

3GPP2 X.S0004-322-E

v 1.0

Date: January 2007



3RD GENERATION
PARTNERSHIP
PROJECT 2
"3GPP2"

Mobile Application Part (MAP) -

VOICE FEATURE SCENARIOS: CALL FORWARDING

COPYRIGHT

3GPP2 and its Organizational Partners claim copyright in this document and individual OPs may copyright and issue documents or standards publications in individual Organizational Partner's name based on this document. Requests for reproduction of this document should be directed to the 3GPP2 Secretariat at secretariat@3gpp2.org. Requests to reproduce individual Organizational Partner's documents should be directed to that Organizational Partner. See www.3gpp2.org for more information.

REVISION HISTORY

Revision	Date	Remarks
X.S0004-322-E v1.0	January 2007	Initial publication.

1 INTRODUCTION

Unless otherwise noted, the scenarios in this Part depict features operating individually; i.e., feature interactions are not considered unless specifically noted.

The scenarios in this Part do not include a complete listing of operation parameters, either in the figures or in the accompanying text descriptions. Parameters are included where they are deemed necessary to improve the understanding of the scenario. For a complete description of the parameters associated with each operation, refer to Parts-540 and -550.

2 Call Forwarding—Busy

This section depicts the interactions between network entities in various situations related to automatic roaming and Call Forwarding—Busy (CFB). These scenarios are for illustrative purposes only.

2.1 CFB Variable Registration or De-Registration

The information flows required for the registration or de-registration of CFB by an authorized MS are described in Part-311 [Section 2.1](#).

2.2 CFB Demand Activation with Courtesy Call

The information flows required for the demand activation of CFB by an authorized MS, where the serving system provides the optional courtesy call to the forward-to number on CFB activation, are described in Part-311 [Section 2.2](#).

2.3 CFB Demand Activation (without Courtesy Call) or De-Activation

The information flows required for the demand activation or de-activation of CFB by an authorized MS, where the serving system does not provide the optional courtesy call to the forward-to number on CFB activation, are described in Part-311 [Section 2.1](#).

2.4 CFB Invocation

This scenario describes CFB invocation due to the served MS being busy.

