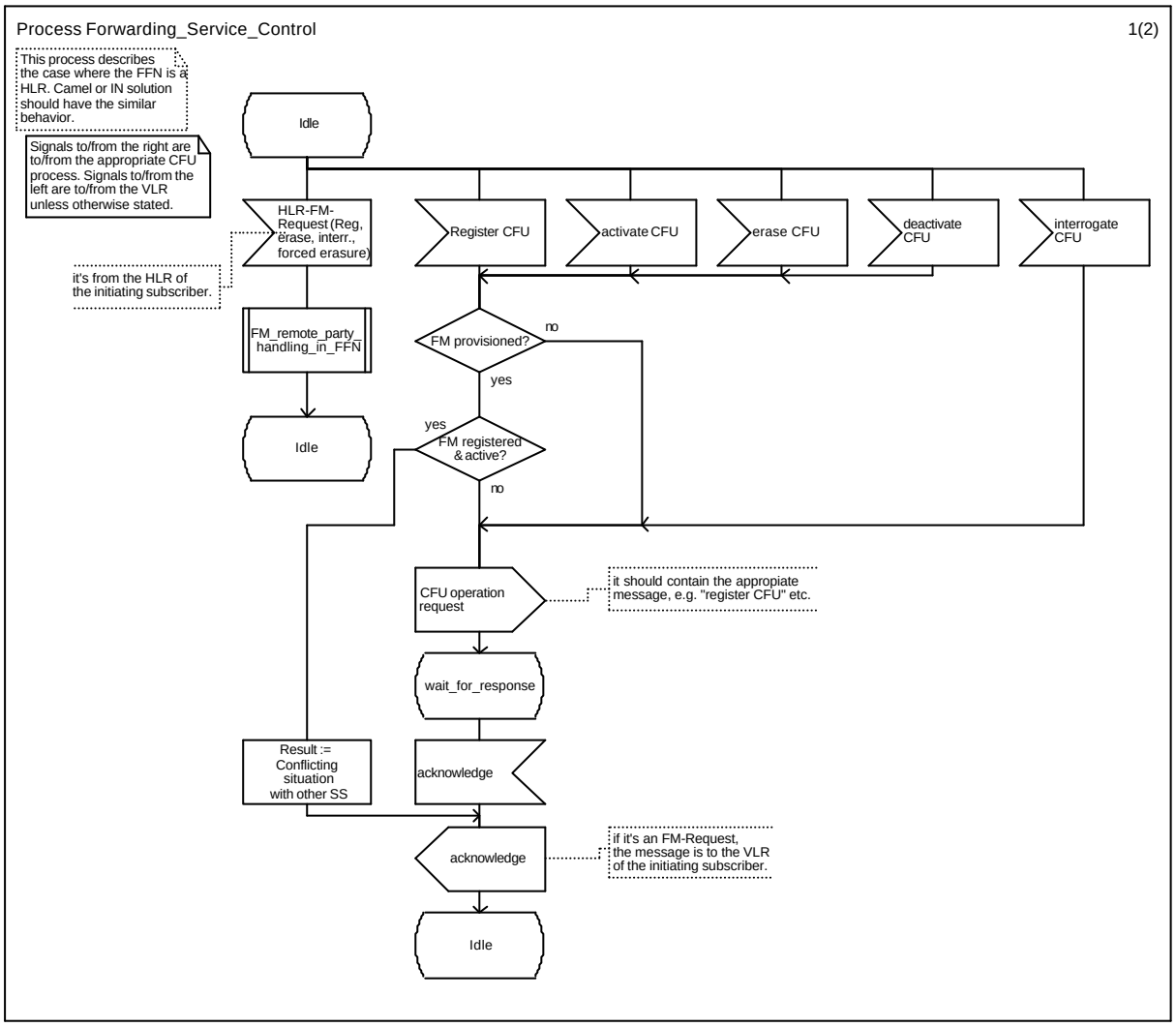


Figure 4.3: FFN_processes



4.4 Process Forwarding_Service_Control

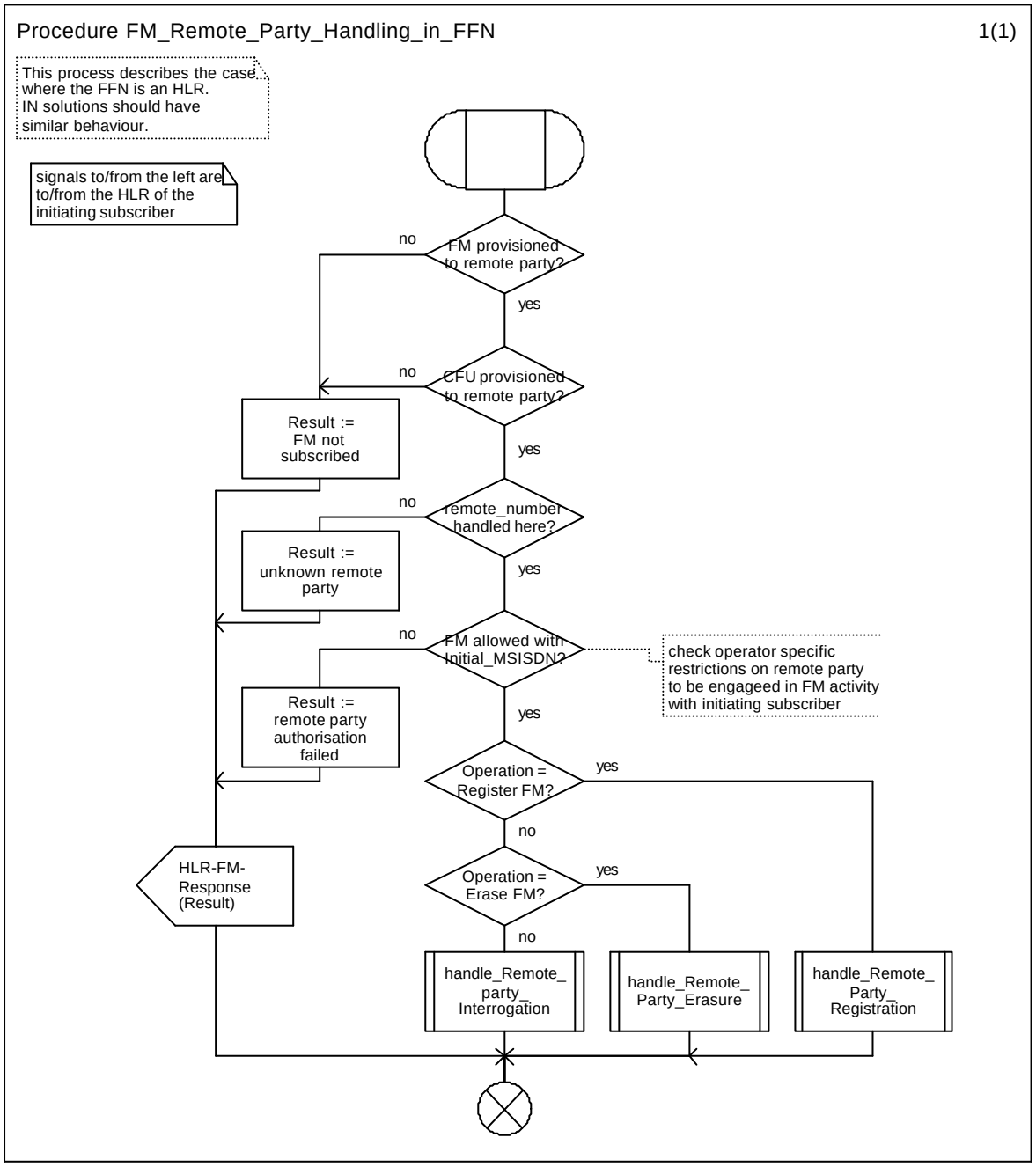


