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TECHNICAL SPECIFICATION

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Supplementary services specification;
General aspects
(3GPP TS 24.010 version 13.0.0 Release 13)

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Foreword

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Contents

Foreword

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

The present document defines the general aspects of the specification of supplementary services at the layer 3 radio interface within the 3GPP system.

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

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1 Scope

The present document gives the general aspects of the specification of supplementary services at the layer 3 radio interface.

3GPP TS 24.08x and 24.09x-series specify the procedures used at the radio interface (reference point Um as defined in 3GPP 24.002) for normal operation, registration, erasure, activation, deactivation, invocation and interrogation of 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.

3GPP TS 24.008 [48] and 3GPP TS 24.080 [27] specifies the formats and coding for the supplementary services.

Definitions and descriptions of supplementary services are given in 3GPP TS 22.004 and 3GPP TS 22.08x and 22.09x-series.

Technical realization of supplementary services is described in 3GPP TS 23.011 and GSM 23.08x and 23.09x-series.

The procedures for Call Control, Mobility Management and Radio Resource management at the layer 3 radio interface are defined in 3GPP TS 24.007 [49] and 3GPP TS 24.008 [48].

1.1 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

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

[1]   3GPP TS 21.905: "Abbreviations and acronyms".

[2]   3GPP TS 22.004: "General on supplementary services".

[3]   3GPP TS 22.081: "Line identification supplementary services - Stage 1".

[4]   3GPP TS 22.082: "Call Forwarding (CF) supplementary services - Stage 1".

[5]   3GPP TS 22.083: "Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 1".

[6]   3GPP TS 22.084: "MultiParty (MPTY) supplementary services - Stage 1".

[7]   3GPP TS 22.085: "Closed User Group (CUG) supplementary services - Stage 1".

[8]   3GPP TS 22.086: "Advice of charge (AoC) supplementary services - Stage 1".

[9]   3GPP TS 22.088: "Call Barring (CB) supplementary services - Stage 1".

[10]   3GPP TS 22.090: "Unstructured Supplementary Services Data (USSD) - Stage 1".

[11]   3GPP TS 22.091: "Explicit Call Transfer (ECT) supplementary service - Stage 1".

[12]   3GPP TS 23.011: "Technical realization of supplementary services".

[13]   3GPP TS 23.081: "Line identification supplementary services - Stage 2".

[14]   3GPP TS 23.082: "Call Forwarding (CF) supplementary services - Stage 2".

[15]   3GPP TS 23.083: "Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 2".

[16]   3GPP TS 23.084: "MultiParty (MPTY) supplementary services - Stage 2".

[17]   3GPP TS 23.085: "Closed User Group (CUG) supplementary services - Stage 2".

[18]   3GPP TS 23.086: "Advice of Charge (AoC) supplementary services - Stage 2".

[19]   3GPP TS 23.088: "Call Barring (CB) supplementary services - Stage 2".

[20]   3GPP TS 23.090: "Unstructured supplementary services operation - Stage 2".

[21]   3GPP TS 23.091: "Explicit Call Transfer (ECT) supplementary service - Stage 2".

[22]   3GPP TS 24.002: "GSM Public Land Mobile Network (PLMN) access reference configuration".

[23]   3GPP TS 24.003: "Mobile Station - Base Stations system (MS - BSS) interface; Channel structures and access capabilities".

[24]   3GPP TS 24.004: "Layer 1; General requirements".

[25]   3GPP TS 44.005: "Data Link (DL) layer; General aspects".

[26]   3GPP TS 44.006: "Mobile Station - Base Station System (MS - BSS) interface; Data Link (DL) layer specification".

[27]   3GPP TS 24.080: "Mobile radio interface layer 3 supplementary services specification; Formats and coding".

[28]   3GPP TS 24.081: "Line identification supplementary services - Stage 3".

[29]   3GPP TS 24.082: "Call Forwarding (CF) supplementary services - Stage 3".

[30]   3GPP TS 24.083: "Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 3".

[31]   3GPP TS 24.084: "MultiParty (MPTY) supplementary services - Stage 3".

[32]   3GPP TS 24.085: "Closed User Group (CUG) supplementary services - Stage 3".

[33]   3GPP TS 24.086: "Advice of Charge (AoC) supplementary services - Stage 3".

[34]   3GPP TS 24.088: "Call Barring (CB) supplementary services - Stage 3".

[35]   3GPP TS 24.090: "Unstructured supplementary services operation - Stage 3".

[36]   3GPP TS 24.091: "Explicit Call Transfer (ECT) supplementary service - Stage 3".

[37]   3GPP TS 45.001: "Physical layer on the radio path; General description".

[38]   3GPP TS 45.002: "Multiplexing and multiple access on the radio path".

[39]   3GPP TS 45.003: "Channel coding".

[40]   3GPP TS 45.004: "Modulation".

[41]   3GPP TS 45.005: "Radio transmission and reception".

[42]   3GPP TS 45.008: "Radio subsystem link control".

[43]   3GPP TS 45.010: "Radio subsystem synchronization".

[44]   GSM 05.90: "Digital cellular telecommunications system; GSM Electro Magnetic Compatibility (EMC) considerations".

[45]   3GPP TS 29.002: "Mobile Application Part (MAP) specification".

[46]   3GPP TS 29.011: "Signalling interworking for supplementary services".

[47]   CCITT Recommendation Q.774 (White Book): "Specifications of Signalling System No.7; Transaction capabilities procedures".

[48]   3GPP TS 24.008: "Core network protocols; Stage 3".

[49]   3GPP TS 24.007: "Mobile radio interface signalling layer 3; General aspects".

1.2   Abbreviations

Abbreviations used in the present document are listed in 3GPP TS 21.905.

2 Generic procedures for the control of supplementary services

2.1 Overview of the generic protocol and its scope

One generic protocol is defined for the control of supplementary services at the radio interface. This protocol operates at layer 3 of the radio interface and assumes the use of layers 1 and 2 conform to 3GPP TS 45-series and 3GPP TS 44.004, 3GPP TS 44.005 and 3GPP TS 44.006. The generic protocol uses the acknowledged information transfer service available at the layer 2 - layer 3 interface.