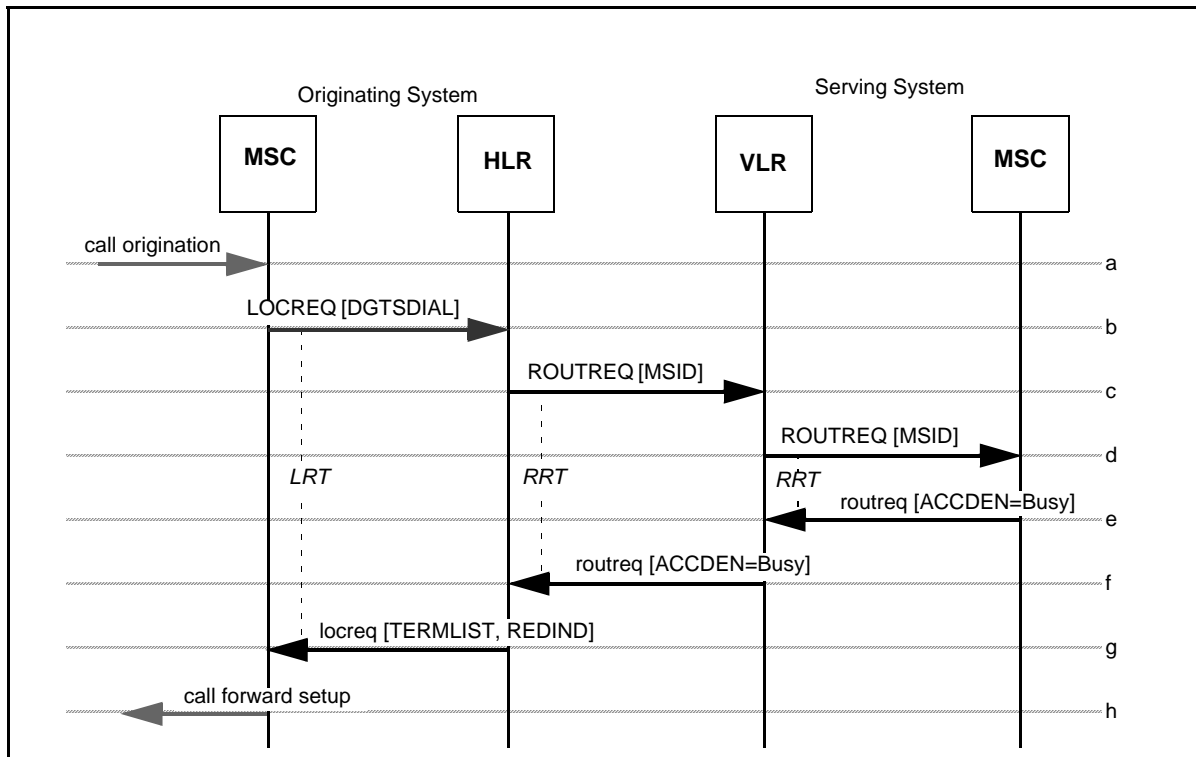


Figure 1 — CFB Invocation

- a. A call origination and the dialed MS address digits (i.e., directory number) are received by the Originating MSC.
- b. The Originating MSC sends a LOCREQ to the HLR associated with the MS; this association is made through the dialed MS address digits (which might not be the same as the MIN).
- c. If the dialed MS address digits are assigned to a legitimate subscriber, the HLR sends a ROUTREQ to the VLR where the MS is registered.
- d. The VLR then forwards the ROUTREQ to the current Serving MSC.
- e. In reaction to the ROUTREQ, the Serving MSC checks its internal data structures and determines that the MS is busy in another call. The status of the MS is returned to the VLR by the Serving MSC in the routreq.
- f. The VLR sends the routreq to the HLR.
- g. The HLR determines from the service profile that CFB is active. It sends a locreq to the Originating MSC providing the forward-to number and other routing information in the TerminationList parameter, along with an indication of the reason for extending the incoming call (i.e., for CFB) in the DMH_RedirectionIndicator parameter.
- h. The Originating MSC then establishes a call to the specified forward-to number.

2.5 CFB Invocation with Call Collision

This scenario describes call delivery to a MS that has CFB active and becomes engaged in a call at the same time that the Originating MSC is delivering a call to the Serving MSC.