Figure 4.5: Procedure: FM_Remote_Party_Handling_in_FFN

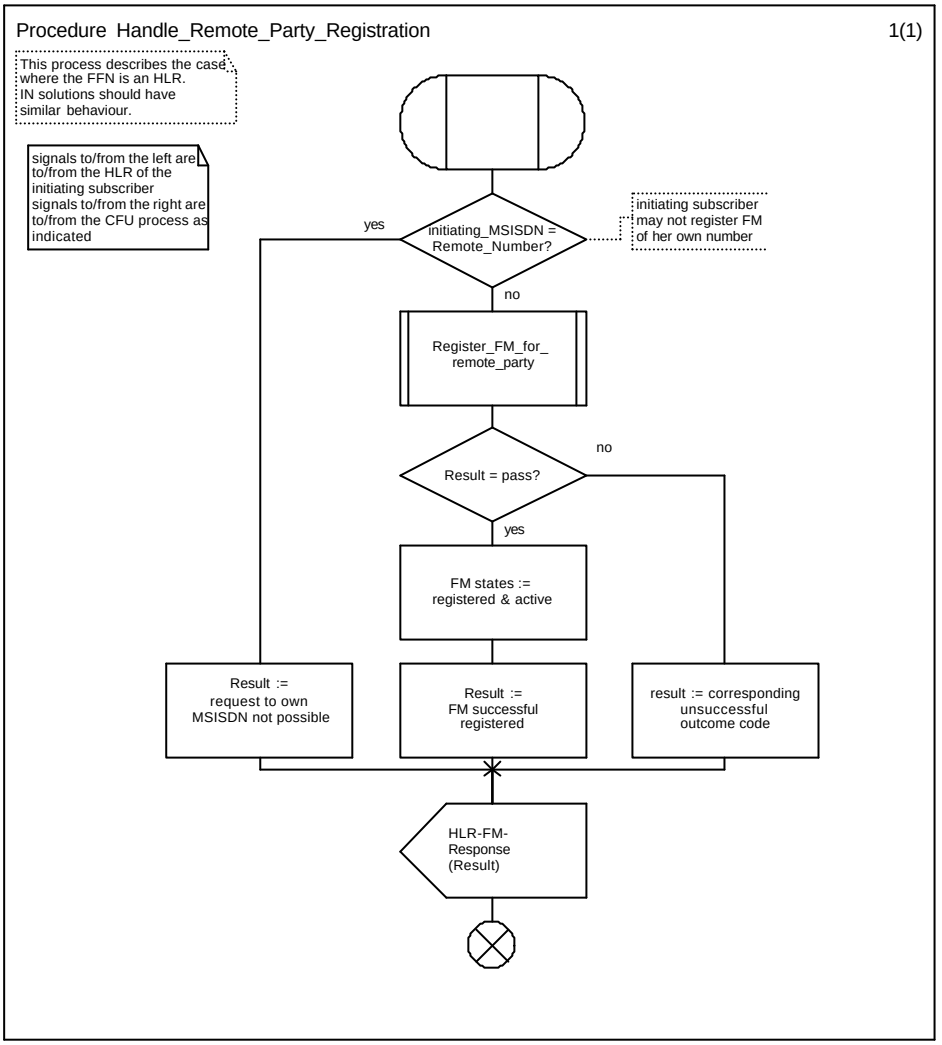


Figure 4.6: Procedure: Handle_Remote_Party_Registration

