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**European digital cellular telecommunications system (Phase 2);
Call Forwarding (CF) supplementary services - Stage 3
(GSM 04.82)**

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Special Mobile Group (SMG) Technical Committee (TC) of the European Telecommunications Standards Institute (ETSI).

This ETS specifies the procedures used at the radio interface (reference point Um as defined in ETS 300 551) for normal operation, registration, erasure, activation, deactivation, interrogation and network invocation of call offering supplementary services within the European digital cellular telecommunications system (Phase 2).

This ETS corresponds to GSM technical specification, GSM 04.82 version 4.8.1.

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

Reference is made within this ETS to GSM Technical Specifications (GSM-TS) (NOTE).

Reference is also made within this ETS to GSM 02.8x and 03.8x series. The specifications in the series can be identified, with their full title, within the normative reference Clause of this ETS by the last two digits of their GSM reference number e.g. GSM 03.8x series, refers to GSM 03.81, GSM 03.82, etc.

NOTE: TC-SMG has produced documents which give the technical specifications for the implementation of the European digital cellular telecommunications system. Historically, these documents have been identified as GSM Technical Specifications (GSM-TS). These TSs may have subsequently become I-ETSS (Phase 1), or ETSSs (Phase 2), whilst others may become ETSI Technical Reports (ETRs). GSM-TSs are, for editorial reasons, still referred to in current GSM ETSSs.

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0 General

0.1 Scope

This technical specification specifies the procedures used at the radio interface (reference point Um as defined in technical specification GSM 04.02) for normal operation, registration, erasure, activation, deactivation, interrogation and network invocation of call offering supplementary services. Provision and withdrawal of supplementary services is an administrative matter between the mobile subscriber and the service provider and cause no signalling on the radio interface.

In technical specification GSM 04.10 the general aspects of the specification of supplementary services at the layer 3 radio interface are given.

Technical specification GSM 04.80 specifies the formats and coding for the supplementary services.

Definitions and descriptions of supplementary services are given in technical specifications GSM 02.04 and GSM 02.8x and 02.9x-series. Technical specification GSM 02.82 is related specially to call offering supplementary services.

Technical realization of supplementary services is described in technical specifications GSM 03.11 and GSM 03.8x and 03.9x-series. Technical specification GSM 03.82 is related specially to call offering supplementary services.

The procedures for Call Control, Mobility Management and Radio Resource management at the layer 3 radio interface are defined in technical specifications GSM 04.07 and GSM 04.08.

The following supplementary services belong to the call offering supplementary services and are described in this technical specification:

- Call forwarding unconditional (CFU) (section 1);
- Call forwarding on mobile subscriber busy (CFB) (section 2);
- Call forwarding on no reply (CFNRy) (section 3);
- Call forwarding on mobile subscriber not reachable (CFNRc) (section 4).

0.2 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): "European digital cellular telecommunications system (Phase 2); "Abbreviations and acronyms".
- [2] GSM 02.01 (ETS 300 500): "European digital cellular telecommunications system (Phase 2); Principles of telecommunication services supported by a GSM Public Land Mobile Network (PLMN)".
- [3] GSM 02.04 (ETS 300 503): "European digital cellular telecommunications system (Phase 2); General on supplementary services".
- [4] GSM 02.81 (ETS 300 514): "European digital cellular telecommunications system (Phase 2); Line identification supplementary services - Stage 1".
- [5] GSM 02.82 (ETS 300 515): "European digital cellular telecommunications system (Phase 2); Call Forwarding (CF) supplementary services - Stage 1".

- [6] GSM 02.83 (ETS 300 516): "European digital cellular telecommunications system (Phase 2); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 1".
- [7] GSM 02.84 (ETS 300 517): "European digital cellular telecommunications system (Phase 2); Multi Party (MPTY) supplementary services - Stage 1".
- [8] GSM 02.85 (ETS 300 518): "European digital cellular telecommunications system (Phase 2); Closed User Group (CUG) supplementary services - Stage 1".
- [9] GSM 02.86 (ETS 300 519): "European digital cellular telecommunications system (Phase 2); Advice of charge (AoC) supplementary services - Stage 1".
- [10] GSM 02.88 (ETS 300 520): "European digital cellular telecommunications system (Phase 2); Call Barring (CB) supplementary services - Stage 1".
- [11] GSM 02.90 (ETS 300 521): "European digital cellular telecommunications system (Phase 2); Unstructured supplementary services operation - Stage 1".
- [12] GSM 03.02 (ETS 300 522): "European digital cellular telecommunications system (Phase 2); Network architecture".
- [13] GSM 03.11 (ETS 300 529): "European digital cellular telecommunications system (Phase 2); Technical realization of supplementary services".
- [14] GSM 03.81 (ETS 300 542): "European digital cellular telecommunications system (Phase 2); Line identification supplementary services - Stage 2".
- [15] GSM 03.82 (ETS 300 543): "European digital cellular telecommunications system (Phase 2); Call Forwarding (CF) supplementary services - Stage 2".
- [16] GSM 03.83 (ETS 300 544): "European digital cellular telecommunications system (Phase 2); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 2".
- [17] GSM 03.84 (ETS 300 545): "European digital cellular telecommunications system (Phase 2); Multi Party (MPTY) supplementary services - Stage 2".
- [18] GSM 03.85 (ETS 300 546): "European digital cellular telecommunications system (Phase 2); Closed User Group (CUG) supplementary services - Stage 2".
- [19] GSM 03.86 (ETS 300 547): "European digital cellular telecommunications system (Phase 2); Advice of Charge (AoC) supplementary services - Stage 2".
- [20] GSM 03.88 (ETS 300 548): "European digital cellular telecommunications system (Phase 2); Call Barring (CB) supplementary services - Stage 2".
- [21] GSM 03.90 (ETS 300 549): "European digital cellular telecommunications system (Phase 2); Unstructured supplementary services operation - Stage 2".
- [22] GSM 04.02 (ETS 300 551): "European digital cellular telecommunications system (Phase 2); GSM Public Land Mobile Network (PLMN) access reference configuration".
- [23] GSM 04.07 (ETS 300 556): "European digital cellular telecommunications system (Phase 2); Mobile radio interface signalling layer 3 General aspects".
- [24] GSM 04.08 (ETS 300 557): "European digital cellular telecommunications system (Phase 2); Mobile radio interface layer 3 specification".

- [25] GSM 04.10 (ETS 300 558): "European digital cellular telecommunications system (Phase 2); Mobile radio interface layer 3 Supplementary services specification General aspects".
- [26] GSM 04.80 (ETS 300 564): "European digital cellular telecommunications system (Phase 2); Mobile radio interface layer 3 supplementary services specification Formats and coding".
- [27] GSM 04.82 (ETS 300 566): "European digital cellular telecommunications system (Phase 2); Call Forwarding (CF) supplementary services - Stage 3".

0.3 Definitions and abbreviations

Abbreviations used in the specification are listed in GSM 01.04.

0.4 Cross phase compatibility

For the following supplementary services, a number of changes exist between this specification and the protocol version 1 specification:

- Call forwarding unconditional;
- Call forwarding on mobile subscriber busy;
- Call forwarding on no reply;
- Call forwarding on mobile subscriber not reachable.

For these supplementary services the main body of this specification assumes that all network entities comply with this version of the service. In each case an additional sub-section (section x.7) defines the additional requirements for when one or more network entities or the MS complies with the protocol version 1 specifications for the supplementary service procedures.

1 Call Forwarding Unconditional (CFU)

1.1 Normal operation

1.1.1 Served mobile subscriber side

When call forwarding unconditional is active, all incoming calls for the specified basic service(s) will be forwarded without being offered to the served mobile subscriber.

When CFU is active, the ability of the served mobile subscriber to originate calls is not affected. However, a NotifySS operation containing the SS-Status indicating that CFU is currently active and operative will be sent to the served mobile subscriber each time an outgoing call is made, see figure 1.1.

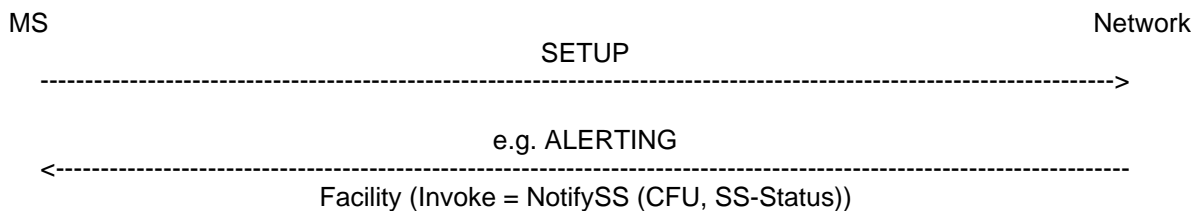
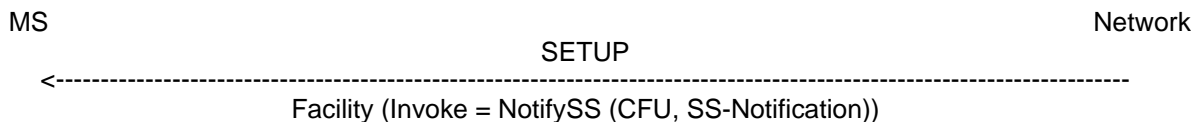


Figure 1.1: Notification to the served mobile subscriber that call forwarding is active

1.1.2 Forwarded-to mobile subscriber side

The forwarded-to mobile subscriber will receive a NotifySS operation containing the SS-Notification indicating that the incoming call is a forwarded call. When available, the SS-Code of the invoked forwarding service is also included, see figure 1.2.

When multiple forwarding occurs the value of the SS-Code shall relate to the last invoked forwarding service.

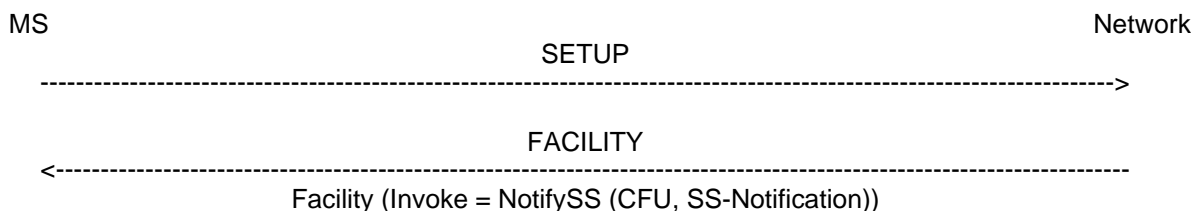


NOTE: If the specific call forwarding service is not known the common SS-Code for all forwarding SS will be used.

Figure 1.2: Notification to the forwarded-to mobile subscriber that the incoming call is a forwarded call

1.1.3 Calling mobile subscriber side

As a subscription option, the served mobile subscriber can request that the calling mobile subscriber receives a NotifySS operation containing the SS-Notification indicating that the call has been forwarded. When available, the SS-Code of the invoked forwarding service is also included, see figure 1.3.



NOTE: If the specific call forwarding service is not known the common SS-Code for all forwarding SS will be used.

Figure 1.3: Notification to the calling mobile subscriber that the call is forwarded

1.2 Registration

The following information has to be registered in the network:

- the ForwardedToNumber which may be accompanied by a ForwardedToSubAddress;
- information as to whether all calls or all calls of a specific basic service should be forwarded.

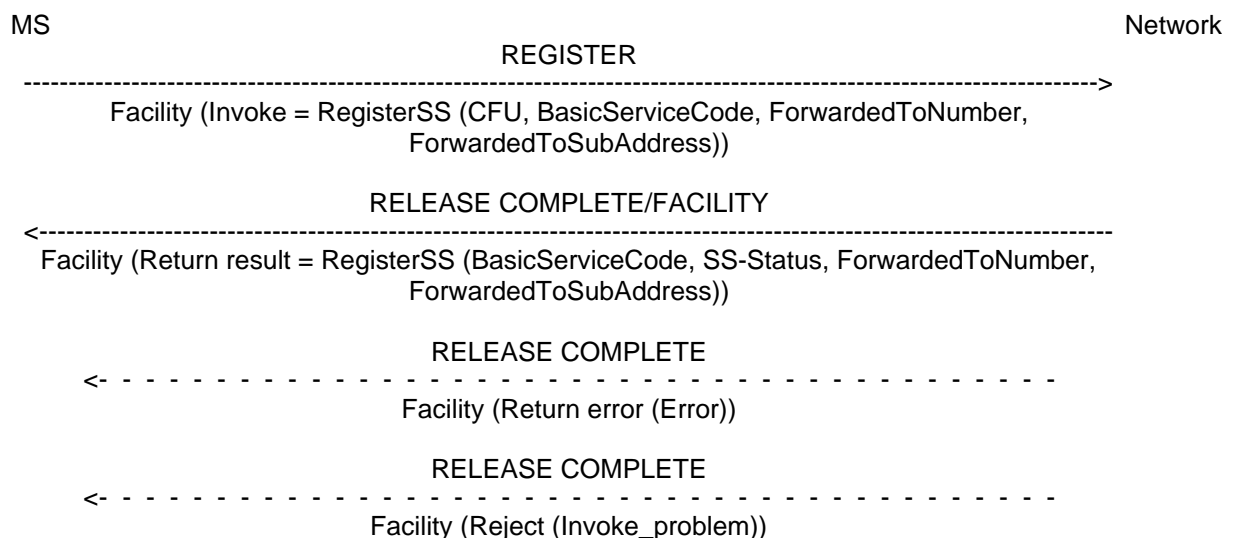
1.2.1 Registration by the served mobile subscriber

A CFU registration request from a mobile user shall include the SS-Code of the forwarding service to be registered and possibly the BasicServiceCode the request applies to. If the BasicServiceCode is not included, the request applies to all basic services.