The Functional protocol is based on the use of the Facility information element and the FACILITY message as well as other specific functional messages specified in 3GPP TS 24.080 [27].

Standardised services use a functional protocol. A transparent protocol is also provided. The functional protocol requires the knowledge of the related supplementary service by the mobile equipment supporting it. This facilitates mobile equipment operation without human intervention by defining semantics for the protocol elements which the mobile equipment can process on its own.

2.2 Functional procedures for the control of supplementary services

2.2.1 General

This clause specifies the functional signalling procedures for the control of supplementary services at the radio interface.

The Functional protocol utilises functions and services provided by 3GPP TS 24.008 [48] basic call control procedures and the functions of the data link layer as defined in 3GPP TS 44.00.

In UMTS only, integrity protected signalling (see TS 24.008 [48], subclause "Integrity Protection of Signalling Messages," and in general, see 3GPP TS 33.102) is mandatory. In UMTS only, all protocols shall use integrity protected signalling. Integrity protection of all SS signalling messages is the responsibility of lower layers. It is the network which activates integrity protection. This is done using the security mode control procedure (TS 25.331).

The defined procedures specify the basic methodology for the control (e.g. registration, erasure, invocation, etc.) of supplementary services.

The first category, called the Separate Message Category utilises separate message types to indicate a desired function. The hold and retrieve families of messages are identified for this category.

The second category called the Common Information Element Category utilises the Facility information element to transport the protocol defined in 3GPP TS 24.080 [27]. The use of the Facility information element is common to many services, and its contents indicates what type of procedure is being requested. This category can be signalled both in the mobile to network and the network to mobile directions.

The control of supplementary services includes the following cases:

  a) the request of supplementary service procedures during the establishment of a call;

  b) the request of supplementary service procedures during the clearing of a call;

  c) the request of call related supplementary service procedures during the active state of a call;

  d) the request of supplementary service procedures independent from an active call;

  e) the request of multiple, different supplementary service procedures within a single message;

  f) the request of supplementary service procedures related to different calls.

The correlation of a call related supplementary service operation and the call which it modifies is provided by use of the transaction identifier (cases a, b, c, e and f).

The correlation of supplementary service operations and their responses, is provided by the combination of the transaction identifier of the messages containing the Facility information element and the Invoke identifier present within the Facility information element itself (cases a, b, c, d, e and f).

The identification of different supplementary service operations within one single message is provided by the Invoke identifier present within the Facility information element itself (case e).

The identification of supplementary service related operations to different calls is provided by using different messages with the corresponding transaction identifier of the appropriate call (case f), i.e. different transaction identifier values are used to identify each call individually.

2.2.2   Separate Messages Category

The messages defined in this clause are specified as separate functional messages for the request, acknowledgement and rejection of specific procedures. These procedures can only be performed during the active phase of a call. The functions of these messages are not to be duplicated or overlapped by the ones of the Common Information Element Category.

The following separate messages are defined:

HOLD	RETRIEVE
HOLD ACKNOWLEDGE	RETRIEVE ACKNOWLEDGE
HOLD REJECT	RETRIEVE REJECT.

For detailed description of the Hold and Retrieve functions see 3GPP TS 24.083.

2.2.3   Common Information Element Category

The Common Information Element Category uses operations defined in 3GPP TS 24.080 [27] for supplementary services signalling. Procedures are initiated by sending an operation including an invoke component. The invoke component may yield a Return Error, Return Result or Reject component (also included in an operation) depending on the outcome of the procedure.

The operation state machines, and procedures for management of Invoke IDs specified in CCITT Recommendation Q.774 White Book are used.

A REGISTER message, a FACILITY message or certain existing 3GPP TS 24.008 [48] Call Control message is used to carry the Facility information element which includes these operations. These operations request, acknowledge or reject the desired supplementary service procedure.

2.2.4   Call related supplementary service procedures

2.2.4.1   Supplementary service procedures at call establishment or call clearing

For call related supplementary service procedures initiated at call establishment or call clearing, the messages for call control specified in 3GPP TS 24.008 [48] are utilised to transport Facility information elements. This enables, for example the originating mobile user to send a supplementary service invoke component within a SETUP message and to receive from the network a Return result, Return error, or Reject component type within the Facility information element in an ALERTING message, CONNECT message, or any other appropriate message.

When a supplementary service invoke component is included within a SETUP message, the originating mobile station shall encode the Facility information element identifier according to one of the three possible ways (see 3GPP TS 24.008 [48]):

    a) simple recall alignment;

    b) advanced recall alignment;

    c) recall alignment not essential.

Encoding of the Facility IEI within the SETUP message for different supplementary services is described in the subclause 2.2.4.1.1.

The three different ways of encoding are required to support the network initiated mobile originating call establishment (see subclause 2.2.4.1.2 and 3GPP TS 24.008 [48]).

2.2.4.1.1 Encoding of the Facility IEI for different supplementary services

The table 2.1 shows the encoding of the Facility IEI within the SETUP message for different supplementary services.

Table 2.1: Encoding of the Facility IE within the SETUP message

Service	Facility IE Encoding
CUG	simple recall alignment
UUS	Advanced recall alignment

2.2.4.1.2 Supplementary service procedures at network initiated mobile originating call establishment

The Facility and SS Version IE received in the set-up container of the CC_ESTABLISHMENT message shall be handled according to the following rules:

The mobile station shall examine the IEI of the Facility IE.

If the Facility IEI coding is "simple recall alignment", the mobile station shall copy the Facility IE and SS Version IE from the set-up container to the SETUP message without verifying or modifying the contents of these information elements.

If the Facility IEI is encoded as "advanced recall alignment", the mobile station shall examine the SS Version IE.

If the mobile station recognises the protocol defined by the SS Version IE, it shall attempt to decode the Facility IE. If the decoding is successful, and the operation is supported by the mobile station, the mobile station shall copy this Facility IE and SS Version IE to the SETUP message. The mobile station shall also store relevant supplementary service information contained within the Facility IE so that any reply to this Facility IE sent by the network will be properly understood and processed.

If the mobile station does not recognise the SS Version IE, or the decoding of the Facility IE is unsuccessful, then the call is rejected as described in 3GPP TS 24.008 [48].

If the Facility IE is encoded as "recall alignment not essential", the mobile station shall examine the SS Version IE .