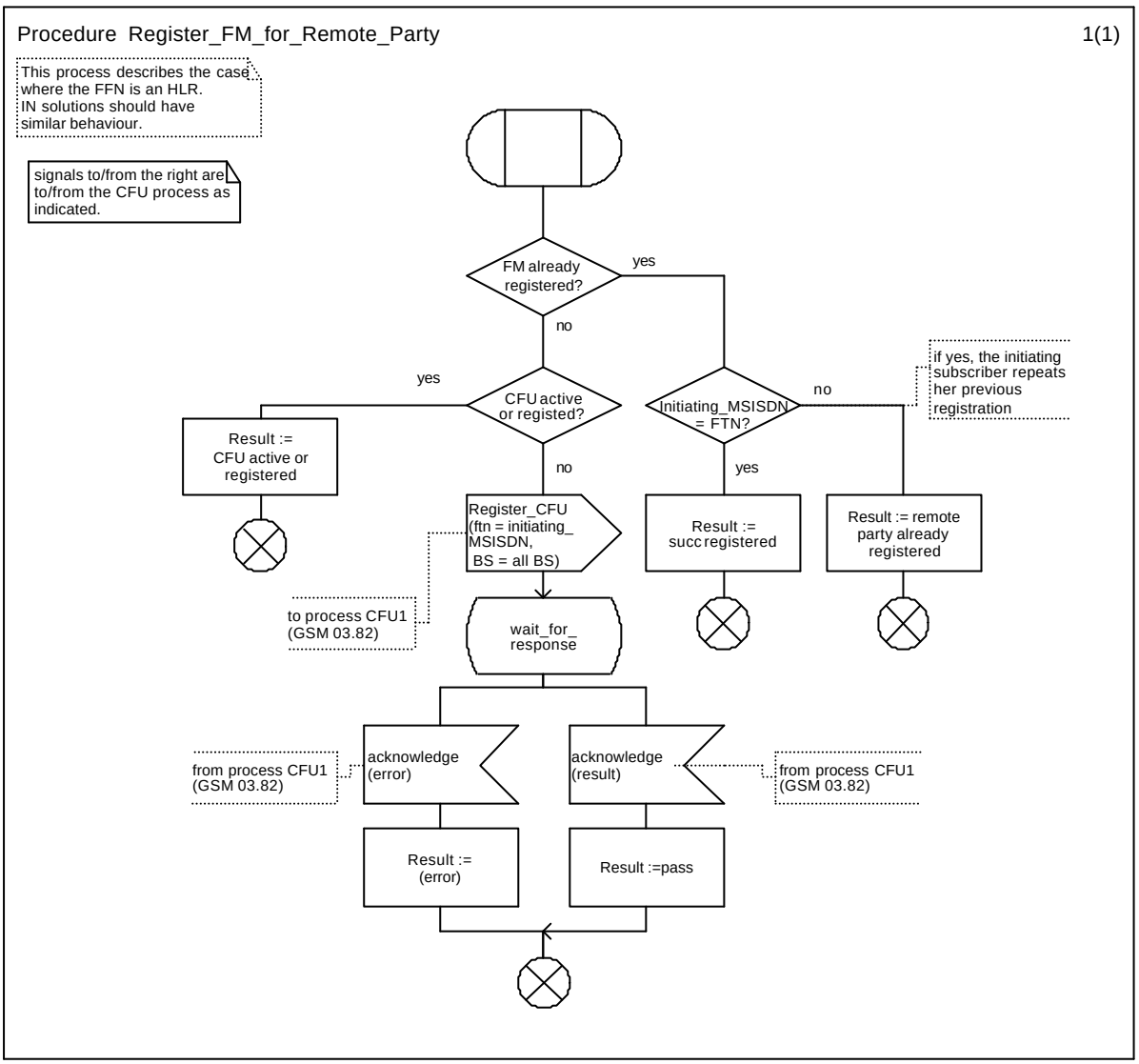


Figure 4.6a: Procedure Register_FM_for_Remote_Party

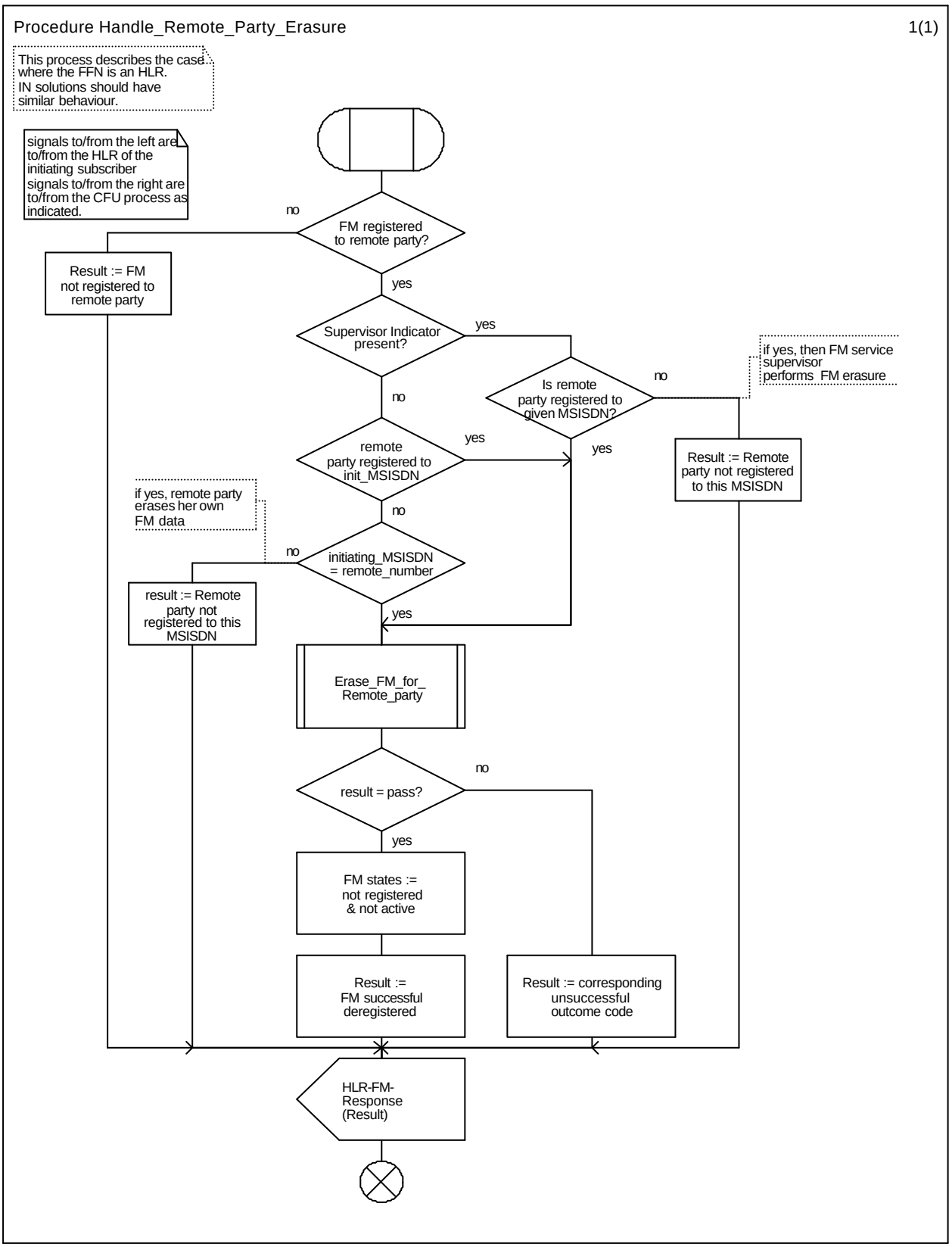