If the registration is successful, the CFU service will be registered and activated. The network will then send a return result indicating acceptance of the request including the ForwardedToNumber and possibly the BasicService (group) Code to which CFU is registered. If the request applied to a single elementary basic service group, the ForwardedToNumber may be accompanied by a ForwardedToSubAddress. In other cases the result shall not contain a ForwardedToSubAddress. The result may also contain an SS-Status parameter. If the MS does not send an SS Version Indicator in the invocation request then the network shall send an SS-Status in the result. If the MS does send an SS Version Indicator in the invocation request then the inclusion of SS-Status in the result is optional. If the SS-Status is included the network shall set it to reflect the state of the service. The MS shall ignore the contents of the SS-Status parameter if one is received. See figure 1.4.

Note that the use of SS-Status is to provide backwards compatibility with phase 1.

If the system cannot accept a registration request, a corresponding error indication is returned to the served mobile subscriber that CFU registration was not successful. Error values are specified in TS GSM 04.80.



NOTE: If BasicServiceCode is not included it applies to all basic services. The ForwardedToNumber may be accompanied by a ForwardedToSubAddress. The SS-Status may not be included in all cases, see text.

Figure 1.4: Registration of call forwarding unconditional

When registering call forwarding, the SS-Code may indicate the code for "all forwarding SS". In this case, if the subscriber has CFU provisioned, the return result shall contain the information for CFU. If the subscriber does not have CFU provisioned, the return result shall contain the information for any conditional call forwarding services which the subscriber has provisioned.

1.3 Erasure

A previous registration can be erased in one of three ways:

- the subscriber can specifically erase a previous registration with an appropriate control procedure;
- the subscriber can register information for CFU for a specific basic service group to another directory number, thus causing the previous registration of CFU to be overridden;
- all information is erased as a result of withdrawal of the supplementary service (administrative handling).

1.3.1 Erasure by the served mobile subscriber

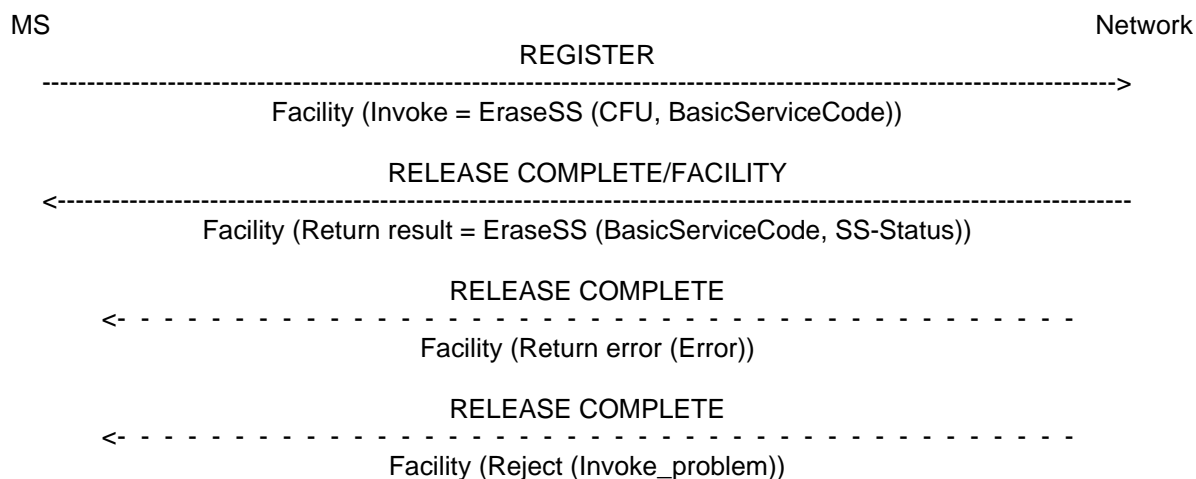
If the erasure is successful, the CFU service will be erased (and automatically deactivated). The network will then send a return result indicating acceptance of the request. The result is formatted according to the options shown below:

- The result includes the BasicService (group) Code for which CFU was erased. The result may also contain an SS-Status parameter. If the MS does not send an SS Version Indicator in the invocation request then the network shall send an SS-Status in the result. If the MS does send an SS Version Indicator in the invocation request then the inclusion of SS-Status in the result is optional. If the SS-Status is included the network shall set it to reflect the state of the service. The MS shall ignore the contents of the SS-Status parameter if one is received. See figure 1.5.

Note that the use of SS-Status is to provide backwards compatibility with phase 1.

- If the request did not include a BasicServiceCode, and the erasure was successful for all basic services, the network may send an empty return result to the MS. This option applies whether or not an SS Version Indicator is received from the MS.

If the network cannot accept the erasure request, the status of CFU in the network remains unchanged. An error indication will then be returned to the served mobile subscriber that erasure of CFU was unsuccessful. Error values are specified in TS GSM 04.80.



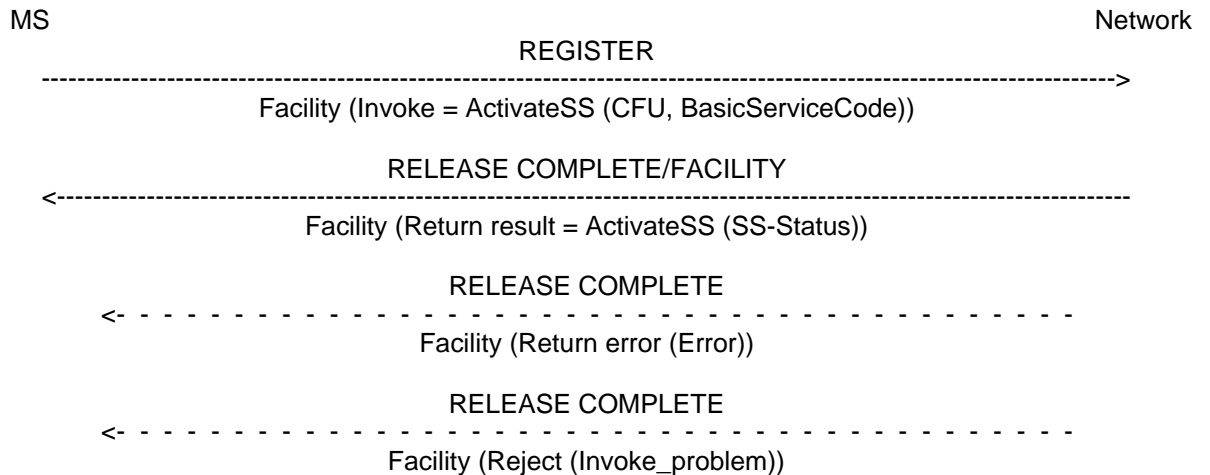
NOTE: If BasicServiceCode is not included it applies to all basic services. The SS-Code may also indicate the code for "all forwarding SS". The SS-Status may not be included in all cases, see text.

Figure 1.5: Erasure of call forwarding unconditional

1.4 Activation

An explicit CFU activation request from a mobile user shall contain the supplementary service to be activated and possibly the basic service group the request applies to. If a basic service group is not included in the activation request the request applies to all basic services against which a CFU forwarded-to number is registered. The user shall receive appropriate notification of acceptance, rejection or partial acceptance of the CFU activation request, see figure 1.6.

Error values (which are used in the two latter situations) are specified in TS GSM 04.80.



NOTE: The SS-Code may also indicate the code for "all forwarding SS", being handled as for registration (see section 1.2.1).

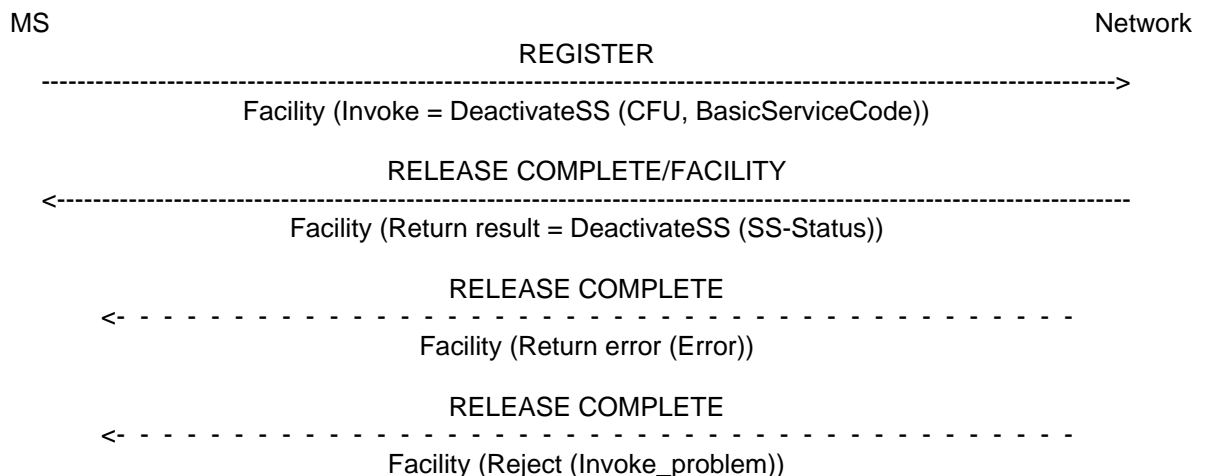
Figure 1.6: Activation of call forwarding unconditional

1.5 Deactivation

An explicit CFU deactivation request shall contain the supplementary service to be deactivated and possibly the basic service group the request applies to. If a basic service group is not included in the deactivation request the request applies to all basic services against which CFU is activated. The user shall receive appropriate notification of acceptance or rejection of the CFU deactivation request, see figure 1.7.

Error values to be used in the latter situation are specified in TS GSM 04.80.

Deactivation shall not lead to erasure of the information registered in the network.



NOTE: The SS-Code may also indicate the code for "all forwarding SS".

Figure 1.7: Deactivation of call forwarding unconditional

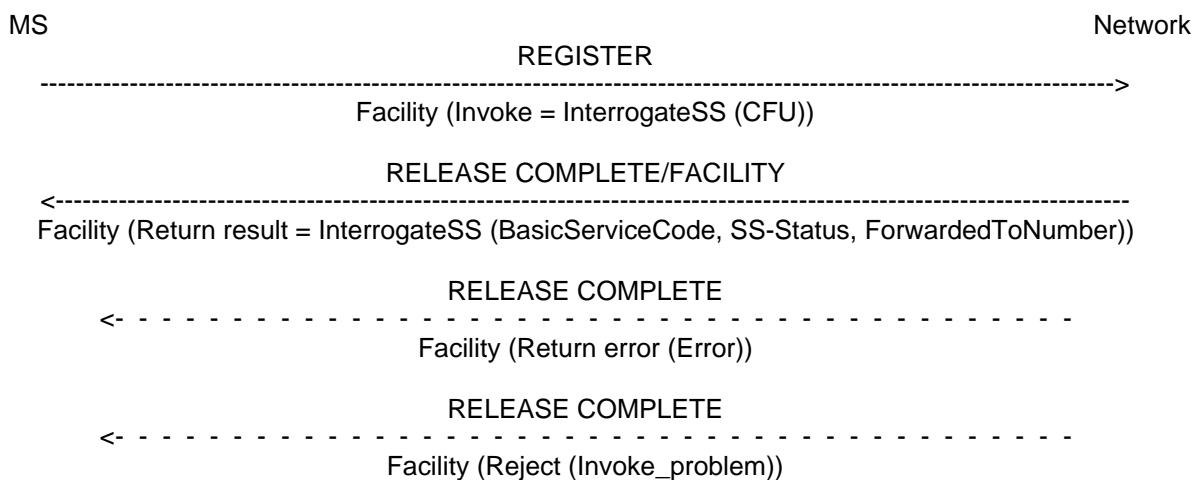
1.6 Interrogation

Data request

The data request procedure enables the mobile subscriber to obtain information about the data stored in the PLMN. After having requested this procedure the network shall return the following information:

- in response to a general data request (i.e. not including a BasicServiceCode) the served mobile subscriber should be given the following data for each basic service group to which CFU is registered:
 - the SS-Status indicating whether the supplementary service is "not active", "active and operative" or "active and quiescent";
 - the associated ForwardedToNumber which shall not be accompanied by a ForwardedToSubAddress, see figure 1.8.