If the mobile station recognises the protocol defined by the SS Version IE, it shall attempt to decode the Facility IE.

If the decoding is successful, and the operation is supported by the mobile station, the mobile station shall copy this Facility IE and SS Version IE into the SETUP message. The mobile station shall also store relevant supplementary service information contained within the Facility IE so that any reply to this Facility IE sent by the network will be properly understood and processed.

If the mobile station does not recognise the SS Version IE, or the decoding of the Facility IE is unsuccessful, then the SS Version IE and Facility IE are discarded, and NOT copied into the SETUP message.

NOTE: A mobile station may include a Facility IE without an associated SS Version IE. This would indicate that the SS operation is encoded using Phase 1 protocols.

2.2.4.2   Supplementary service procedures during the call

For call related supplementary service procedures during the active state of a call, the FACILITY message is used for the exchange of the Facility information elements.

Note that the FACILITY message can also be used for this purpose in all states after the SETUP message has been sent.

If the supplementary service procedure is related only to a single call, the FACILITY message will use the transaction identifier and protocol discriminator of this call.

If the supplementary service procedure affects more then one call, the FACILITY message may use the transaction identifier and protocol discriminator of one of these calls.

If a call related FACILITY message is sent using the transaction identifier of a call in progress, and this call is cleared due to call related causes, then the transaction identifier may not be cleared simultaneously in all cases. Depending upon the supplementary service invoked, one of the following will occur:

-   the network or mobile user may retain both the connection and the transaction identifier association and may send a response within a Facility information element in a FACILITY message prior to the initiation of the normal call clearing procedures; or

-   the network or mobile user may send a response with a Facility information element in the first clearing message (i.e. DISCONNECT, RELEASE or RELEASE COMPLETE message).

2.2.4.3   Handling of protocol errors in call related SS procedures

Messages containing a Facility information element shall be checked for protocol errors before the contents of the Facility IE is acted on. The checks shall be performed in the following order:

1)   The message carrying the Facility IE shall be checked for protocol errors as specified in 3GPP TS 24.008 [48]. If a protocol error is found then the procedures in 3GPP TS 24.008 [48] apply.

2)   The contents of the Facility IE shall be checked for protocol errors as specified in subclause 2.2.8. If a protocol error is found then the procedures in subclause 2.2.8 apply.

2.2.4.4   Handling of other errors in call related SS procedures

If the tests specified in subclause 2.2.4.3 have been passed without the detection of a protocol error, the receiver will attempt to process the contents of the Facility Information Element. If errors occur during this processing (e.g. system failure, or information in the Facility IE is incompatible with the requested operation) then the procedures specified in the individual service specifications apply.

Examples of the behaviour that could occur in this case are:

-   the network or MS clears the call and rejects the supplementary services request by means of a clearing message which contains a Return Error component with the appropriate parameter in the Facility Information Element;

-   the network and MS continue to process the call according to normal 3GPP TS 24.008 [48] call control procedures. The supplementary services request is rejected by means of a FACILITY message or appropriate call control message containing a Return Error component with the appropriate parameter in the Facility Information Element;

-   the network and MS continue to process the call according to the normal 3GPP TS 24.008 [48] call control procedures. The supplementary services request is ignored.

2.2.5 Call independent supplementary service procedures

2.2.5.1 Introduction

For supplementary service procedures independent of any call, the initiating side must establish a MM-connection between the network and the MS according to the rules given in 3GPP TS 24.007 [49] and 3GPP TS 24.008 [48]. The call independent supplementary service procedures shall apply to both CS and PS domain for some specific services. On PS domain, a PS-signalling connection shall be established between the network and the MS instead of a MM-connection. Throughout this specification, the term MM-connection is used to denote a MM-connection for CS domain or PS-signalling connection for PS domain, as appropriate. The MS or the network starts the transaction by transferring a REGISTER message across the radio interface. This transaction is identified by the transaction identifier associated with the REGISTER message, and the Invoke identifier present in the component part of the Facility information element. Following the REGISTER message one or more FACILITY messages may be transmitted, all of them related by the use of the same transaction identifier. If the transaction is no longer used, it shall be released by sending a RELEASE COMPLETE message. This procedure is specified in detail in clause 3, and the text in clause 3 takes precedence over this introduction.

To convey the supplementary service invocation, the Facility information element is used. The Facility information element present either in the REGISTER message or a subsequent message identifies the supplementary service involved and the type of component (i.e. Invoke, Return result, Return error or Reject component).

When the REGISTER or FACILITY message contains a Facility information element and the requested service is available, a FACILITY message containing a Facility information element may be returned. One or more exchanges of FACILITY messages may subsequently occur. To terminate the service interaction and release the transaction identifier value, a RELEASE COMPLETE message is sent as specified for the specific supplementary service procedure. The RELEASE COMPLETE message may also contain the Facility information element.

2.2.5.2 Handling of protocol errors in call independent SS procedures

Messages containing a Facility information element shall be checked for protocol errors before the contents of the Facility IE is acted on. The checks shall be performed in the following order:

1) The message carrying the Facility IE shall be checked for protocol errors as specified in subclause 3.7. If a protocol error is found then the procedures in subclause 3.7 apply.

2) The contents of the Facility IE shall be checked for protocol errors as specified in subclause 2.2.8. If a protocol error is found then the procedures in subclause 2.2.8 apply.

2.2.5.3 Handling of other errors in call independent SS procedures

If the tests specified in subclause 2.2.5.2 have been passed without the detection of a protocol error, the receiver will attempt to process the contents of the Facility Information Element. If errors occur during this processing (e.g. system failure, or information in the Facility IE is incompatible with the requested operation) then the procedures specified in the individual service specifications apply.

An example of the behaviour that could occur in this case is:

- the MS or network sends a Facility information element containing a return error component in a FACILITY or RELEASE COMPLETE message. If the FACILITY message is used then the MM Connection may continue to be used for further signalling.

2.2.6 Multiple supplementary service invocations

2.2.6.1 Call related supplementary service procedures

Simultaneous requests for different supplementary service procedures (i.e. using more than one operation in the Facility information element) are permitted. Interactions between different operations shall be managed by processing the operations in the order in which they appear in the Facility information element.