Figure 4.7: Procedure: Handle_Remote_Party_Erasure

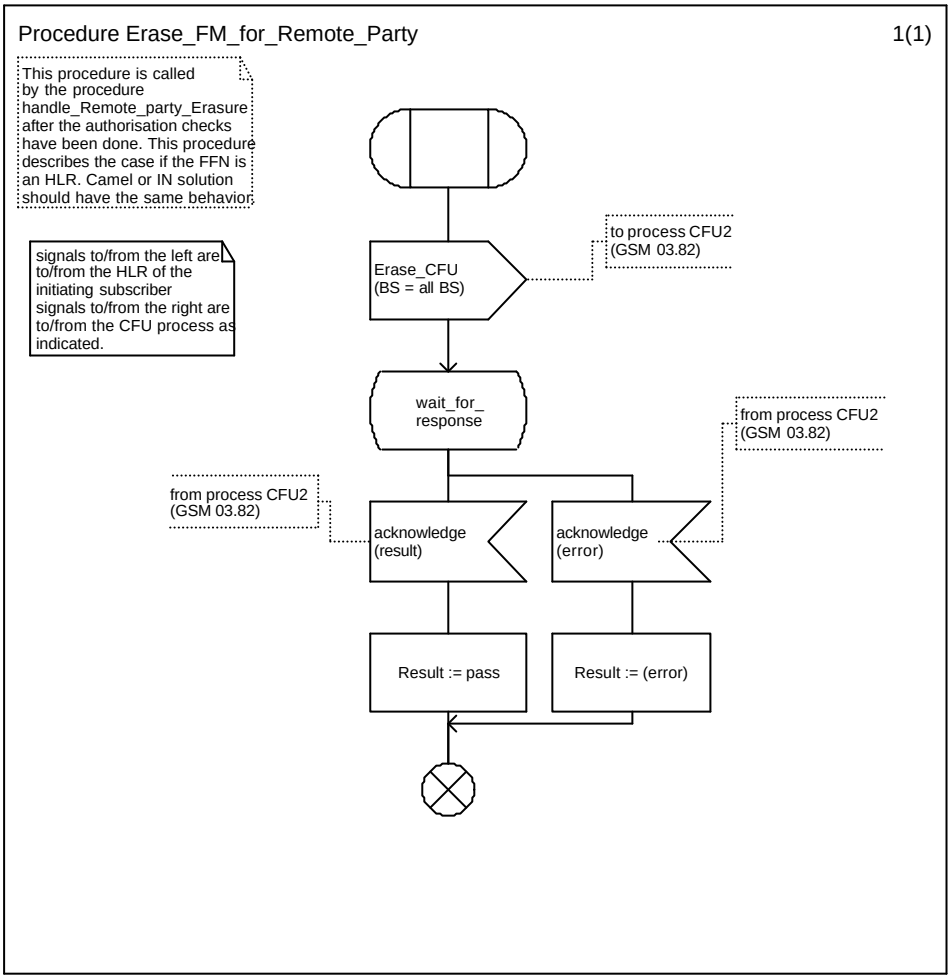


Figure 4.7a: Procedure Erase_FM_for_Remote_party