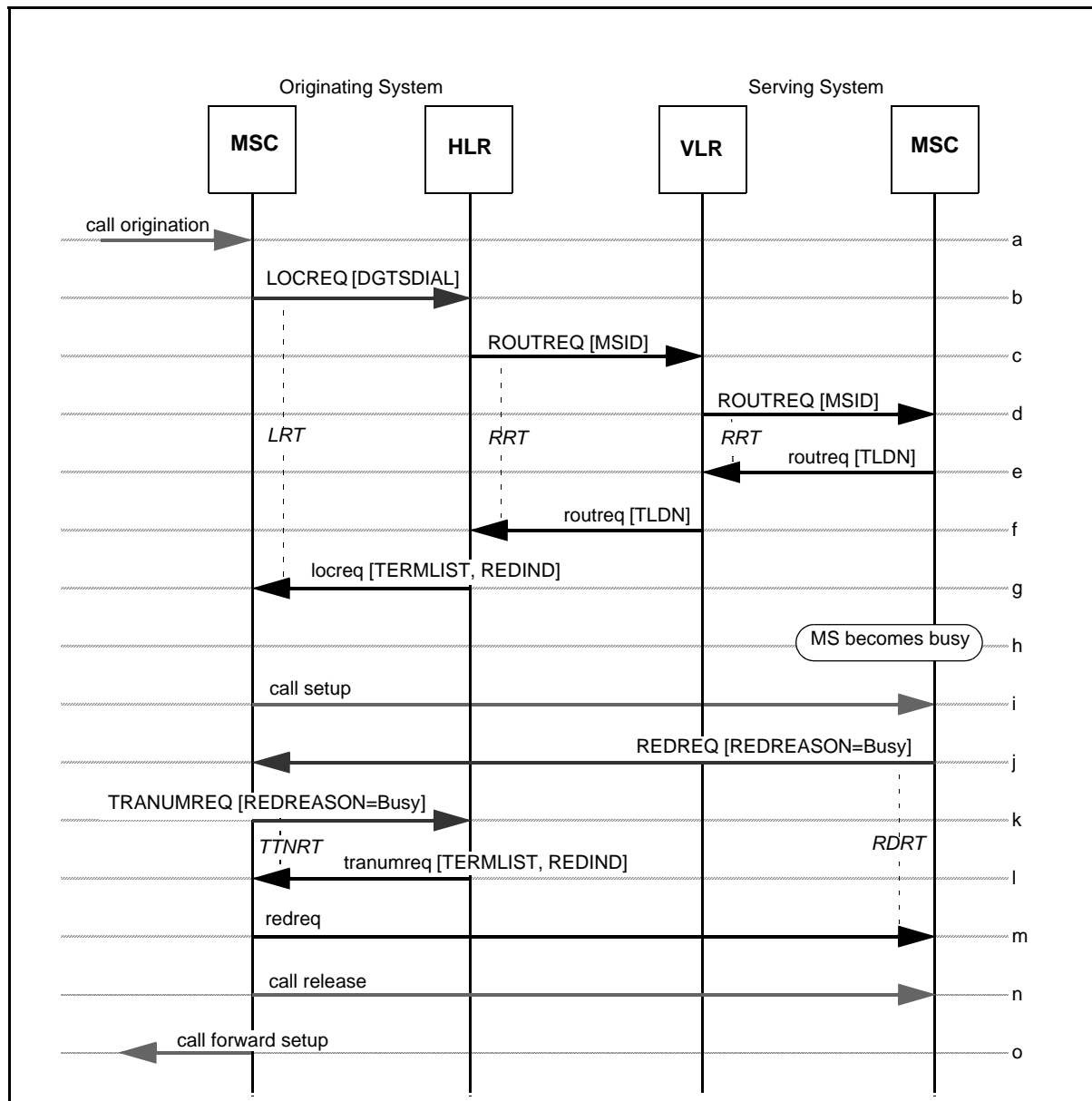


Figure 2 — CFB Invocation with Call Collision

- a-d. Same as CFB, [Section 2.4](#), Steps a-d.
- e. The Serving MSC allocates a TLDN (Temporary Local Directory Number) and returns this information to the VLR in the *routreq*.
- f. The VLR sends the *routreq* to the HLR.
- g. When the *routreq* is received by the HLR, it returns a *locreq* to the Originating MSC. The *locreq* includes routing information in the form of the TerminationList parameter, along with an indication of the reason for extending the incoming call (i.e., for CD) in the DMH_RedirectionIndicator parameter.

- h. Sometime after the Serving MSC sends the `routrreq` back to the HLR, the MS becomes engaged in another call. This may be the result of an MS origination, a call through the local roamer port or the arrival of an inter-MSC call from a previous `ROUTREQ`.
- i. Upon receiving the `locrreq`, the Originating MSC sets up a voice path to the Serving MSC using the protocols defined by the interconnection method.
- When the inter-MSC call is received, the Serving MSC checks its internal data structures and determines that the MS is busy in another call. The Serving MSC determines from the service profile that the MS has call forwarding on busy active.
- j. The Serving MSC then sends a `REDREQ` to the Originating MSC, indicating that the call is being redirected due to a “busy” condition.
- k. The Originating MSC is able to redirect the call, therefore, it sends a `TRANUMREQ` to the HLR requesting the forward-to number appropriate for this condition from the MS’s service profile.
- l. The HLR sends the `tranumreq` to the Originating MSC, including the appropriate forward-to number in the `TerminationList` parameter, along with an indication of the reason for extending the incoming call (i.e., for CFB) in the `DMH_RedirectionIndicator` parameter.
- m. When the `tranumreq` is received from the HLR, the Originating MSC sends a `redreq` to the Serving MSC.
- n. The Originating MSC releases the voice path to the Serving MSC.
- o. The Originating MSC initiates call forwarding using the specified forward-to number.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