If CFU is not registered for any basic service groups, only the SS-Status parameter indicating "not registered" is returned.

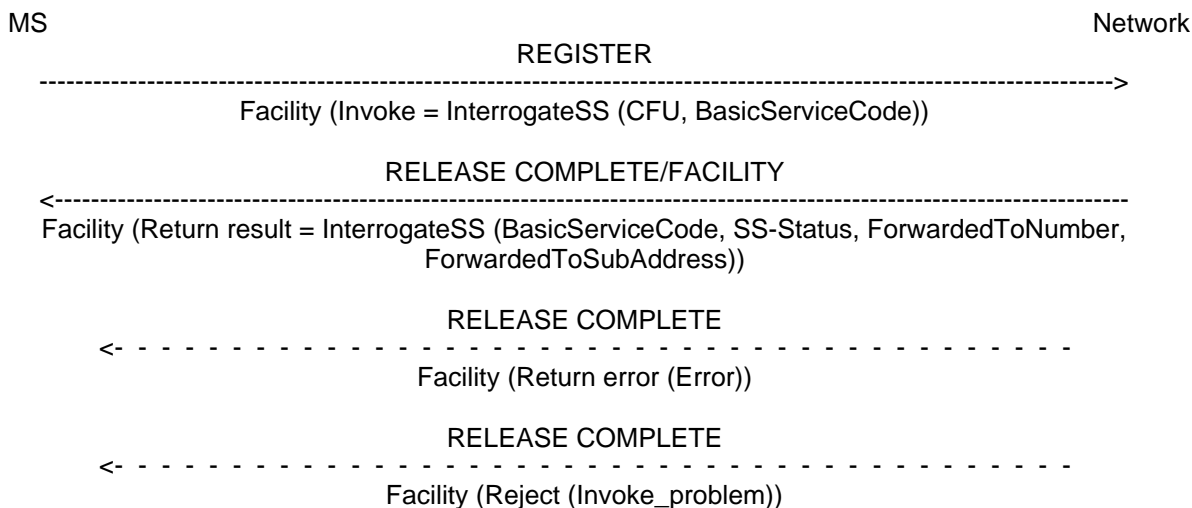


NOTE: The ForwardedToNumber shall not be accompanied by a ForwardedToSubAddress. The return result may consist of a list of parameters, each relating to a specific basic service group.

Figure 1.8: Interrogation of active call forwarding unconditional for all basic services

- in response to a specific request concerning one particular basic service group, the served mobile subscriber should be informed whether or not CFU is registered, including information on whether or not it is active and operative or active and quiescent for that basic service group. If CFU is registered, the associated ForwardedToNumber shall be given, see figure 1.9. If the request applied to a single elementary basic service group, the ForwardedToNumber may be accompanied by a ForwardedToSubAddress. In other cases the result shall not contain a ForwardedToSubAddress.

If CFU is not registered for the interrogated basic service group, only the SS-Status parameter indicating "not registered" is returned.



NOTE: The ForwardedToNumber may be accompanied by a ForwardedToSubAddress.

Figure 1.9: Interrogation of active call forwarding unconditional for one particular basic service

The values "all forwarding SS" and "all conditional forwarding SS" shall not be sent over the air interface by the MS in an interrogation. If an interrogation is received containing one of these codes the network shall send a return error component.

1.7 Cross phase compatibility

1.7.1 Network only supports protocol version 1 control of SS by the subscriber

A CFU registration request which contains a ForwardedToSubaddress shall be rejected by the network if any network element involved is of protocol version 1.

Note that a CFU activation or deactivation request will be rejected by the network if any network element involved is of protocol version 1.

1.7.2 MS only supports protocol version 1 control of SS by the subscriber

In response to a CFU interrogation request, where the SS Version Indicator is not received from the MS, the network shall only return data for basic service groups to which CFU is activated and operative. Data shall not be returned for basic service groups to which CFU is deactivated. This means that the subscriber is not always aware of the true state of the service.

In response to a CFU registration or erasure request, where the SS Version Indicator is not received from the MS, the network shall always include the SS-Status parameter.

2 Call Forwarding on mobile subscriber Busy (CFB)

2.1 Normal operation

2.1.1 Served mobile subscriber side

When call forwarding on mobile subscriber busy is active, the following actions are taken by the network:

- If the mobile is Network Determined User Busy (NDUB as defined in TS GSM 02.01), incoming calls for the specified basic service(s) will be forwarded without being offered to the served mobile subscriber.
- If the mobile is not NDUB, the incoming call is offered (as a normal or waiting call) to the served mobile subscriber.
 - if the call is subsequently released by the mobile with the first clearing message containing the cause = "User Busy" before the CONNECT message is received, it will be forwarded by the network, see figure 2.0;
 - if any other release causes are given, the call will be released;
 - if one of the call control timers (T303 or T310) elapse, the call will be released.

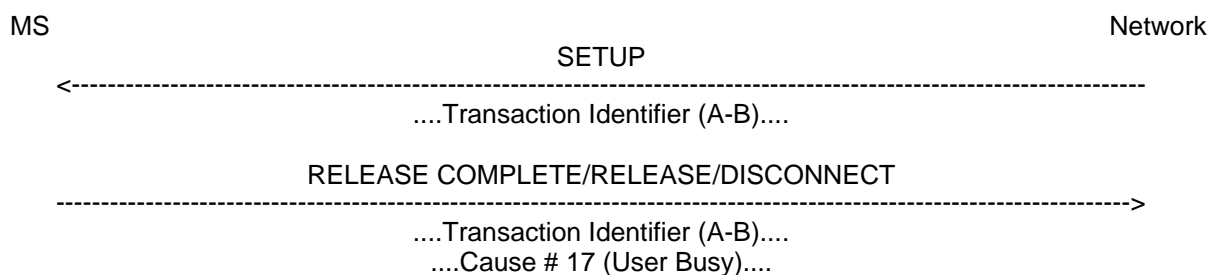
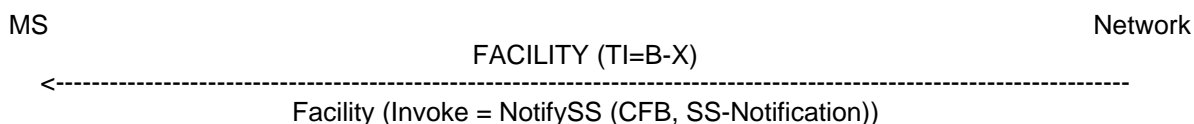


Figure 2.0: Call which is offered to the served mobile subscriber being released. The network will invoke call forwarding on mobile subscriber busy in this case, if CFB is active for the requested basic service

When an incoming call is forwarded on mobile subscriber busy due to NDUB the served mobile subscriber can, as a subscription option, receive a NotifySS operation containing the SS-Notification indicating that a call has been forwarded, see figure 2.1. He will not be able to answer the incoming call.

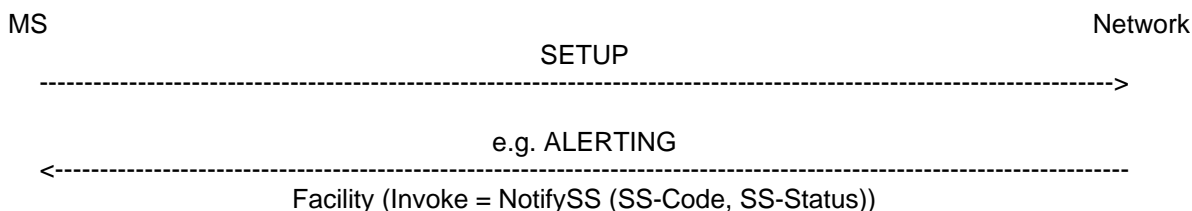
The transaction identifier employed shall correspond to any call B is having.



NOTE: X is any party with which B has a call.

Figure 2.1: Notification to the served mobile subscriber that a call is forwarded on mobile subscriber busy

When CFB is active, the ability of the served mobile subscriber to originate calls is not affected. However, a NotifySS operation containing the SS-Status indicating that a conditional call forwarding supplementary service is currently active and operative will be sent to the served mobile subscriber each time an outgoing call is made, see figure 2.2.



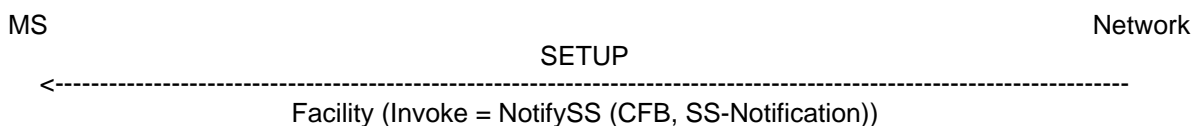
NOTE: The SS-Code will be the common SS-Code for all conditional call forwarding services.

Figure 2.2: Notification to the served mobile subscriber that a conditional call forwarding service is active

2.1.2 Forwarded-to mobile subscriber side

The forwarded-to mobile subscriber will receive a NotifySS operation containing the SS-Notification indicating that the incoming call is a forwarded call. When available, the SS-Code of the invoked forwarding service is also included, see figure 2.3.

When multiple forwarding occurs the value of the SS-Code shall relate to the last invoked forwarding service.

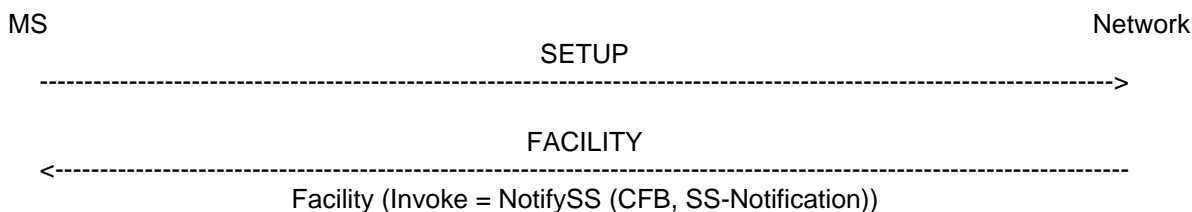


NOTE: If the specific call forwarding service is not known the common SS-Code for all forwarding SS will be used.

Figure 2.3: Notification to the forwarded-to mobile subscriber that the incoming call is a forwarded call

2.1.3 Calling mobile subscriber side

As a subscription option, the served mobile subscriber can request that the calling mobile subscriber receives a NotifySS operation containing the SS-Notification indicating that the call has been forwarded. When available, the SS-Code of the invoked forwarding service is also included, see figure 2.4.



NOTE: If the specific call forwarding service is not known the common SS-Code for all forwarding SS will be used.

Figure 2.4: Notification to the calling mobile subscriber that the call is forwarded

2.2 Registration

The following information has to be registered in the network:

- the ForwardedToNumber which may be accompanied by a ForwardedToSubAddress;
- information as to whether all calls or all calls of a specific basic service should be forwarded.

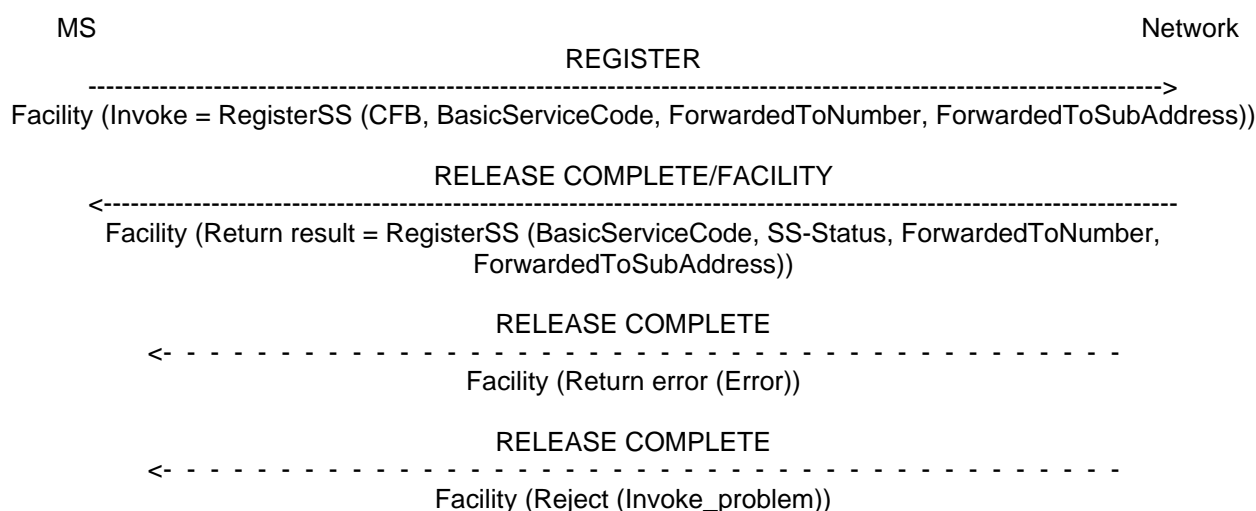
2.2.1 Registration by the served mobile subscriber

A CFB registration request from a mobile user shall include the SS-Code of the forwarding service to be registered, and possibly the BasicServiceCode the request applies to. If the BasicServiceCode is not included, the request applies to all basic services.