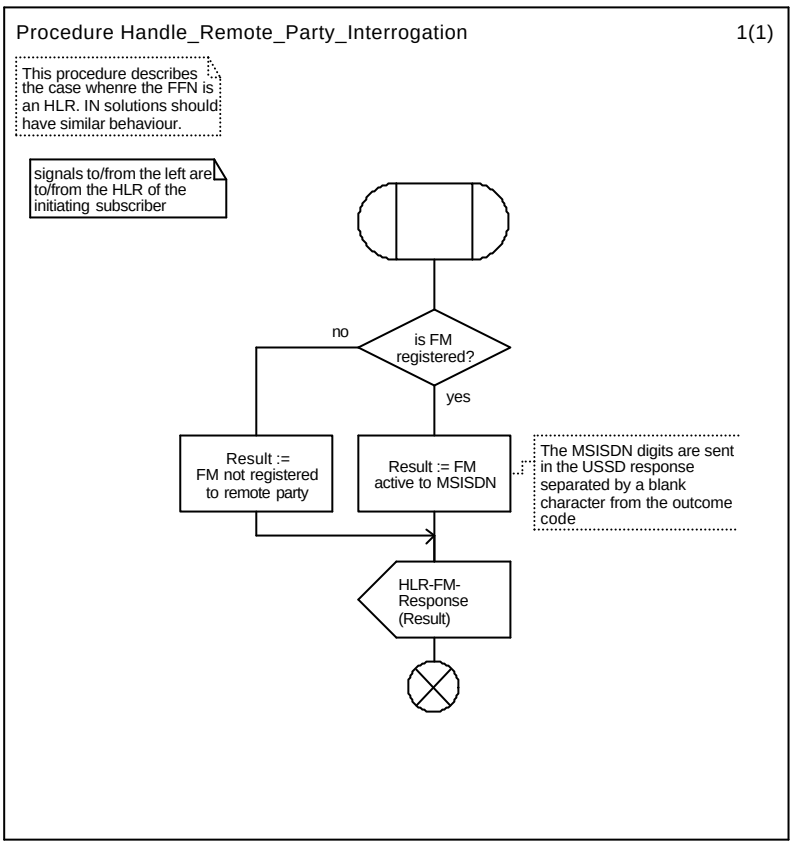


Figure 4.8: Procedure Handle_Remote_Party_Interrogation

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 [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 GSM 03.11 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.