3 Call Forwarding—Default

This section depicts the interactions between network entities in various situations related to automatic roaming and Call Forwarding—Default (CFD). These scenarios are for illustrative purposes only.

3.1 CFD Variable Registration or De-Registration

The information flows required for the registration or de-registration of CFD by an authorized MS are described in Part-311 [Section 2.1](#).

3.2 CFD Demand Activation with Courtesy Call

The information flows required for the demand activation of CFD by an authorized MS, where the serving system provides the optional courtesy call to the forward-to number on CFD activation, are described in Part-311 [Section 2.2](#).

Note that the activation of CFD results in the activation of call forwarding on busy, no answer, and no page response conditions at the Serving MSC.

3.3 CFD Demand Activation (without Courtesy Call) or De-Activation

The information flows required for the demand activation or de-activation of CFD by an authorized MS, where the serving system does not provide the optional courtesy call to the forward-to number on CFD activation, are described in Part-311 [Section 2.1](#).

Note that the activation of CFD results in the activation of call forwarding on busy, no answer, and no page response conditions at the Serving MSC. Likewise, the de-activation of CFD may result in the de-activation of call forwarding on busy (if CFB is not active), no answer (if CFNA is not active), and no page response (if CFNA is not active) conditions at the Serving MSC.

3.4 CFD Invocation with Busy

The information flows required for the invocation of CFD when the served MS is determined to be busy are the same as those for the CFB case described in [Section 2.4](#); simply replace the acronym *CFB* in that description with *CFD*.

3.5 CFD Invocation with Call Collision

The information flows required for the invocation of CFD when the served MS becomes engaged in a call at the same time that the Originating MSC is delivering a call to the Serving MSC, are the same as those for the CFB case described in [Section 2.5](#); simply replace the acronym *CFB* in that description with *CFD*.

3.6 CFID Invocation—Immediate

This scenario describes CFID invocation due to the following causes:

- Do Not Disturb active, etc.
- MS not registered by *MAP* procedures.
- MS reported inactive by *MAP* procedures.
- Roaming with Call Delivery inactive.

In these cases, the HLR has sufficient information available to make an immediate forwarding decision, rather than directing that the call be routed to the serving system.