If the registration is successful, the CFB service will be registered and activated. The network will then send a return result indicating acceptance of the request, including the ForwardedToNumber and possibly the BasicService (group) Code to which CFB is registered. If the request applied to a single elementary basic service group, the ForwardedToNumber may be accompanied by a ForwardedToSubAddress. In other cases the result shall not contain a ForwardedToSubAddress. The result may also contain an SS-Status parameter. If the MS does not send an SS Version Indicator in the invocation request then the network shall send an SS-Status in the result. If the MS does send an SS Version Indicator in the invocation request then the inclusion of SS-Status in the result is optional. If the SS-Status is included the network shall set it to reflect the state of the service. The MS shall ignore the contents of the SS-Status parameter if one is received. See figure 2.5.

Note that the use of SS-Status is to provide backwards compatibility with phase 1.

If the system cannot accept a registration request, a corresponding error indication is returned to the served mobile subscriber that CFB registration was not successful. Error values are specified in TS GSM 04.80.



NOTE: If BasicServiceCode is not included it applies to all basic services. The ForwardedToNumber may be accompanied by a ForwardedToSubAddress. The SS-Status may not be included in all cases, see text.

Figure 2.5: Registration of call forwarding on mobile subscriber busy

The SS-Code may indicate the code for "all forwarding SS", as specified in section 1.2.1.

The SS-Code may indicate the code for "all conditional forwarding SS". In this case the return result shall contain the information for any conditional call forwarding services which the subscriber has provisioned.

2.3 Erasure

A previous registration can be erased in one of three ways:

- the subscriber can specifically erase a previous registration with an appropriate control procedure;
- the subscriber can register information for CFB for the specific basic service to another directory number, thus causing the previous registration of CFB to be overridden;
- all information is erased as a result of withdrawal of the supplementary service (administrative handling).

2.3.1 Erasure by the served mobile subscriber

A CFB erasure request from a mobile subscriber may include the BasicServiceCode. If this is not the case, the erasure applies to all basic services.

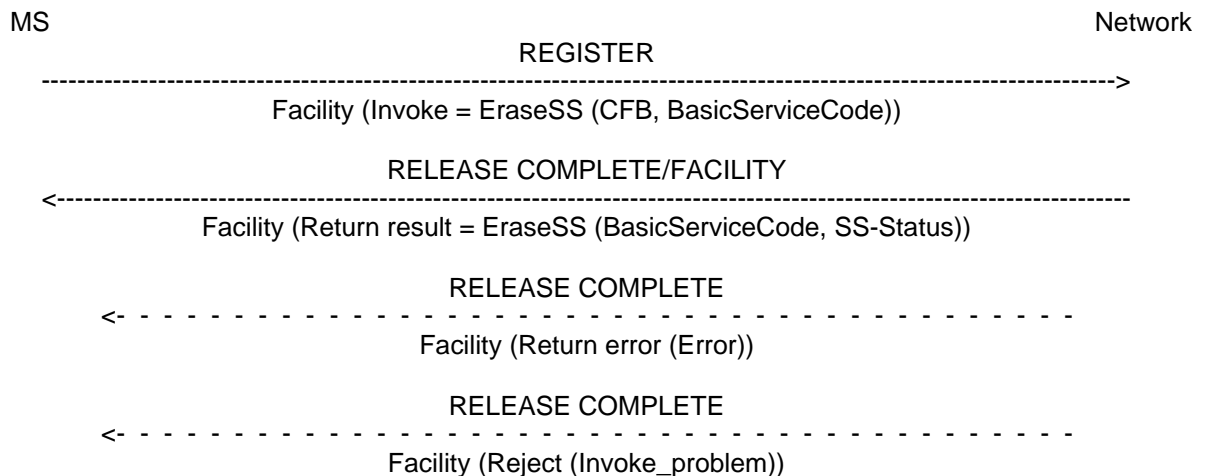
If the erasure is successful, the CFB service will be erased (and automatically deactivated). The network will then send a return result indicating acceptance of the request. The result is formatted according to the options shown below:

- The result includes the BasicService (group) Code for which CFB was erased. The result may also contain an SS-Status parameter. If the MS does not send an SS Version Indicator in the invocation request then the network shall send an SS-Status in the result. If the MS does send an SS Version Indicator in the invocation request then the inclusion of SS-Status in the result is optional. If the SS-Status is included the network shall set it to reflect the state of the service. The MS shall ignore the contents of the SS-Status parameter if one is received. See figure 2.6.

Note that the use of SS-Status is to provide backwards compatibility with phase 1.

- If the request did not include a BasicServiceCode, and the erasure was successful for all basic services, the network may send an empty return result to the MS. This option applies whether or not an SS Version Indicator is received from the MS.

If the network cannot accept the erasure request, the status of CFB in the network remains unchanged. An error indication will then be returned to the served mobile subscriber that erasure of CFB was unsuccessful. Error values are specified in TS GSM 04.80.



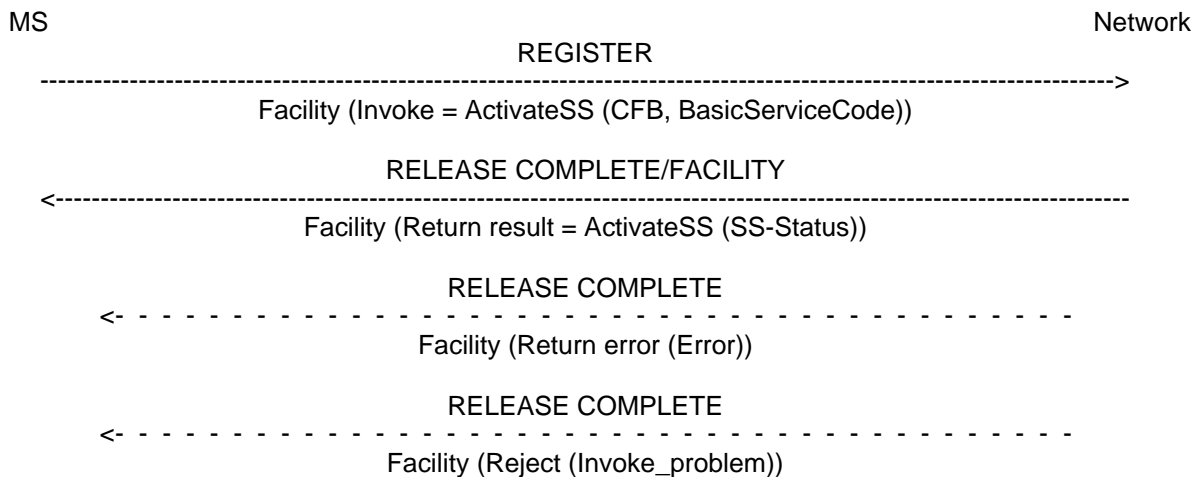
NOTE: If BasicServiceCode is not included it applies to all basic services. The SS-Code may also indicate the code for "all conditional forwarding SS" or the code for "all forwarding SS". The SS-Status may not be included in all cases, see text.

Figure 2.6: Erasure of call forwarding on mobile subscriber busy

2.4 Activation

An explicit CFB activation request shall contain the SS-Code of the supplementary service to be activated and possibly the BasicServiceCode the request applies to. If a BasicServiceCode is not included in the activation request the request applies to all basic services against which CFB forwarded-to number is registered. The user shall receive appropriate notification of acceptance, rejection or partial acceptance of the CFB activation request, see figure 2.7.

Error values to be used in the two latter situations are specified in TS GSM 04.80.



NOTE: The SS-Code may also indicate the code "all conditional forwarding SS" group, as specified in section 2.2.1, or the "all forwarding SS" group, as specified in section 1.2.1.

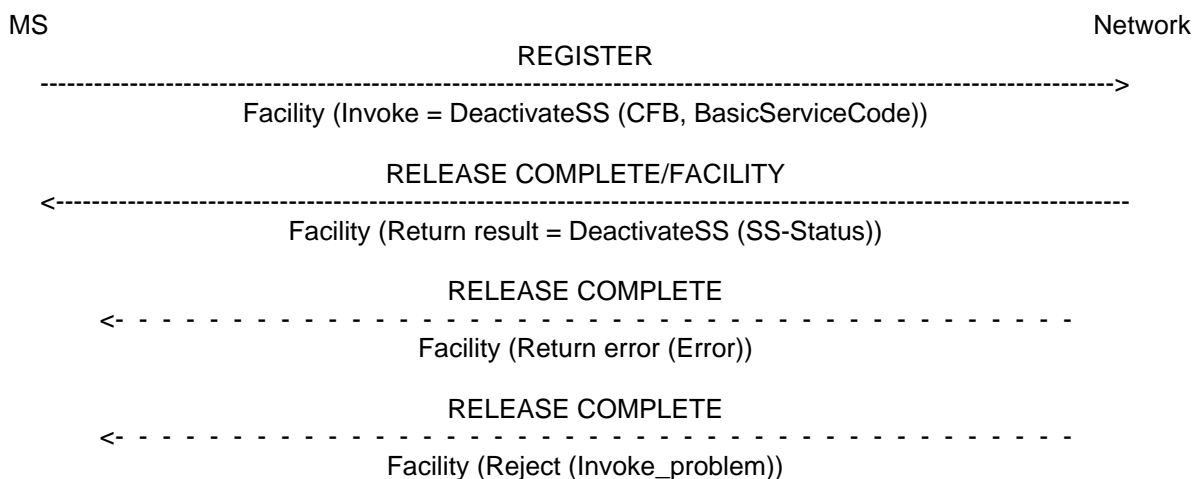
Figure 2.7: Activation of call forwarding on mobile subscriber busy

2.5 Deactivation

An explicit CFB deactivation request shall contain the SS-Code of the supplementary service to be deactivated and possibly the BasicServiceCode the request applies to. If a BasicServiceCode is not included in the deactivation request the request applies to all basic services against which CFB is activated. The user shall receive appropriate notification of acceptance or rejection of the CFB deactivation request, see figure 2.8.

Error values to be used in the latter situation are specified in TS GSM 04.80.

Deactivation shall not lead to erasure of the information registered in the network.



NOTE: The SS-Code may also indicate the "all conditional forwarding SS" group or the "all forwarding SS" group.

Figure 2.8: Deactivation of call forwarding on mobile subscriber busy

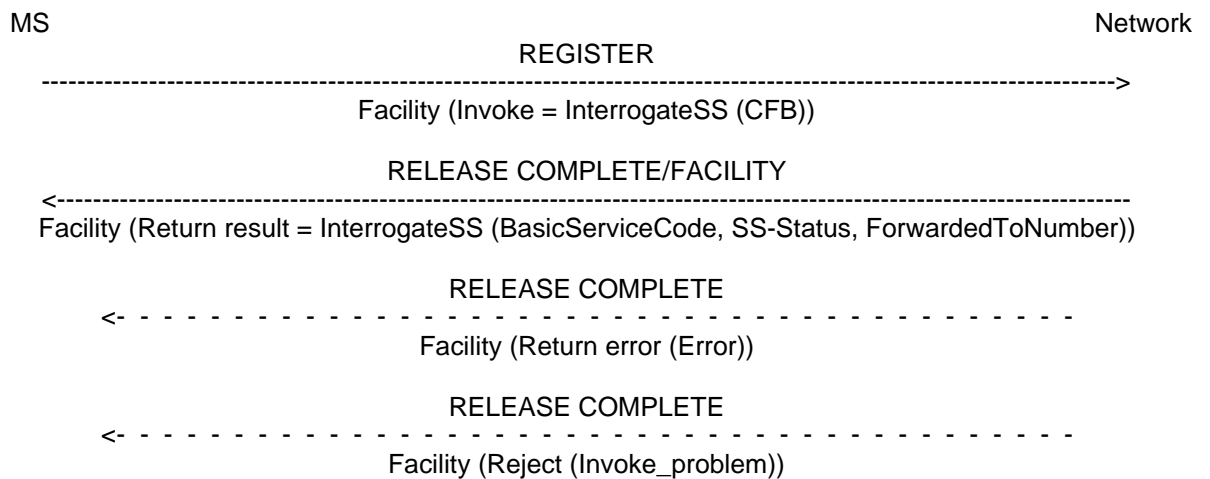
2.6 Interrogation

Data request

The data request procedure enables the mobile subscriber to obtain information about the data stored in the PLMN. After having requested this procedure the network shall return the following information:

- in response to a general data request (i.e. not including a BasicServiceCode) the served mobile subscriber should be given the following data for each basic service group to which CFB is registered:
 - the SS-Status indicating whether the supplementary service is "not active", "active and operative" or "active and quiescent";
 - the associated ForwardedToNumber which shall not be accompanied by a ForwardedToSubAddress, see figure 2.9.