2.2.6.2 Call independent supplementary service procedures

Where permitted by the relevant stage 3 specification, multiple operations may be sent on the same transaction.

It is possible for several call independent SS transactions to be used simultaneously. Call independent SS transactions can also exist in parallel with other CM-Layer and MM transactions. The handling of multiple MM connections is defined in 3GPP TS 24.007 [49]and 3GPP TS 24.008 [48].

For call independent operations a single Facility Information Element shall not contain more than one component.

2.2.7 Recovery procedures

2.2.7.1 Call related supplementary service recovery procedures

There are no additional recovery procedures for call related supplementary service signalling on the radio path. The recovery procedures as specified for the basic service apply.

2.2.7.2 Call independent supplementary service recovery procedures

In case a transaction is not terminated according to the normal procedure as described in technical specifications 3GPP TS 24.08x and 24.09x-series, the network side has to ensure that the transaction is terminated e.g. by a supervision timer.

2.2.8 Generic protocol error handling for the component part of supplementary services operations

If (according to the rules specified in 3GPP TS 29.002 [45]) a supplementary service operation is to be rejected the operation will be denied, and provided the transaction is still in progress, an appropriate reject component will be returned in a Facility Information Element.

The handling of the transaction depends on whether the operation is call related or call independent.

2.2.8.1 Call related component errors

If the call related transaction is still in progress then a reject component shall be sent. Any message which contains a Facility Information Element may be used. In general, the transaction (call) associated with the rejected operation shall not be automatically released by the entity that detects the error. The transaction (call) may be released in some exceptional cases where security related services are involved (e.g. Advice of Charge (Charging)). If this behaviour is required, then it will be specified in the relevant specification for the individual service.

When a reject component for a call related operation is received by a MS or MSC then it may initiate release of the transaction (call) if this is a specified action for the service the SS operation relates to.

Note that this behaviour is intended to allow security related services to release calls if one entity in the system does not support the service. The normal action should be to allow the call to continue.

If the call related transaction has terminated before the operation has been rejected (e.g. the component containing the error was sent in a RELEASE COMPLETE message) then the contents of the component shall be ignored, and no reject component is sent.

2.2.8.2 Call independent component errors

2.2.8.2.1 Single component errors

The reject component shall be sent in a RELEASE COMPLETE message.

If the component containing the error was itself sent in a RELEASE COMPLETE message then the contents of the component shall be ignored, and no reject component is sent.

2.2.8.2.2 Multiple component errors

If a single Facility IE contains more than one component then a RELEASE COMPLETE message with the cause "Facility rejected" and without any component shall be sent.

3 Supplementary service support procedures

3.1 General

This clause describes the supplementary service support procedures at the radio interface. These procedures are provided by the supplementary service support entity defined in 3GPP TS 24.007 [49]. The supplementary service support procedures provide the means to transfer messages for the call independent supplementary service procedures. These procedures are regarded as the user of the supplementary service support.

3.2 Supplementary service support establishment

At the beginning of each call independent supplementary service procedure a supplementary service support must be established.

3.2.1 Supplementary service support establishment at the originating side

If the entity that uses the supplementary support procedures wants to send a REGISTER message, the supplementary service support entity shall first request the establishment of an MM-connection. This MM-connection is established according to 3GPP TS 24.008 [48] and 04.07. If the network is the initiating side then MM-connection establishment may involve paging the MS.

The supplementary service support entity shall send the REGISTER message as the first CM-message on the MM-connection. The REGISTER message is sent to the corresponding peer entity on the MM-connection and the supplementary service support shall be regarded as being established.

3.2.2 Supplementary service support establishment at the terminating side

At the terminating side a supplementary service support is regarded as being established when an MM-connection is established. According 3GPP TS 24.008 [48] this can be ascertained by the receipt of the first message, with a new transaction identifier. For successful establishment of supplementary service support this message shall be a REGISTER message.

If the terminating side wishes to reject the establishment of supplementary services support then it may be immediately initiate supplementary services support release (see subclause 3.4).

3.3 Supplementary service support information transfer phase

Upon the establishment of the supplementary service support both users may exchange FACILITY messages by use of the supplementary service support.

3.4 Supplementary service support release

At the end of each call independent supplementary service procedure the established supplementary service support is released.

The side closing the transaction shall release the transaction by sending the RELEASE COMPLETE message to its corresponding peer entity.

Both supplementary service support entities release the MM-connection locally.

3.5 Recovery procedures

The supplementary service support does not provide recovery procedures, i.e. the operations are transparent to the supplementary service support.

3.6 Message flow (single operation example)

This subclause contains examples of message flows for a single transaction consisting of a single operation. These examples may not show all possibilities.