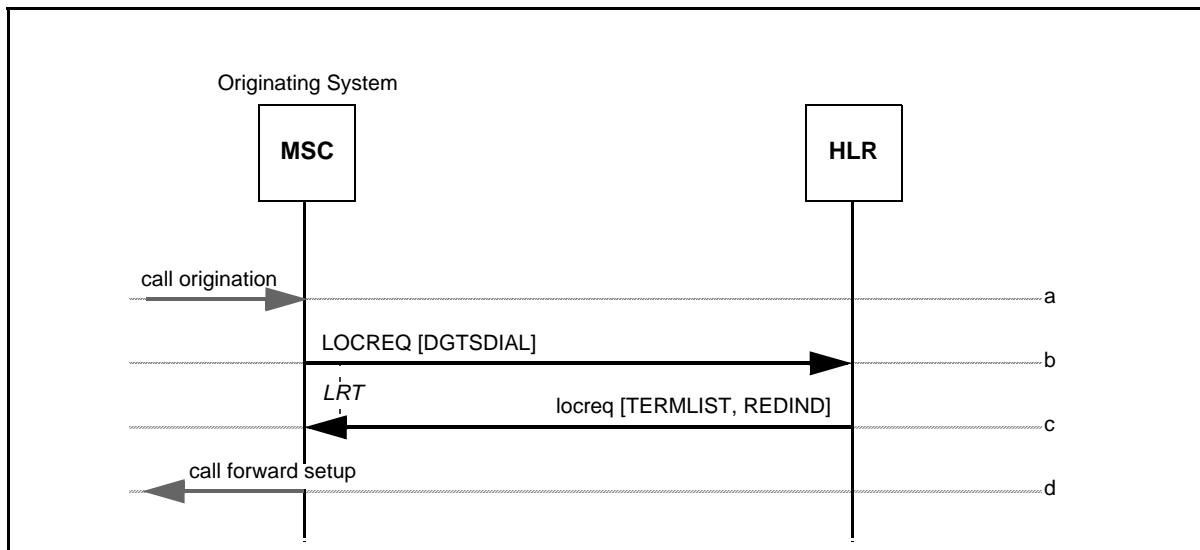


Figure 3 — CFID Invocation (Immediate)

- A call origination and the dialed MS address digits (i.e., directory number) are received by the Originating MSC.
- The Originating MSC sends a *LOCREQ* to the HLR associated with the MS; this association is made through the dialed MS address digits (which may not be the MIN).
- The HLR determines from the MS's service profile that CFID is in effect and that an immediate forwarding condition exists (see above for explanation). It sends a *locreq* to the Originating MSC providing the forward-to number and other routing information in the TerminationList parameter, along with an indication of the reason for extending the incoming call (i.e., for CFID) in the *DMH_RedirectionIndicator* parameter.
- The Originating MSC then establishes a call to the specified forward-to number.

3.7 CFD Invocation with No Answer or No Response to Page

This scenario describes CFD invocation due to the MS not answering or not responding to page.