If CFB is not registered for any basic service groups, only the SS-Status parameter indicating "not registered" is returned.

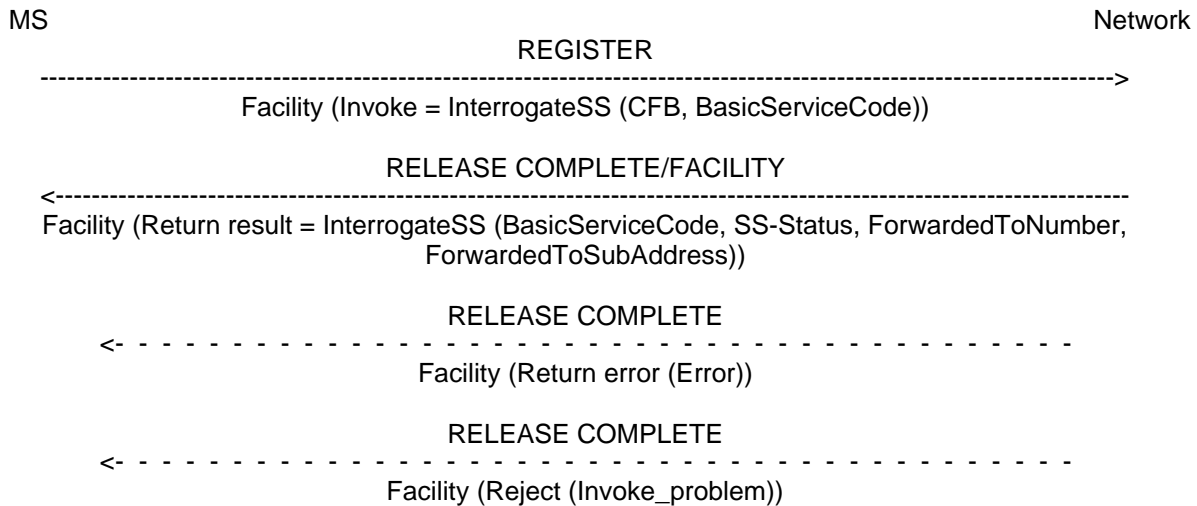


NOTE: The ForwardedToNumber shall not be accompanied by a ForwardedToSubAddress. The return result may consist of a list of parameters, each relating to a specific basic service group.

Figure 2.9: Interrogation of active call forwarding on mobile subscriber busy for all basic services

- in response to a specific request (i.e. containing one particular BasicService (group) Code, the served mobile subscriber should receive the SS-Status parameter, indicating whether or not CFB is registered, including information as to whether or not it is active and operative or active and quiescent for that basic service group. If CFB is registered, the associated ForwardedToNumber shall be given, see figure 2.10. If the request applied to a single elementary basic service group, the ForwardedToNumber may be accompanied by a ForwardedToSubAddress. In other cases the result shall not contain a ForwardedToSubAddress.

If CFB is not registered for the interrogated BasicService (group) code, only the SS-Status parameter indicating "not registered" is returned.



NOTE: The ForwardedToNumber may be accompanied by a ForwardedToSubAddress.

Figure 2.10: Interrogation of active call forwarding on mobile subscriber busy for one particular basic service

The values "all forwarding SS" and "all conditional forwarding SS" shall not be sent over the air interface by the MS in an interrogation. If an interrogation is received containing one of these codes the network shall send a return error component.

2.7 Cross phase compatibility

2.7.1 Network only supports protocol version 1 control of SS by the subscriber

A CFB registration request which contains a ForwardedToSubaddress shall be rejected by the network if any network element involved is of protocol version 1.

Note that a CFB activation or deactivation request will be rejected by the network if any network element involved is of protocol version 1.

2.7.2 MS only supports protocol version 1 control of SS by the subscriber

In response to a CFB interrogation request, where the SS Version Indicator is not received from the MS, the network shall only return data for basic service groups to which CFB is activated and operative. Data shall not be returned for basic service groups to which CFB is deactivated. This means that the subscriber is not always aware of the true state of the service.

In response to a CFB registration or erasure request, where the SS Version Indicator is not received from the MS, the network shall always include the SS-Status parameter.

3 Call Forwarding on No Reply (CFNRy)

3.1 Normal operation

3.1.1 Served mobile subscriber side

When call forwarding on no reply is active, all incoming calls for the specified basic service(s) that are not answered within the period defined by the no reply condition timer, will be forwarded.

When an incoming call is forwarded on no reply the served mobile subscriber can, as a subscription option, receive a NotifySS operation containing the SS-Notification indicating that a call has been forwarded, see figure 3.1.

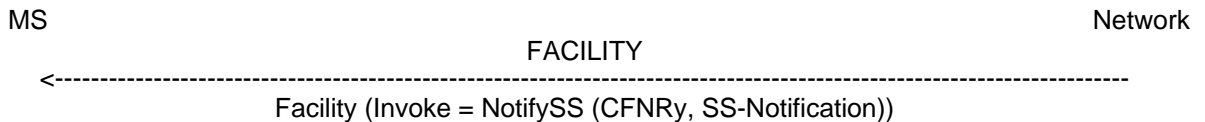
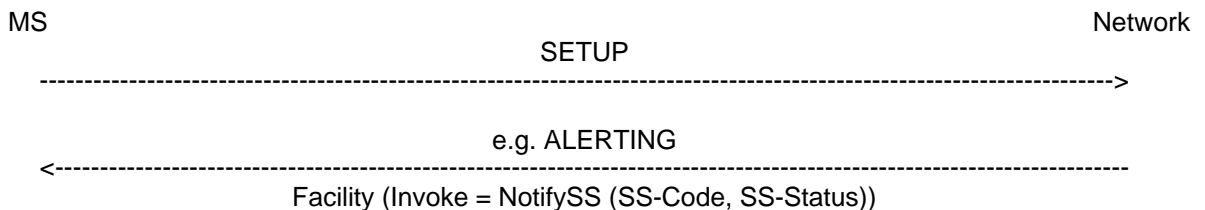


Figure 3.1: Notification to the served mobile subscriber that the call is forwarded on no reply

When CFNRy is active, the ability of the served mobile subscriber to originate calls is not affected. However, a NotifySS operation containing the SS-Status indicating that a conditional call forwarding supplementary service is currently active and operative will be sent to the served mobile subscriber each time an outgoing call is made, see figure 3.2.



NOTE: The SS-Code will be the common SS-Code for all conditional call forwarding services.

Figure 3.2: Notification to the served mobile subscriber that a conditional call forwarding service is active

3.1.2 Forwarded-to mobile subscriber side

The forwarded-to mobile subscriber will receive a NotifySS operation containing the SS-Notification indicating that the incoming call is a forwarded call. When available, the SS-Code of the invoked forwarding service is also included, see figure 3.3.

When multiple forwarding occurs the value of the SS-Code shall relate to the last invoked forwarding service.

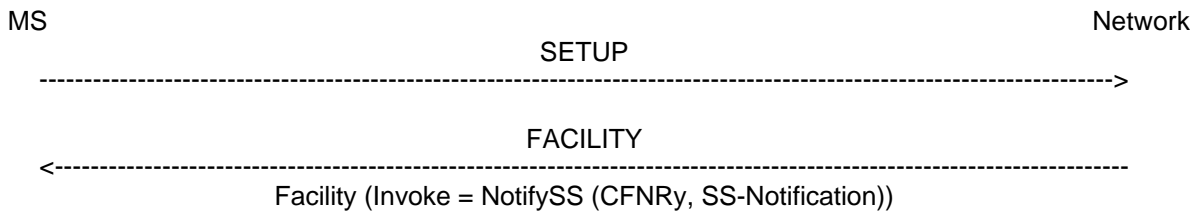


NOTE: If the specific call forwarding service is not known the common SS-Code for "all forwarding SS" will be used.

Figure 3.3: Notification to the forwarded-to mobile subscriber that the incoming call is a forwarded call

3.1.3 Calling mobile subscriber side

As a subscription option, the served mobile subscriber can request that the calling mobile subscriber receives a NotifySS operation containing the SS-Notification indicating that the call has been forwarded. When available, the SS-Code of the invoked forwarding service is also included, see figure 3.4.



NOTE: If the specific call forwarding service is not known the common SS-Code for "all forwarding SS" will be used.

Figure 3.4: Notification to the calling mobile subscriber that the call is forwarded

3.2 Registration

The following information has to be registered in the network:

- the ForwardedToNumber, which may be accompanied by a ForwardedToSubAddress;
- information as to whether all calls or all calls of a specific basic service should be forwarded;
- the duration of the no reply condition timer.

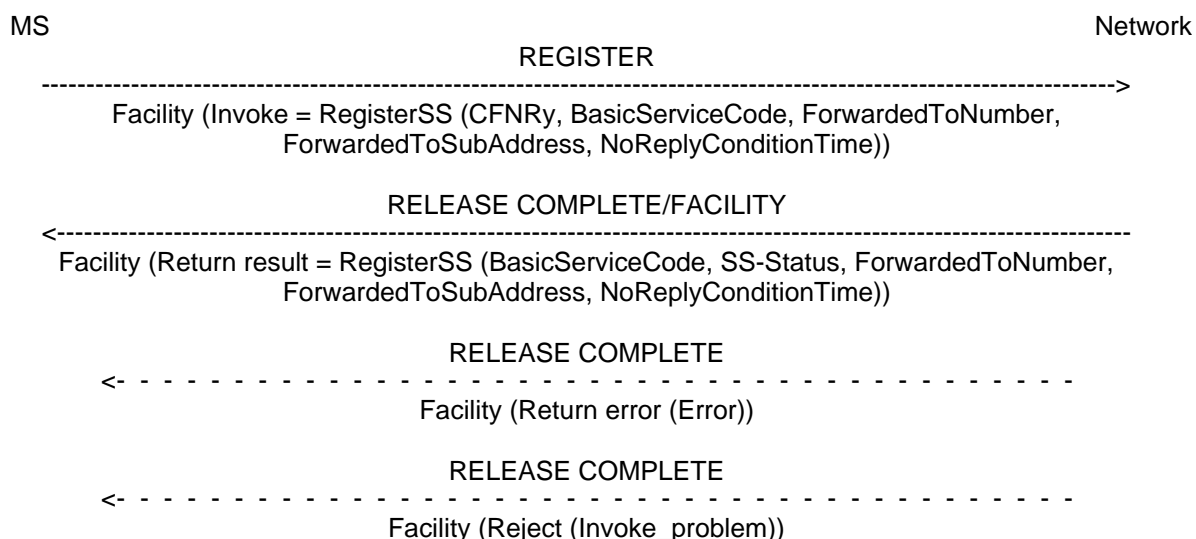
3.2.1 Registration by the served mobile subscriber

A CFNRy registration request from a mobile user shall include the SS-Code of the forwarding service to be registered and possibly the applicable BasicServiceCode and NoReplyConditionTime. If the BasicServiceCode is not included, the request applies to all basic services. If the NoReplyConditionTime is not included, the previous value set by the mobile user or network operator applies.

If the registration is successful, the CFNRy service will be registered and activated. The network will then send a return result indicating acceptance of the request, including the ForwardedToNumber and possibly the applicable BasicService (group) code and NoReplyConditionTime. If the request applied to a single elementary basic service group, the ForwardedToNumber may be accompanied by a ForwardedToSubAddress. In other cases the result shall not contain a ForwardedToSubAddress. The result may also contain an SS-Status parameter. If the MS does not send an SS Version Indicator in the invocation request then the network shall send an SS-Status in the result. If the MS does send an SS Version Indicator in the invocation request then the inclusion of SS-Status in the result is optional. If the SS-Status is included the network shall set it to reflect the state of the service. The MS shall ignore the contents of the SS-Status parameter if one is received. See figure 3.5.

Note that the use of SS-Status is to provide backwards compatibility with phase 1.

If the system cannot accept a registration request, a corresponding error indication is returned to the served mobile subscriber that CFNRy registration was not successful. Error values are specified in TS GSM 04.80.



NOTE: If BasicServiceCode is not included it applies to all basic services. If NoReplyConditionTime is not included the value previously registered in the network applies. The ForwardedToNumber may be accompanied by a ForwardedToSubAddress. The SS-Code may also indicate the code for "all conditional forwarding SS", as specified in section 2.2.1, or the code for "all forwarding SS", as specified in section 1.2.1. The SS-Status may not be included in all cases, see text.

Figure 3.5: Registration of call forwarding on no reply

3.3 Erasure

A previous registration can be erased in one of three ways:

- the subscriber can specifically erase a previous registration with an appropriate control procedure;
- the subscriber can register information for CFNRy for the specific basic service to another directory number, thus causing the previous registration of CFNRy to be overridden;
- all information is erased as a result of withdrawal of the supplementary service (administrative handling).

3.3.1 Erasure by the served mobile subscriber

A CFNRy erasure request from a mobile subscriber may include the BasicServiceCode. If this is not the case, the erasure applies to all basic services.