3.6.1 Mobile station initiated supplementary service transaction

```
        MS                                                                              Network

                                        REGISTER
        -------------------------------------------------------------------------------------->
                    Facility (Invoke = Operation (Supplementary service code, Parameter(s)))

                                  RELEASE COMPLETE
        <-------------------------------------------------------------------------------------
                         Facility (Return result = Operation (Parameter(s)))

                                  RELEASE COMPLETE
        <- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
                              Facility (Return error (Error))

                                  RELEASE COMPLETE
        <- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
                              Facility (Reject (Invoke_problem))

                              RELEASE COMPLETE (note)
        <- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

                              RELEASE COMPLETE (note)
        - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - ->
```
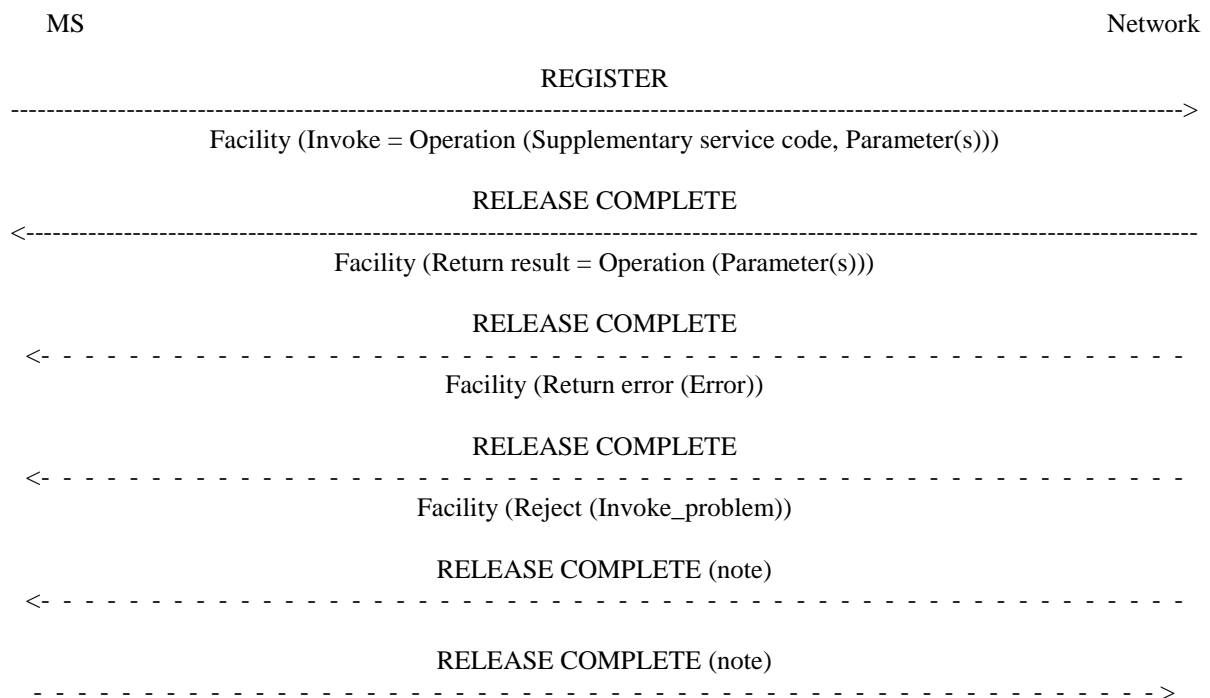
NOTE: To prevent transactions being kept open following exceptional cases, either side of the transaction may release it by sending a RELEASE COMPETE message without a Facility IE.

Figure 3.1: Mobile station initiated supplementary service transaction

3.6.2   Network initiated supplementary service transaction

MS   Network

REGISTER

<--

Facility (Invoke = Operation (Supplementary service code, Parameter(s)))

RELEASE COMPLETE

-->

Facility (Return result = Operation (Parameter(s)))

RELEASE COMPLETE

- ->

Facility (Return error (Error))

RELEASE COMPLETE

- ->

Facility (Reject (Invoke_problem))

RELEASE COMPLETE (note 1, note 3)

- - - - - - -- ->

RELEASE COMPLETE (note 3)

<- -
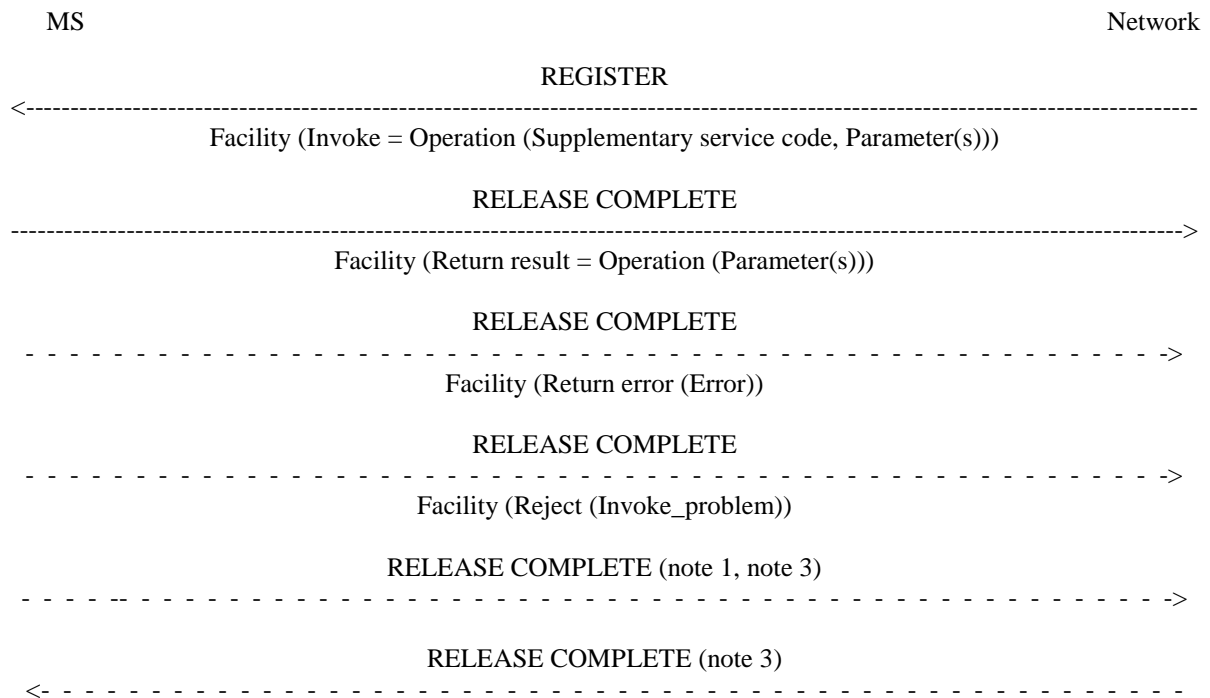
NOTE 1: If the network initiated operation does not require a result, reject or error to be returned then the MS shall release the transaction by sending a RELEASE COMPLETE message without a Facility Information Element.

NOTE 2: For network initiated unstructured SS data alternative procedures for connection release apply; refer to 3GPP TS 23.090 [20] and 3GPP TS 24.090 [35].

NOTE 3: To prevent transactions being kept open following exceptional cases, either side of the transaction may release it by sending a RELEASE COMPETE message without a Facility IE.

Figure 3.2: Network initiated supplementary service transaction

3.7   Handling of unknown, unforeseen, and erroneous protocol data

3.7.1   General

These procedures only apply to messages where the protocol discriminator is set to indicate call independent SS operations according to the rules in 3GPP TS 24.007 [49] and 3GPP TS 24.080 [27]. Messages that do not meet this criteria are treated according to other GSM technical specifications.