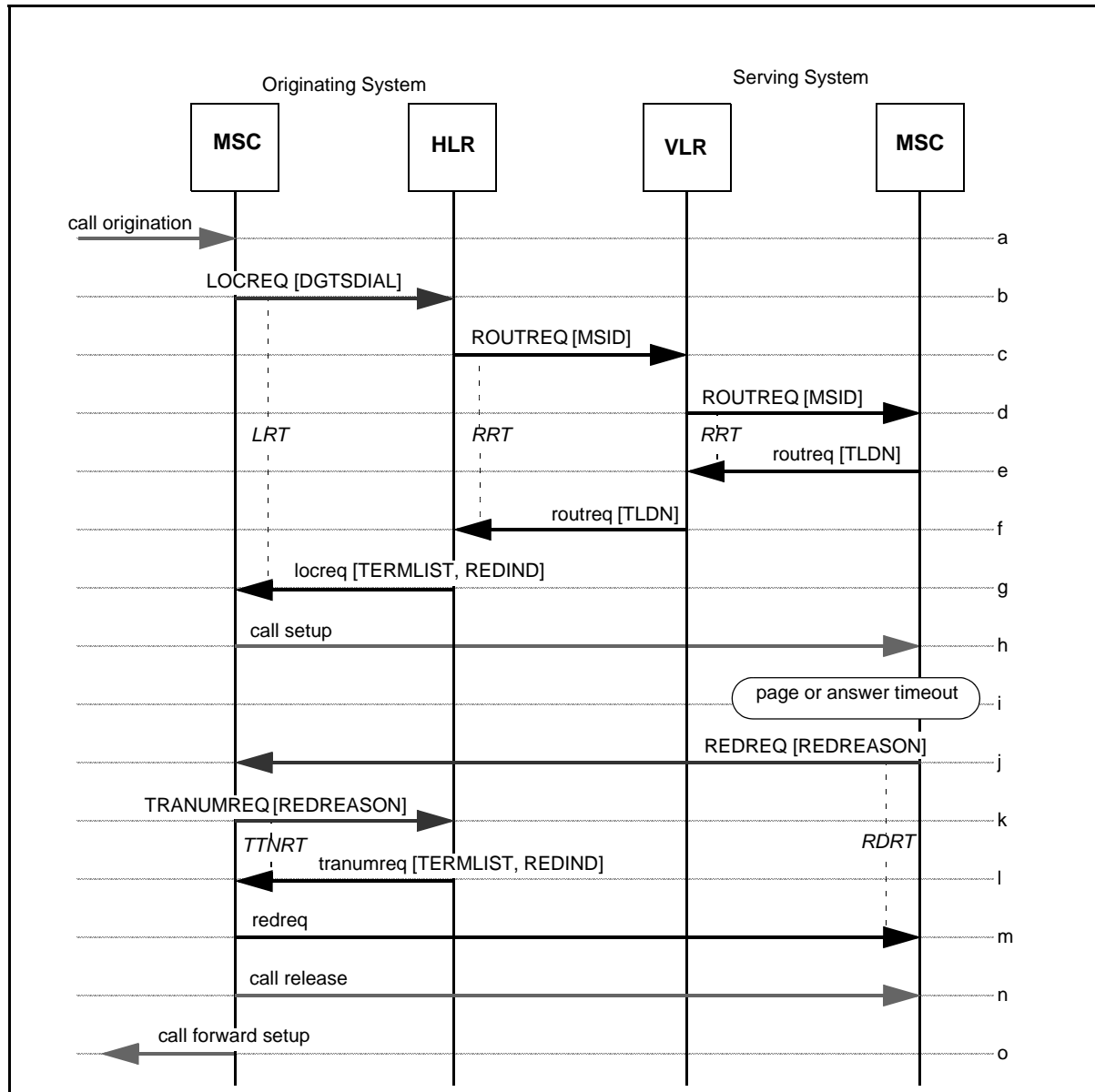


Figure 4 — CFD Invocation with No Answer or No Response to Page

- A call origination and the dialed MS address digits (i.e., directory number) are received by the Originating MSC.
- The Originating MSC sends a LOCREQ to the HLR associated with the MS; this association is made through the dialed MS address digits (which may not be the MIN).
- If the dialed MS address digits are assigned to a legitimate subscriber, the HLR sends a ROUTREQ to the VLR where the MS is registered.
- The VLR then forwards the ROUTREQ to the current Serving MSC.

- e. The Serving MSC allocates a TLDN (Temporary Local Directory Number) and returns this information to the VLR in the `roureq`. 1
- f. The VLR sends the `roureq` to the HLR. 2
- g. When the `roureq` is received by the HLR, it returns a `locreq` to the Originating MSC. The `locreq` includes routing information in the form of the `TerminationList` parameter, along with an indication of the reason for extending the incoming call (i.e., for CD) in the `DMH_RedirectionIndicator` parameter. 3
- h. Upon receiving the `locreq`, the Originating MSC sets up a voice path to the Serving MSC using the protocols defined by the interconnection method. 4
- i. When the inter-MS-C call is received at the Serving MSC, the MS is paged and, if a page response is received, subsequently alerted. If the MS fails to respond to the page or does not answer after alerting, the Serving MSC determines from the service profile that the MS has call forwarding active on no answer or no response to page conditions. 5
- j. The Serving MSC sends a `REDREQ` to the Originating MSC, indicating that the call is being redirected due to a *no answer* or *no page response* condition. 6
- k. The Originating MSC is able to redirect the call, therefore, it sends a `TRANUMREQ` to the HLR requesting the forward-to number appropriate for this condition from the MS's service profile. 7
- l. The HLR sends the `tranumreq` to the Originating MSC, including the appropriate forward-to number in the `TerminationList` parameter, along with an indication of the reason for extending the incoming call (i.e., for CFD) in the `DMH_RedirectionIndicator` parameter. 8
- m. When the `tranumreq` is received from the HLR, the Originating MSC sends a `redreq` to the Serving MSC. 9
- n. The Originating MSC releases the inter-MS-C call. 10
- o. The Originating MSC initiates call forwarding using the specified forward-to number. 11
- p. As described in CFB, [Section 2.5](#), the Serving MSC may choose to redirect the call if it cannot be redirected by the Originating MSC. The Serving MSC should, however, always attempt to have the call redirected by the Originating MSC in order to minimize resource usage. 12