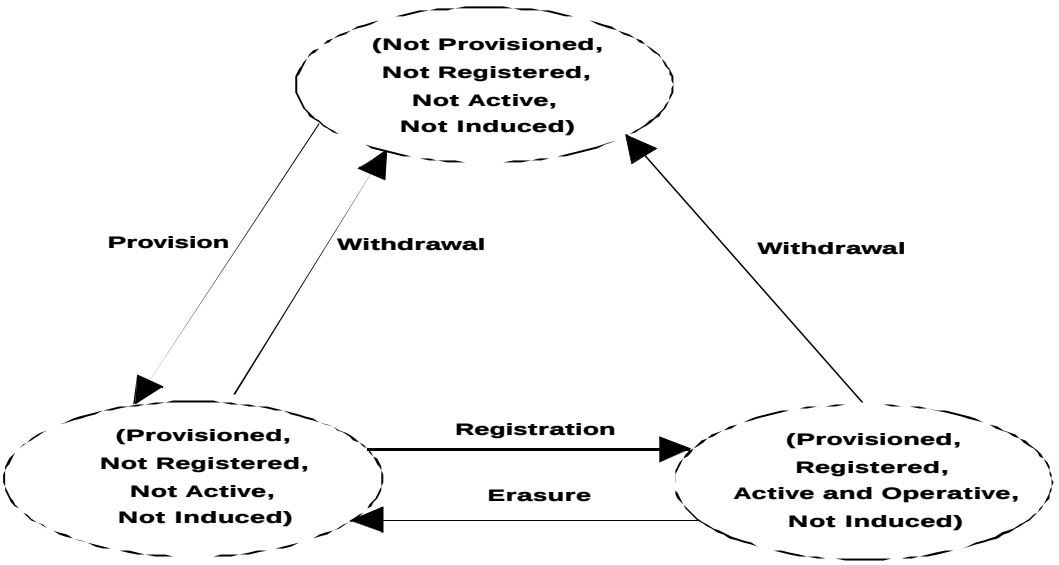


Figure 5.1: State transition model for FM

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.

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

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

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 GSM 03.82 for CFU handling.

Note 4: Conflicting situation with other supplementary service (see GSM 02.82: 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 GSM 02.90, GSM 03.90,GSM 04.90 and GSM 09.02.

This 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 GSM 02.30 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 characters 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 this specification.

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

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 has been asked to allocate 25 for FM.
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

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

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 B.3. Additionally, the MSISDNa is sent to the FFNb together with the FM-Request within the MAP operation.

B.5 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):

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 *blank* character from the outcome code.			X	03
Operator Specific outcome codes					04-06
Reserved for future enhancement					07-09
Spare outcome codes					**10 series**
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**

codes					
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
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**

Table B.2 Outcome codes for FM-Response

History

Status of Technical Specification GSM 03.94		
Date	**Version**	**Remarks**
July 1999	version 0.0.0	First Draft
Sept 1999	version 0.1.0	SDLs added, interaction with CFU, Outcome codes
November 1999	Version 1.1.0	Redrawing SDLs; Rewording the text; Redefining the messages and their contents
November 1999	Version 1.1.2	New concept for Handling of interaction with CFU
November 1999	Version 1.2.0	General concept in Version 1.1.2 was accepted by SS ad hoc meeting. Some editorial changes in SDLs added.
November 1999	Version 1.3.0	Forced Erasure introduced.
December 1999	Version 1.3.1	Editorial revision
December 1999	Version 1.3.2	Updating Table A.1
December 1999	Version 2.0.0	To TSG CN # 6 for Approval
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