This subclause specifies procedures for handling of unknown, unforeseen and erroneous protocol data by the receiving entity. The procedures are called "error handling procedures", but they also define a compatibility mechanism for future extension of the protocol.

Most error handling procedures are mandatory in the MS, but optional in the network. Detailed error handling procedures may vary from PLMN to PLMN.

In this subclause, the following terminology is used:

-    An IE is defined to be syntactically incorrect in a message if it contains at least one value defined as "reserved" in 3GPP TS 24.080 [27] or 3GPP TS 24.008 [48]. However, it is not a syntactical error if a type 4 IE specifies a length indicator greater than that defined. The component part of the Facility information element is handled by a separate mechanism, and errors in the component part are not covered by this subclause.

The following procedures are listed in order of precedence.

Handling of errors in the contents of the Facility IE is described in subclause 2.2.8, and is outside the scope of this subclause.

3.7.2 Message too short

When a message is received that is too short to contain a complete message type information element, that message shall be ignored.

3.7.3 Unknown or unforeseen transaction identifier

The MS shall ignore messages with the transaction identifier value set to "111".

If the transaction identifier value is not "111" the following procedures shall apply to the MS:

a) If a RELEASE COMPLETE message is received specifying a transaction identifier that is not recognised as relating to a call independent SS transaction that is in progress then the message shall be ignored.

b) If a FACILITY message is received specifying a transaction identifier that is not recognised as relating to a call independent SS transaction that is in progress then a RELEASE COMPLETE message shall be sent with cause value #81 "invalid call reference value".

c) If a REGISTER message is received specifying a transaction identifier that is not recognised as relating to a call independent SS transaction that is in progress and with a transaction identifier flag incorrectly set to "1", this message shall be ignored.

The network may follow the same procedures.

3.7.4 Unknown or unforeseen message type

If the MS receives a message type not defined for the protocol discriminator or not implemented by the receiver, then a RELEASE COMPLETE message shall be sent with cause value #97 "message type non-existent or not implemented".

If the MS receives a message type not consistent with the transaction state then a RELEASE COMPLETE message shall be sent with cause value #98 "message not compatible with control state".

The network may follow the same procedures.

3.7.5 Non-semantical mandatory Information Element Error

When on receipt of a message:

- an "imperative message part" error; or

- a "missing mandatory IE" error;

is diagnosed, or when a message containing:

- a syntactically incorrect mandatory IE; or

- an IE unknown in the message, but encoded as "comprehension required" (see 3GPP TS 24.008 [48]); or

- an out of sequence IE encoded as "comprehension required";

is received, the MS shall proceed as follows:

a) If the message is not RELEASE COMPLETE it shall send a RELEASE COMPLETE message with cause "#96 - Invalid mandatory information".

b) If the message is RELEASE COMPLETE, it shall be treated as a normal RELEASE COMPLETE message.

The network may follow the same procedures.

3.7.6 Unknown and Unforeseen IEs in the non-imperative part

3.7.6.1 IEIs unknown in the message

The MS shall ignore all IEs unknown in the message which are not encoded as "comprehension required".

The network shall take the same approach.

3.7.6.2 Out of sequence IEs

The MS shall ignore all out of sequence IEs in a message which are not encoded as "comprehension required".

The network may take the same approach.

3.7.6.3 Repeated IEs

If an information element with format T, TV or TLV (see 3GPP TS 24.007 [49]) is repeated in a message in which repetition of the information element is not specified, only the contents of the information element appearing first shall be handled and all subsequent repetitions of the information element shall be ignored. When repetition of information elements is specified, only the contents of specified repeated information elements shall be handled. If the limit on repetition of information elements is exceeded, the contents of information elements appearing first up to the limit of repetitions shall be handled and all subsequent repetitions of the information element shall be ignored.

The network may follow the same procedures.

3.7.7 Non-imperative message part errors

This category includes:

- syntactically incorrect optional IEs;

- conditional IE errors.

Errors in the content of the Facility IE are handled according to subclause 2.2.8.

3.7.7.1 Syntactically incorrect optional IEs (other than Facility)

The MS shall treat all optional IEs that are syntactically incorrect in a message as not present in the message

The network shall take the same approach.

3.7.7.2 Conditional IE errors

When the MS upon receipt of a message diagnoses a "missing conditional IE" error, or an "unexpected conditional IE error", or when it receives a message containing at least one syntactically incorrect conditional IE (other than Facility), it shall send a RELEASE COMPLETE message with cause #100 "conditional IE error".

The network may follow the same procedure.

4 Password management

The password management procedures consist of two independent procedures:

- password check;

- password registration.

4.1 Password check

4.1.1 Successful procedure

When the password check procedure is invoked by a parent procedure (e.g. for service activation, service deactivation, password registration), the network sends to the MS an invoke component of the operation "get password" with "password" as the value of the mandatory GuidanceInfo information element. This invoke component is embedded in a FACILITY message, since the password check procedure is always invoked during an existing transaction. The MS will return to the network the required password in the return result component of the operation. This return result component is embedded in a FACILITY message, see figure 4.1. If the provided password is right the password check procedure returns to the parent procedure an indication of successful password check.

```
   MS                                                                          Network

                              REGISTER (note)
  ============================================================================>
                                 Facility

                                 FACILITY
  <----------------------------------------------------------------------------
              Facility (Invoke = GetPassword (GuidanceInfo = "password"))

                                 FACILITY
  ---------------------------------------------------------------------------->
                  Facility (Return result = GetPassword (Password))

                          RELEASE COMPLETE (note)
  <============================================================================
```
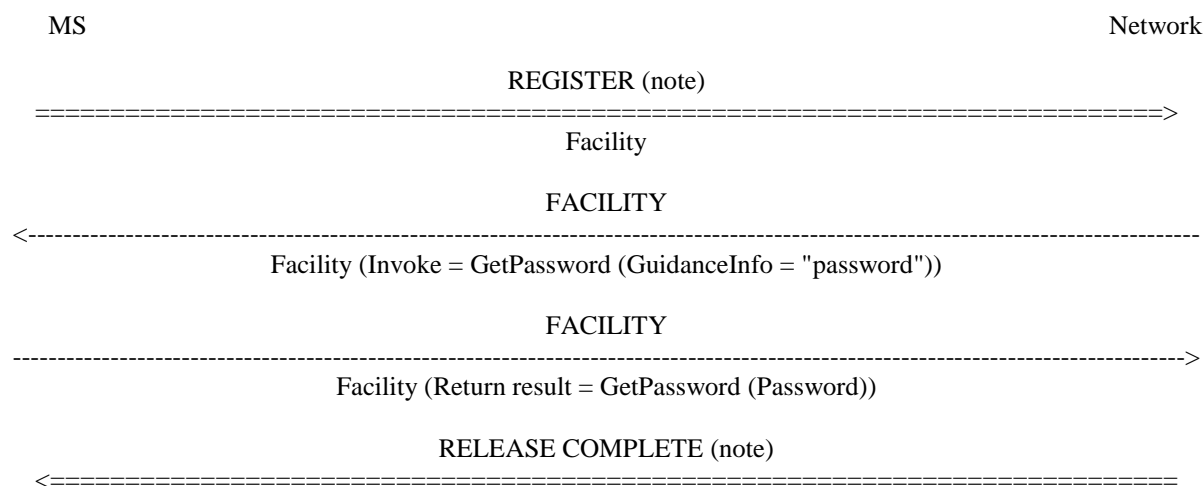
NOTE: This message is part of the initiating SS operation.