13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

4 Call Forwarding—No Answer

This section depicts the interactions between network entities in various situations related to automatic roaming and Call Forwarding—No Answer (CFNA). These scenarios are for illustrative purposes only.

4.1 CFNA Variable Registration or De-Registration

The information flows required for the registration or de-registration of CFNA by an authorized MS are described in Part-311 [Section 2.1](#).

4.2 CFNA Demand Activation with Courtesy Call

The information flows required for the demand activation of CFNA by an authorized MS, where the serving system provides the optional courtesy call to the forward-to number on CFNA activation, are described in Part-311 [Section 2.2](#).

4.3 CFNA Demand Activation (without Courtesy Call) or De-Activation

The information flows required for the demand activation or de-activation of CFNA by an authorized MS, where the serving system does not provide the optional courtesy call to the forward-to number on CFNA activation, are described in Part-311 [Section 2.1](#).

4.4 CFNA Invocation—Immediate

This scenario describes CFNA invocation due to the following causes:

- Do Not Disturb active, etc.
- MS not registered by *MAP* procedures.
- MS reported inactive by *MAP* procedures.
- Roaming with Call Delivery inactive.

In these cases, the HLR has sufficient information available to make an immediate forwarding decision, rather than directing that the call be routed to the serving system.

The information flows required for this scenario are the same as those for the CFD case described in [Section 3.6](#); simply replace the acronym *CFD* in that description with *CFNA*.

4.5 CFNA Invocation—Delayed

This scenario applies to the invocation of CFNA due to the following causes:

- No MS response to a page request.
- No MS or subscriber response to alerting.
- No subscriber response to Call Waiting notification.

In these cases, the HLR does not have sufficient information available to make an immediate forwarding decision; therefore, the call must be routed to the serving system, where the forwarding cause is encountered.

The information flows required for this scenario are the same as those for the CFD case described in [Section 3.7](#); simply replace the acronym *CFD* in that description with *CFNA*.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

5 Call Forwarding—Unconditional

This section depicts the interactions between network entities in various situations related to automatic roaming and Call Forwarding—Unconditional (CFU). These scenarios are for illustrative purposes only.

5.1 CFU Variable Registration or De-Registration

The information flows required for the registration or de-registration of CFU by an authorized MS are described in Part-311 [Section 2.1](#).

5.2 CFU Demand Activation with Courtesy Call

The information flows required for the demand activation of CFU by an authorized MS, where the serving system provides the optional courtesy call to the forward-to number on CFU activation, are described in Part-311 [Section 2.2](#).

5.3 CFU Demand Activation (without Courtesy Call) or De-Activation

The information flows required for the demand activation or de-activation of CFU by an authorized MS, where the serving system does not provide the optional courtesy call to the forward-to number on CFU activation, are described in Part-311 [Section 2.1](#).

5.4 CFU Invocation with Alert

This scenario describes CFU invocation, along with the provision of the optional CFU alert to the served MS.