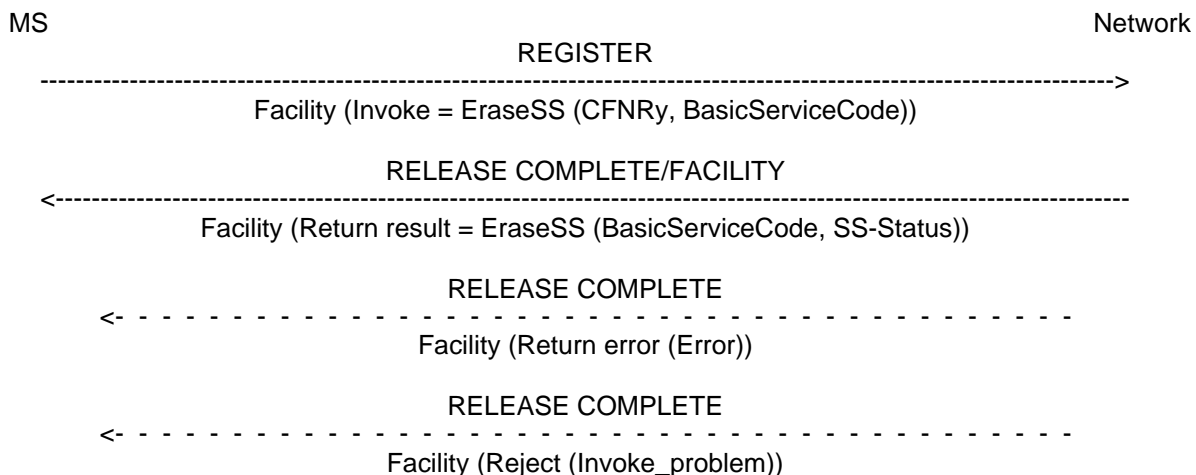
If the erasure is successful, the CFNRy service will be erased (and automatically deactivated). The network will then send a return result indicating acceptance of the request. The result is formatted according to the options shown below:

- The result includes the BasicService (group) Code for which CFNRy was erased. The result may also contain an SS-Status parameter. If the MS does not send an SS Version Indicator in the invocation request then the network shall send an SS-Status in the result. If the MS does send an SS Version Indicator in the invocation request then the inclusion of SS-Status in the result is optional. If the SS-Status is included the network shall set it to reflect the state of the service. The MS shall ignore the contents of the SS-Status parameter if one is received. See figure 3.6.

Note that the use of SS-Status is to provide backwards compatibility with phase 1.

- If the request did not include a BasicServiceCode, and the erasure was successful for all basic services, the network may send an empty return result to the MS. This option applies whether or not an SS Version Indicator is received from the MS.

If the network cannot accept the erasure request, the status of CFNRy in the network remains unchanged. An error indication will then be returned to the served mobile subscriber that erasure of CFNRy was unsuccessful. Error values are specified in TS GSM 04.80.



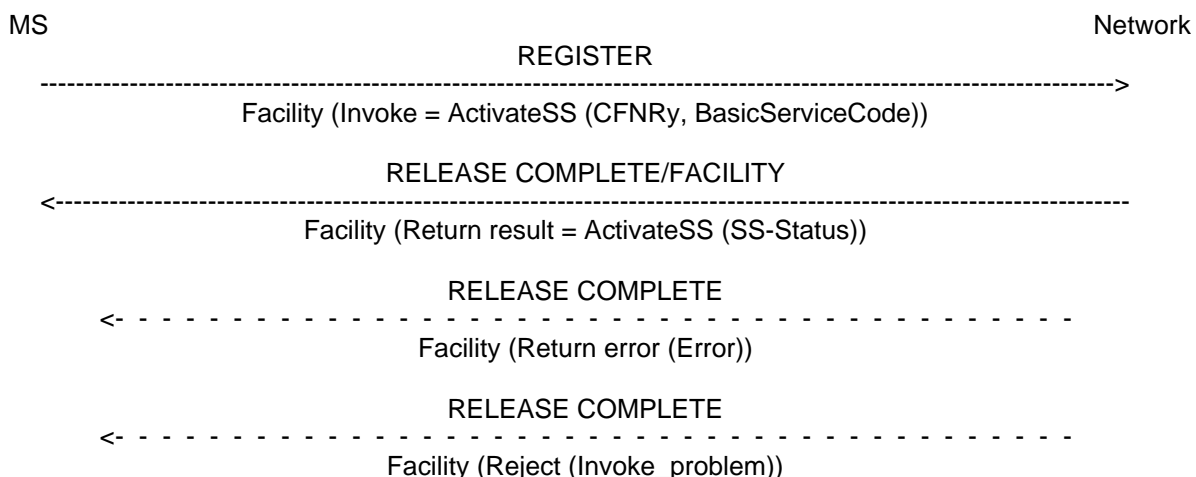
NOTE: If BasicServiceCode is not included it applies to all basic services. The SS-Code may also indicate the code for "all conditional forwarding SS" or the code for "all forwarding SS". The SS-Status may not be included in all cases, see text.

Figure 3.6: Erasure of call forwarding on no reply

3.4 Activation

An explicit CFNRy activation request shall contain the SS-Code of the supplementary service to be activated and possibly the BasicServiceCode the request applies to. If a BasicServiceCode is not included in the activation request the request applies to all basic services against which a CFNRy forwarded-to number is registered. The user shall receive appropriate notification of acceptance, rejection or partial acceptance of the CFNRy activation request, see figure 3.7.

Error values (which are used in the two latter situations) are specified in TS GSM 04.80.



NOTE: The SS-Code may also indicate the code "all conditional forwarding SS" group, as specified in section 2.2.1, or the "all forwarding SS" group, as specified in section 1.2.1.

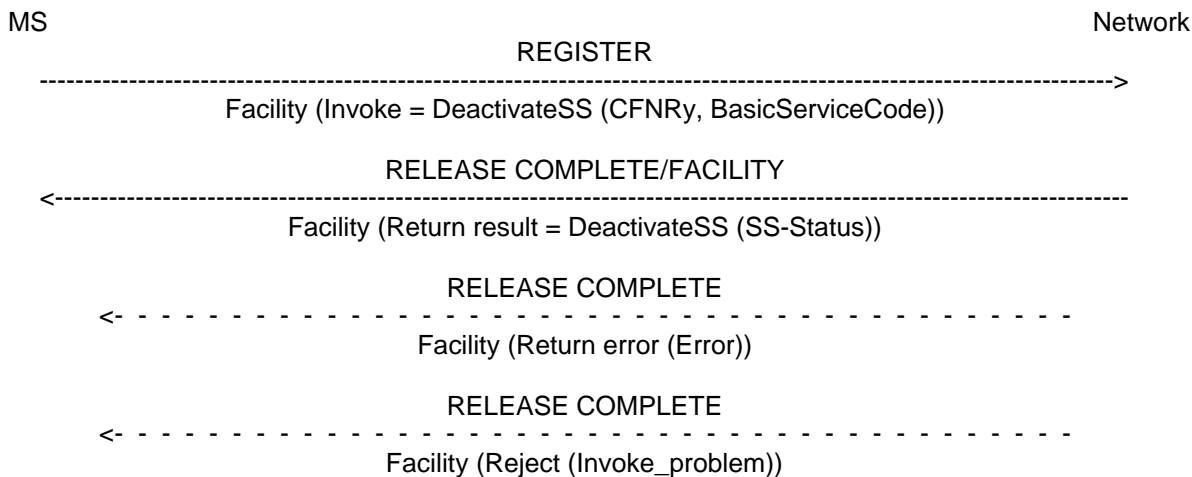
Figure 3.7: Activation of call forwarding on no reply

3.5 Deactivation

An explicit CFNRy deactivation request shall contain the SS-Code of the supplementary service to be deactivated and possibly the BasicServiceCode the request applies to. If a BasicServiceCode is not included in the deactivation request the request applies to all basic services against which CFNRy is activated. The user shall receive appropriate notification of acceptance or rejection of the CFNRy deactivation request, see figure 3.8.

Error values to be used in the latter situation are specified in TS GSM 04.80.

Deactivation shall not lead to erasure of the information registered in the network.



NOTE: The SS-Code may also indicate "all conditional forwarding SS" group or the "all forwarding SS" group.

Figure 3.8: Deactivation of call forwarding on no reply

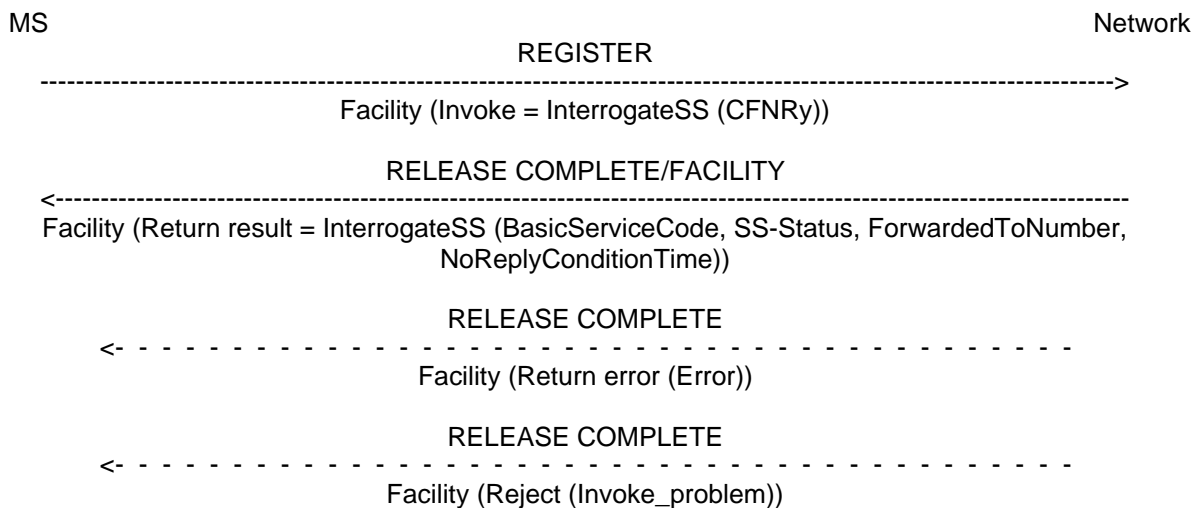
3.6 Interrogation

Data request

The data request procedure enables the mobile subscriber to obtain information about the data stored in the PLMN. After having requested this procedure the network shall return the following information:

- in response to a general data request (i.e. not including a BasicServiceCode) the served mobile subscriber should be given the following data for each basic service group to which CFNRy is registered:
 - the SS-Status indicating whether the supplementary service is "not active", "active and operative" or "active and quiescent";
 - the associated ForwardedToNumber which shall not be accompanied by a ForwardedToSubAddress;
 - the duration of the no reply condition timer, see figure 3.9.

If CFNRy is not registered for any basic service groups, only the SS-Status parameter indicating "not registered" is returned.

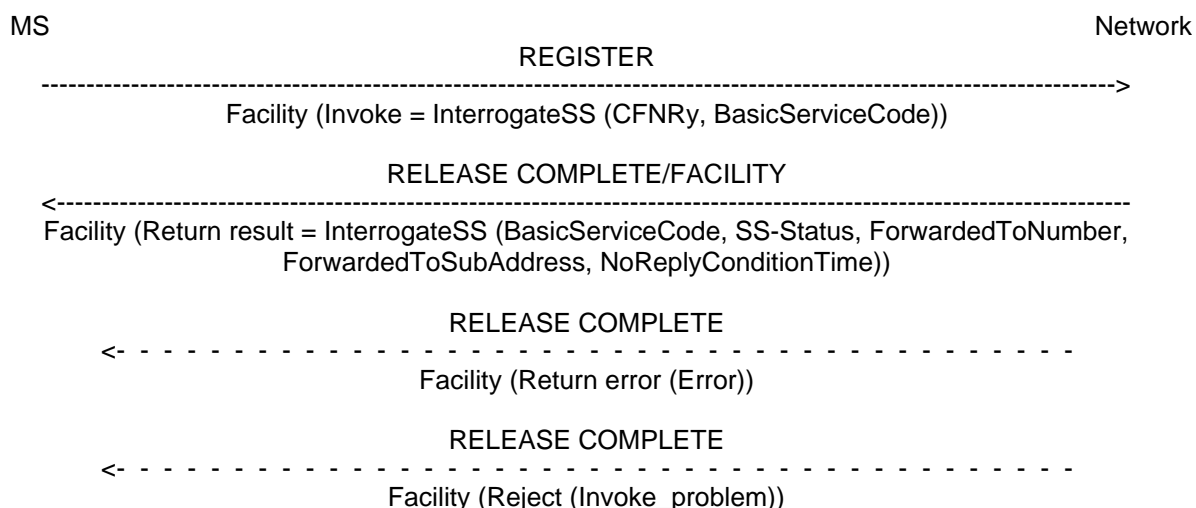


NOTE: The ForwardedToNumber shall not be accompanied by a ForwardedToSubAddress. The return result may consist of a list of parameters, each relating to a specific basis service group.