Figure 4.1: Password check: successful procedure

4.1.2 Error cases

If no result is returned by the MS for the "Get password" operation invoked by the network, the password check procedure is terminated.

If the password value which is returned by the MS does not match the password value registered in the network, the network increments a counter and sends to the MS a Return Error component indicating "Negative Password Check". The counter is reset as soon as the right password is returned.

If the served mobile subscriber enters a wrong call barring "password" three consecutive times, the subscription option "control of services" is set to "by the service provider" in the network: thus the network makes the use of password impossible for any subscriber operation. The password check procedure returns to the parent procedure an indication of Password Attempts Violation. The password can be made valid by the service provider only.

4.2 Password registration

If the served mobile subscriber is given the possibility to control the service by the use of a password, the service provider has to register a password at provision time. Furthermore, the served mobile subscriber can change the call barring password at any time.

The password registration procedure is as follows:

When the mobile subscriber wants to register a new password the old password, the new password and the repeat of the new password shall be entered into the MS. Then the MS sends to the network an invoke component of the operation "register password".

The common SS-code for call restriction services shall be used, but if the service code is not entered by the user the MS shall include the SS-code referring to all supplementary services.

4.2.1 Successful procedure

The successful procedure consists of three steps:

- the password registration procedure invokes first the password check procedure as it is described above;

- if the password check procedure has returned an indication of successful password check, the network sends secondly to the MS, in an invoke component of the operation "get password" with "new password?" as the value of the mandatory GuidanceInfo information element. This invoke component is embedded in a FACILITY message. The MS will return to the network the required new password in the return result component of the operation. This return result component is embedded in a FACILITY message;

- the network sends thirdly to the MS an invoke component of the operation "get password" with "new password again?" as the value of the mandatory GuidanceInfo information element. This invoke component is embedded in a FACILITY message. The MS will return again to the network the required new password in the return result component of the operation. This return result component is embedded in a FACILITY message.

If the two values of the provided passwords are identical, the network confirms the registration of the new password by sending to the MS the return result component of the operation "register password", with the new password as a mandatory information element, see figure 4.2.

4.2.2 Error cases

If the subscription option "control of services" is set to "by the service provider" or if the WPA is greater than 3 an attempt to register a password will be denied by the network (see 3GPP TS 23.011). If the counter for wrong password attempts is smaller than four, the network will return to the MS an error component with the error value "SS_SubscriptionViolation". If the counter is larger than three, the error value "Password Attempts Violation" is returned.

If the password check procedure returns an indication of negative password check, the network will send to the MS a return error component of the operation "register password" with the error value "negativePasswordCheck".

If the new password is not repeated twice identically by the mobile subscriber, the network returns to the MS an error component of the "register password" operation with the error value "passwordRegistrationFailure". The diagnostic "newPasswordsMismatch" may be passed as an error parameter. The old password remains registered.

If no result is returned by the MS for the "Get password" operation invoked by the network the "register password" procedure is terminated, and the old password remains registered.

If the format of a new password which is returned by the MS is invalid (e.g. the value does not belong to the [0000-9999] range), the network sends to the MS an error component of the "register password" operation with the error value "passwordRegistrationFailure". The diagnostic "invalidFormat" may be passed as an error parameter. The old password remains registered.

MS   Network

REGISTER
--->
Facility (Invoke = Register Password (SS-Code))

FACILITY
<---
Facility (Invoke = GetPassword (GuidanceInfo = "password"))

FACILITY
--->
Facility (Return result = GetPassword (Password))

FACILITY
<---
Facility (Invoke = GetPassword (GuidanceInfo = "new password"))

FACILITY
--->
Facility (Return result = GetPassword (Password))

FACILITY
<---
Facility (Invoke = GetPassword (GuidanceInfo = "new password again"))

FACILITY
--->
Facility (Return result = GetPassword (Password))

RELEASE COMPLETE
<---
Facility(Return result = Register Password (Password))

RELEASE COMPLETE
<- -
Facility (Return error (Error))

RELEASE COMPLETE
<- -
Facility (Reject (Invoke_problem))

NOTE: The figure illustrates successful outcome only. In case of input errors by the mobile subscriber, the
         information flow may be interrupted as defined in 3GPP TS 23.011.

Figure 4.2: Password registration procedure

4.3   Cross phase compatibility

When password procedures are initiated by an MS which does not provide an SS version indicator and where errors occur in password procedures, the network shall not send the protocol error values "DataMissing", "CallBarred" or "NumberOfPWAttemptsViolation".

When an MS that supports version 2 of the SS-protocol receives the guidance values "badPW-TryAgain" or "badPW-FormatTryAgain" it shall release the transaction and notify the mobile user in the same way as if the error value "negativePasswordCheck" has been returned by the network in reply to the parent operation.