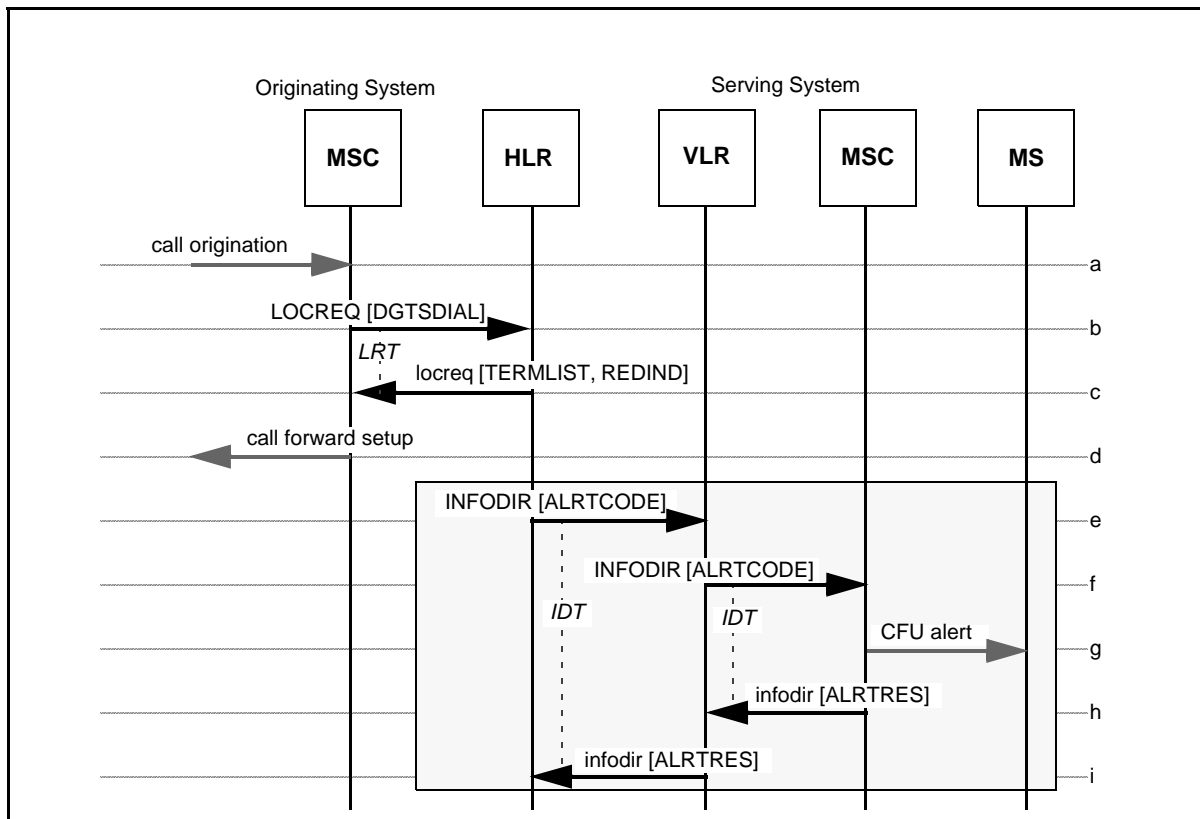


Figure 5 — CFU Invocation with Alert

- a. A call origination and the dialed MS address digits (i.e., directory number) are received by the Originating MSC.
- b. The Originating MSC sends a LOCREQ to the HLR associated with the MS; this association is made through the dialed MS address digits (which might not be the same as the MIN).
- c. The HLR determines from the MS's service profile that CFU is active. It sends a locreq to the Originating MSC providing the forward-to number and other routing information in the TerminationList parameter, along with an indication of the reason for extending the incoming call (i.e., for CFU) in the DMH_RedirectionIndicator parameter.
- d. The Originating MSC then establishes a call to the specified forward-to number.
- e. The HLR determines that the MS should be informed that a call has been forwarded unconditionally and therefore sends an INFODIR to the VLR where the MS is registered.
- f. The VLR directs the Serving MSC to alert the MS by sending an INFODIR to the Serving MSC.
- g. The Serving MSC alerts the MS, if idle, via the alerting method specified in the AlertCode parameter in the received INFODIR.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

- h. The Serving MSC sends an `infodir` to the VLR, including the result of the alerting action (e.g., success, not attempted due to MS busy condition).
- i. The VLR forwards the `infodir` to the HLR.