Figure 3.9: Interrogation of active call forwarding on no reply for all basic services

- in response to a specific request (i.e. containing one particular BasicService (group) code, the served mobile subscriber should receive the SS-Status parameter, indicating whether or not CFNRy is registered, including information as to whether or not it is active and operative or active and quiescent for that basic service group. If CFNRy is registered for the interrogated basic service group, the associated ForwardedToNumber and the duration of the no reply condition timer shall be given, see figure 3.10. If the request applied to a single elementary basic service group, the ForwardedToNumber may be accompanied by a ForwardedToSubAddress. In other cases the result shall not contain a ForwardedToSubAddress.

If CFNRy is not registered for the interrogated BasicService (group) code, only the SS-Status parameter indicating "not registered" is returned.



NOTE: The ForwardedToNumber may be accompanied by a ForwardedToSubAddress.

Figure 3.10: Interrogation of active call forwarding on no reply for one particular basic service

The values "all forwarding SS" and "all conditional forwarding SS" shall not be sent over the air interface by the MS in an interrogation. If an interrogation is received containing one of these codes the network shall send a return error component.

3.7 Cross phase compatibility

3.7.1 Network only supports protocol version 1 control of SS by the subscriber

A CFNRy registration request which contains a ForwardedToSubaddress shall be rejected by the network if any network element involved is of protocol version 1.

Note that a CFNRy activation or deactivation request will be rejected by the network if any network element involved is of protocol version 1.

3.7.2 MS only supports protocol version 1 control of SS by the subscriber

In response to a CFNRy interrogation request, where the SS Version Indicator is not received from the MS, the network shall only return data for basic service groups to which CFNRy is activated and operative. Data shall not be returned for basic service groups to which CFNRy is deactivated. This means that the subscriber is not always aware of the true state of the service.

In response to a CFNRy registration or erasure request, where the SS Version Indicator is not received from the MS, the network shall always include the SS-Status parameter.

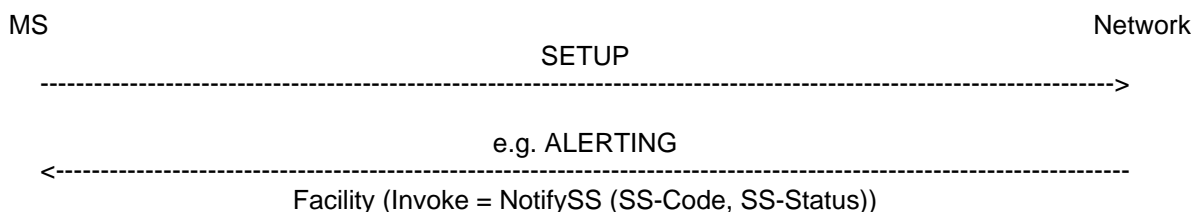
4 Call Forwarding on mobile subscriber Not Reachable (CFNRc)

4.1 Normal operation

4.1.1 Served mobile subscriber side

When call forwarding on mobile subscriber not reachable, all incoming calls for the specified basic service(s) when the mobile subscriber is not reachable, will be forwarded without being offered to the served mobile subscriber.

When CFNRc is active, the ability of the served mobile subscriber to originate calls is not affected. However, a NotifySS operation containing the SS-Status indicating that a conditional call forwarding service is currently active and operative will be sent to the served mobile subscriber each time an outgoing call is made, see figure 4.1.



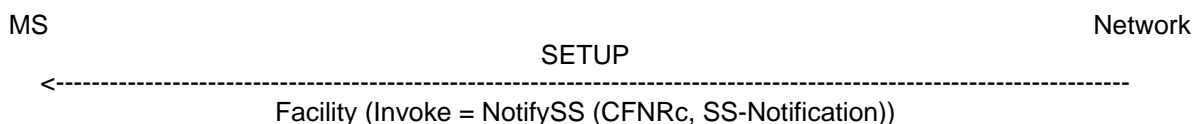
NOTE: The SS-Code will be the common SS-Code for all conditional call forwarding services.

Figure 4.1: Notification to the served mobile subscriber that a conditional call forwarding service is active

4.1.2 Forwarded-to mobile subscriber side

The forwarded-to mobile subscriber will receive a NotifySS operation containing the SS-Notification indicating that the incoming call is a forwarded call. When available, the SS-Code of the invoked forwarding service is also included, see figure 4.2.

When multiple forwarding occurs the value of the SS-Code shall relate to the last invoked forwarding service.

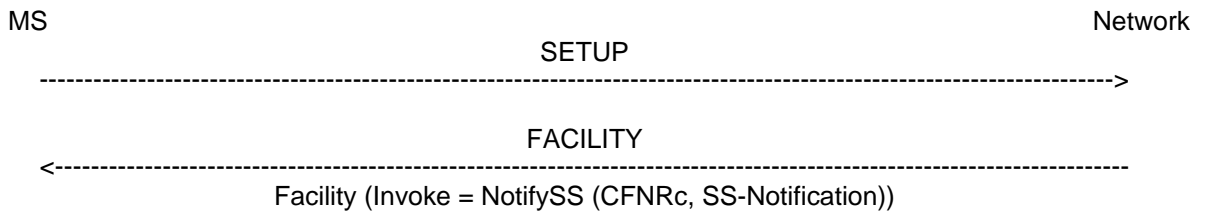


NOTE: If the specific call forwarding service is not known the common SS-Code for call forwarding SS will be used.

Figure 4.2: Notification to the forwarded-to mobile subscriber that the incoming call is a forwarded call

4.1.3 Calling mobile subscriber side

As a subscription option, the served mobile subscriber can request that the calling mobile subscriber receives a NotifySS operation containing the SS-Notification indicating that the call has been forwarded. When available, the SS-Code of the invoked forwarding service is also included, see figure 4.3.



NOTE: If the specific call forwarding service is not known the common SS-Code for all forwarding SS will be used.

Figure 4.3: Notification to the calling mobile subscriber that the call is forwarded

4.2 Registration

The following information has to be registered in the network:

- the ForwardedToNumber which may be accompanied by a ForwardedToSubAddress;
- information as to whether all calls or all calls of a specific basic service should be forwarded.

4.2.1 Registration by the served mobile subscriber

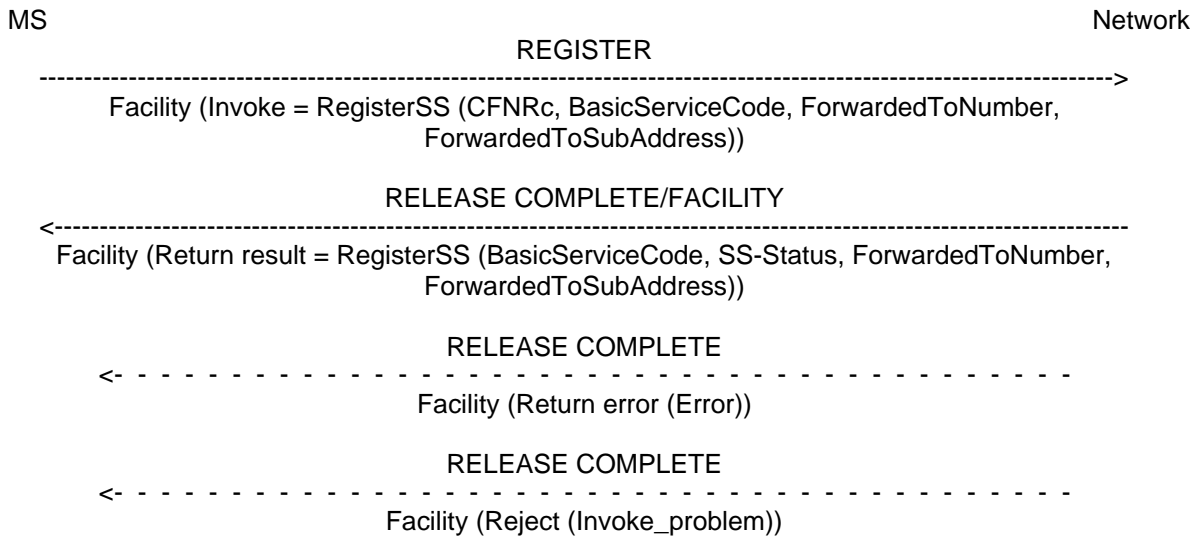
A CFNRc registration request from a mobile user shall include the SS-Code of the forwarding service to be registered and possibly the BasicServiceCode the request applies to. If the BasicServiceCode is not included, the request applies to all basic services.

If the registration is successful, the CFNRc will be registered and activated. The network will then send a return result indicating of acceptance of the request, including the ForwardedToNumber and possibly the applicable BasicService (group) code to which CFNRc is registered. If the request applied to a single elementary basic service group, the ForwardedToNumber may be accompanied by a ForwardedToSubAddress. In other cases the result shall not contain a ForwardedToSubAddress. The result may also contain an SS-Status parameter. If the MS does not send an SS Version Indicator in the invocation request then the network shall send an SS-Status in the result. If the MS does send an SS Version Indicator in the invocation request then the inclusion of SS-Status in the result is optional. If the SS-Status is included the network shall set it to reflect the state of the service. The MS shall ignore the contents of the SS-Status parameter if one is received. See figure 4.4.

Note that the use of SS-Status is to provide backwards compatibility with phase 1.

If the registration is successful, the CFNRc will be registered and activated. The network will then send a return result indicating of acceptance of the request, including the ForwardedToNumber to which CFNRc is registered. If no BasicServiceCode was included in the registration request it is not included in the return result either, see figure 4.4.

If the system cannot accept a registration request, a corresponding error indication is returned to the served mobile subscriber that CFNRc registration was not successful. Error values are specified in TS GSM 04.80.



NOTE: If BasicServiceCode is not included it applies to all basic services. The ForwardedToNumber may be accompanied by a ForwardedToSubAddress. The SS-Code may also indicate the code for "all conditional forwarding SS", as specified in section 2.2.1, or the code for "all forwarding SS", as specified in section 1.2.1. The SS-Status may not be included in all cases, see text.

Figure 4.4: Registration of call forwarding on mobile subscriber not reachable

4.3 Erasure

A previous registration can be erased in one of three ways:

- the subscriber can specifically erase a previous registration with an appropriate control procedure;
- the subscriber can register information for CFNRc for the specific basic service to another directory number, thus causing the previous registration of CFNRc to be overridden;
- all information is erased as a result of withdrawal of the supplementary service (administrative handling).

4.3.1 Erasure by the served mobile subscriber

A CFNRc erasure request from a mobile subscriber may include the BasicServiceCode. If this is not the case, the erasure applies to all basic services.

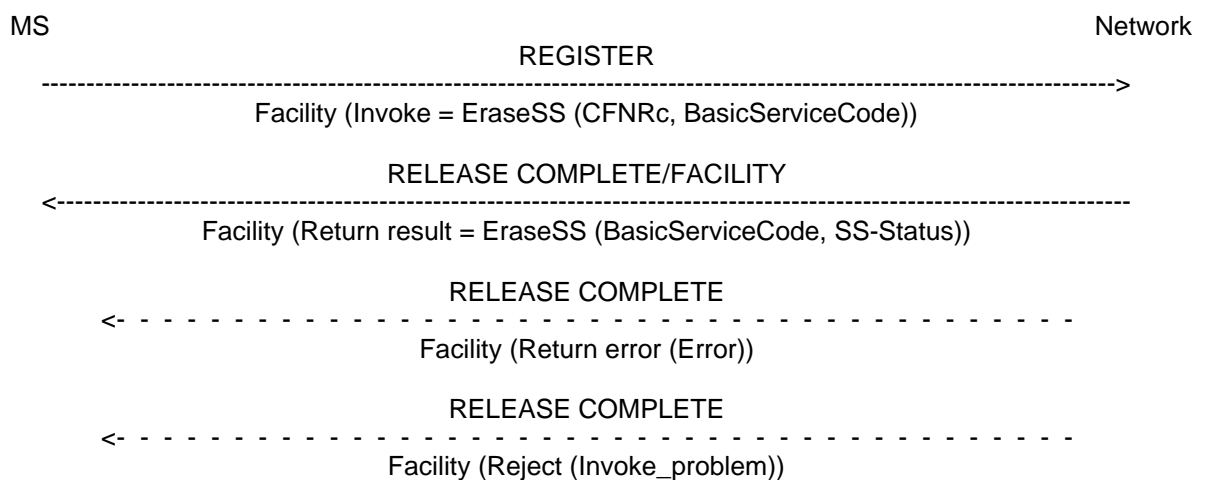
If the erasure is successful, the CFNRc service will be erased (and automatically deactivated). The network will then send a return result indicating acceptance of the request. The result is formatted according to the options shown below:

- The result includes the BasicService (group) Code for which CFNRc was erased. The result may also contain an SS-Status parameter. If the MS does not send an SS Version Indicator in the invocation request then the network shall send an SS-Status in the result. If the MS does send an SS Version Indicator in the invocation request then the inclusion of SS-Status in the result is optional. If the SS-Status is included the network shall set it to reflect the state of the service. The MS shall ignore the contents of the SS-Status parameter if one is received. See figure 4.5.

Note that the use of SS-Status is to provide backwards compatibility with phase 1.

- If the request did not include a BasicServiceCode, and the erasure was successful for all basic services, the network may send an empty return result to the MS. This option applies whether or not an SS Version Indicator is received from the MS.

If the network cannot accept the erasure request, the status of CFNRc in the network remains unchanged. An error indication will then be returned to the served mobile subscriber that erasure of CFNRc was unsuccessful. Error values are specified in TS GSM 04.80.



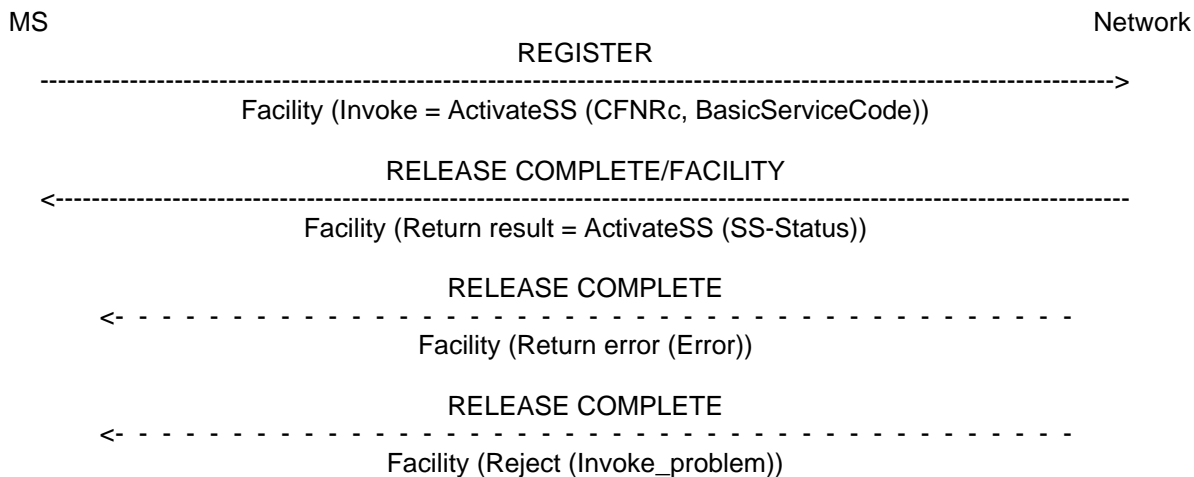
NOTE: If BasicServiceCode is not included it applies to all basic services. The SS-Code may also indicate the code for "all conditional forwarding SS" or the code for "all forwarding SS". The SS-Status may not be included in all cases, see text.

Figure 4.5: Erasure of call forwarding on mobile subscriber not reachable

4.4 Activation

An explicit CFNRc activation request shall contain the SS-Code of the supplementary service to be activated and possibly the BasicServiceCode the request applies to. If a BasicServiceCode is not included in the activation request the request applies to all basic services against which a CFNRc forwarded-to number is registered. The user shall receive appropriate notification of acceptance, rejection or partial acceptance of the CFNRc activation request, see figure 4.6.

Error values (which are used in the two latter situations) are specified in TS GSM 04.80.



NOTE: The SS-Code may also indicate the code "all conditional forwarding SS" group, as specified in section 2.2.1, or the "all forwarding SS" group, as specified in section 1.2.1.

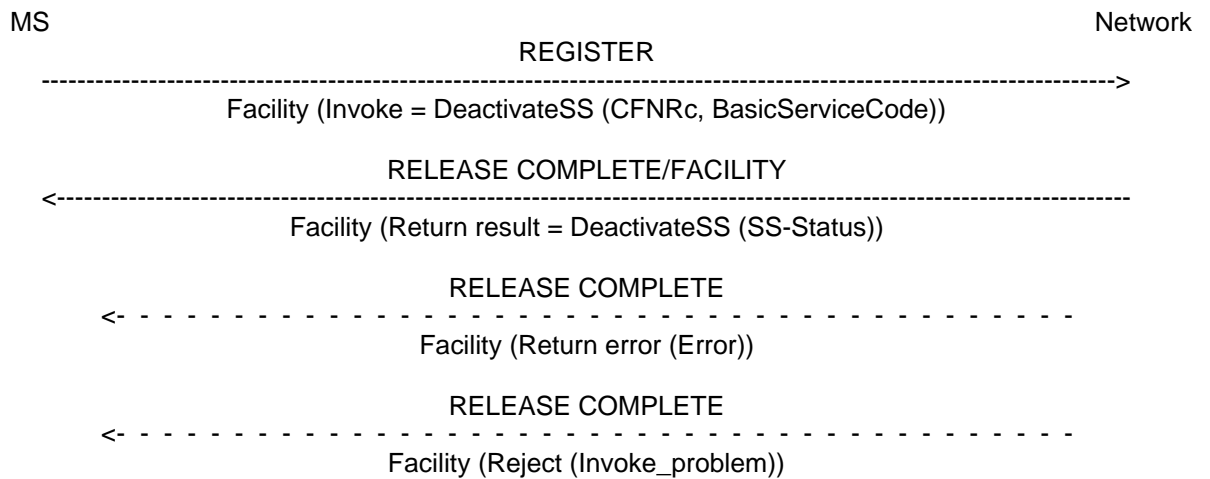
Figure 4.6: Activation of call forwarding on mobile subscriber not reachable

4.5 Deactivation

An explicit CFNRc deactivation request shall contain the SS-Code of the supplementary service to be deactivated and possibly the BasicServiceCode the request applies to. If a BasicServiceCode is not included in the deactivation request the request applies to all basic services against which CFNRc is activated. The user shall receive appropriate notification of acceptance or rejection of the CFNRc deactivation request, see figure 4.7.

Error values to be used in the latter situation are specified in TS GSM 04.80.

Deactivation shall not lead to erasure of the information registered in the network.



NOTE: The SS-Code may also indicate the "all conditional forwarding SS" group or the "all forwarding SS" group.

Figure 4.7: Deactivation of call forwarding on mobile subscriber not reachable

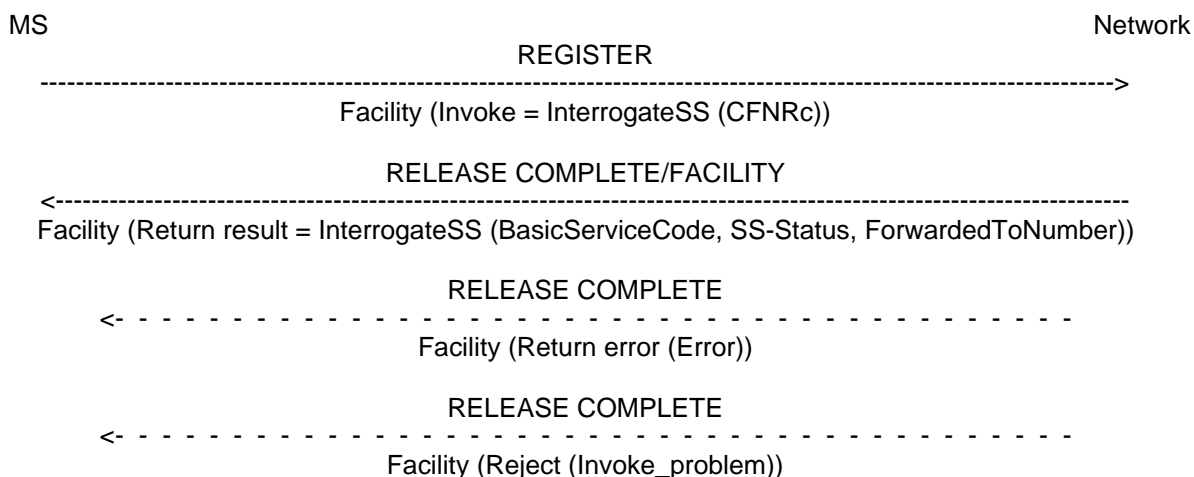
4.6 Interrogation

Data request

The data request procedure enables the mobile subscriber to obtain information about the data stored in the PLMN. After having requested this procedure the network shall return the following information:

- in response to a general data request (i.e. not including a BasicServiceCode) the served mobile subscriber should be given the following data for each basic service group to which CFNRc is registered:
 - the SS-Status indicating whether the supplementary service is "not active", "active and operative" or "active and quiescent";
 - the associated ForwardedToNumber which shall not be accompanied by a ForwardedToSubAddress, see figure 4.8.

If CFNRc is not registered for any basic service groups, only the SS-Status parameter indicating "not registered" is returned.

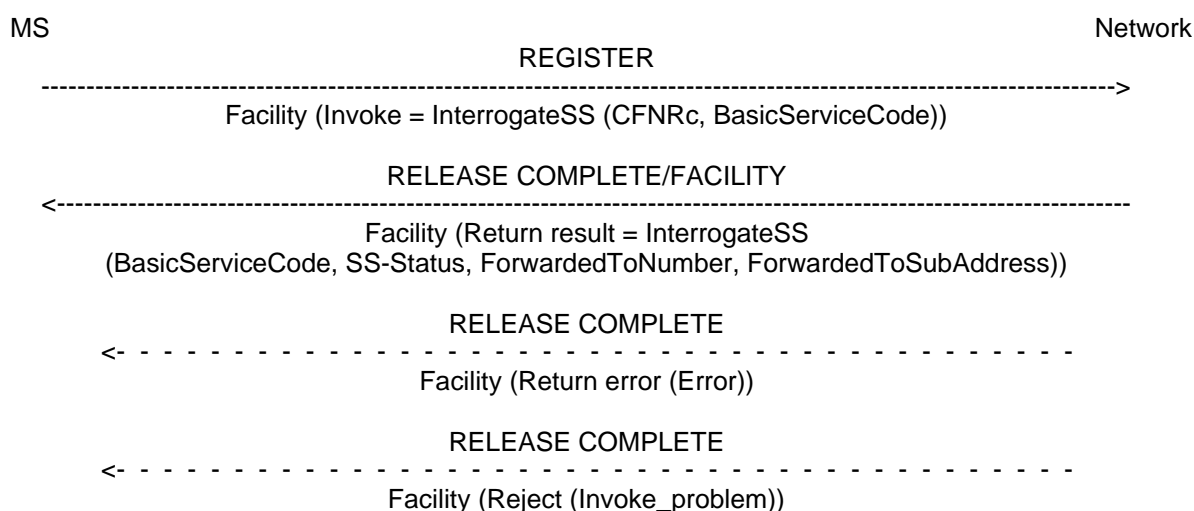


NOTE: The ForwardedToNumber shall not be accompanied by a ForwardedToSubAddress. The return result may consist of a list of parameters, each relating to a specific basic service group.

Figure 4.8: Interrogation of call forwarding on mobile subscriber not reachable active for all basic services

- in response to a specific request (i.e. containing one particular BasicService (group) code), the served mobile subscriber should receive the SS-Status parameter, indicating whether or not CFNRc is registered, including information as to whether or not it is active and operative or active and quiescent for that basic service group. If CFNRc is registered, the associated ForwardedToNumber shall be given, see figure 4.9. If the request applied to a single elementary basic service group, the ForwardedToNumber may be accompanied by a ForwardedToSubAddress. In other cases the result shall not contain a ForwardedToSubAddress.

If CFNRc is not registered for the interrogated BasicService (group) code, only the SS-Status parameter indicating "not registered" is returned.



NOTE: The ForwardedToNumber may be accompanied by a ForwardedToSubAddress.

Figure 4.9: Interrogation of active call forwarding on mobile subscriber not reachable for one particular basic service

The values "all forwarding SS" and "all conditional forwarding SS" shall not be sent over the air interface by the MS in an interrogation. If an interrogation is received containing one of these codes the network shall send a return error component.

4.7 Cross phase compatibility

4.7.1 Network only supports protocol version 1 control of SS by the subscriber

A CFNRc registration request which contains a ForwardedToSubaddress shall be rejected by the network if any network element involved is of protocol version 1.

Note that a CFNRc activation or deactivation request will be rejected by the network if any network element involved is of protocol version 1.

4.7.2 MS only supports protocol version 1 control of SS by the subscriber

In response to a CFNRc interrogation request, where the SS Version Indicator is not received from the MS, the network shall only return data for basic service groups to which CFNRc is activated and operative. Data shall not be returned for basic service groups to which CFNRc is deactivated. This means that the subscriber is not always aware of the true state of the service.

In response to a CFNRc registration or erasure request, where the SS Version Indicator is not received from the MS, the network shall always include the SS-Status parameter.

History

Document history	
February 1995	First Edition
November 1995	Converted into Adobe Acrobat Portable Document Format (PDF)