5 Supplementary service cross phase compatibility

5.1 Cross phase, or cross protocol version, interworking

Due to the phased approach to GSM standardisation it is possible for a service to be changed, or new services to be added, between different versions of the standard. Since GSM supports the features "terminal mobility" and "roaming" and is a system of open interfaces, it is possible for entities supporting different versions of the standards to have to interwork. This clause describes the supplementary service procedures which provide this interworking.

This clause describes compatibility procedures for radio interface SS operations. In this clause the term "SS operation" refers to one of the operations sent in the Facility IE as defined in 3GPP TS 24.080 [27] and 3GPP TS 29.002 [45]. An "MS initiated operation" is an SS operation where the MS sends the invoke component. A corresponding definition applies to network initiated operations.

5.2 Objectives

The objectives of these procedures are as follows:

- to allow flexibility of implementation, i.e. allow different combinations of services to be supported at different versions within a single entity;

- to allow SSs to evolve from version to version of the standards;

- to decouple SS protocol from other protocols;

- to guarantee the best quality of service in situations where different entities support different versions of that service.

5.3 Supplementary service compatibility philosophy

The purpose of the SS compatibility procedures is to ensure that when a service is invoked the highest common version of the service protocol is used in the entities supporting that service. The highest protocol version gives the best level of service to the subscriber. The commonality of versions between entities provides compatibility.

The basic philosophy is that the MS shall provide the network with information about its capabilities in order that the network may adjust to the capabilities of the MS. This ensures that compatible information is sent to the MS. This process is not required in the other direction, i.e. the network does not provide the MS with capability information. The network is expected to be able to cope with unexpected information cleanly and due to network evolution will generally be more advanced than operating MSs.

In this description the terms "phase" and "version" are used with respect to supplementary services. In this context "phase" means a particular collection of GSM standards or an implementation according to that phase of standards. In each phase of GSM standards "versions" of a service or protocol are described. Therefore it is sometimes applicable to refer to which version of a service is supported.

5.4 Compatibility mechanisms

Two signalling indicators are used in the MS to network direction to provide information on the general capabilities of the MS and on specific SS protocol versions. A protocol extension mechanism is also used for protocol evolution.

NOTE: These compatibility mechanisms are flexible, and could be applied in ways outside the scope of this standard. In general, MSs and networks should support complete implementations of supplementary services (e.g. mobile initiated USSD) including all elements that are not explicitly indicated as manufacturer or operator options. Complete support for a service also implies that the necessary compatibility indicators are set to appropriate values. If the MS or network does not implement all the elements necessary to support a service then the user may receive only a subset of the complete service. Such a MS or network is outside the scope of this standard and may:
- provide a version of the service that is unpredictable or inconsistent;
- fail to meet important service requirements;
- be incompatible with other entities.

5.4.1 SS screening indicator

The SS screening indicator is sent by the MS at the beginning of the radio connection to allow the network to assess the capabilities of the MS and hence determine,

- whether a particular network initiated SS operation may be invoked; or

- what version of a network initiated SS operation should be invoked.

The SS screening indicator is only relevant to network initiated SS operation and is valid for the duration of a radio connection. The coding of the SS screening indicator is described in 3GPP TS 24.008 [48] and 3GPP TS 24.080 [27].

5.4.2 SS version indicator

The SS version indicator is sent by the MS and is associated with one or more related SS operations. It indicates to the network the correct version of radio interface protocol and procedures to use for those SS operations. For call related SSs the version indicator is valid for the invocation period of the SS operation to which it was attached (i.e. the validity of the invoke ID). For call independent SSs the indicator is valid for the duration of the call independent transaction. The SS version indicator takes precedence over the screening indicator during its period of validity. The coding of the SS version indicator is described in 3GPP TS 24.008 [48] and 3GPP TS 24.080 [27].

5.4.3 Protocol extension mechanism

A protocol extension mechanism is used in the common information element category supplementary service protocol to allow controlled evolution of the protocol. The purpose of this mechanism is to allow optional information to be introduced into operations without causing receiving entities, who do not recognise this information, to reject the entire operation.

5.5 SS compatibility procedures

5.5.1 Screening indicator procedures

5.5.1.1 MS procedure

If a MS supports Phase 2 3GPP TS 24.010 error handling and the Phase 2 3GPP TS 24.080 [27] extension mechanism it shall send the screening indicator to the network during layer 3 connection establishment. The value of the indicator shall indicate Phase 2. The sending of the screening indicator does not depend upon the invocation of any supplementary service.

5.5.1.2 Network procedure

At layer 3 connection establishment with the MS, the network shall check for the SS screening indicator and note, for the duration of the connection, whether the indicator was sent, and if sent, the value of the indicator.

On invocation of any network initiated SS operation (unless an SS version indicator has taken precedence over the screening indicator) the network shall check the screening indicator status. If the screening indicator was not sent, the network shall screen information sent to the MS, i.e. invoke the Phase 1 version of the operation or abort the invocation if only a Phase 2 version is available. If the screening indicator was received, indicating that Phase 2 error handling and extension mechanisms are supported at the MS, the network shall invoke the highest supported version of the operation toward the MS.

According to this version of the standards the highest version is Phase 2. However when the next version of standards is available, new services may also be invoked. If the MS does not support the service the error handling or extension mechanism will handle unrecognised information cleanly.

If in the future a new value is assigned to the screening indicator, new screening procedures may also be defined for networks of similar or higher capability. These procedures cannot be predicted and no definition is required in this version of the standards.

If the value of the screening indicator is unrecognised the network shall attempt to handle network initiated SS operations as if the MS had indicated the highest values supported by the network.

The indicator has been defined in such a way that it is ignored when received by a Phase 1 network therefore no Phase 1 procedures are described.

5.5.2 SS version indicator procedures

5.5.2.1 MS procedure

If an SS operation has been initiated at the MS, and the MS supports Phase 2 3GPP TS 24.010 error handling and the Phase 2 3GPP TS 24.080 [27] extension mechanism and the operations used by the mobile initiated procedure are implemented according to the Phase 2 GSM standards, then:

- in the case of call independent activity, the MS shall send the SS version indicator at the beginning of the transaction indicating the version of the SS operation being invoked. No further indication shall be sent by the MS during the transaction. No operations shall be sent within the same transaction which are not compliant with the SS version indicated.

- in the case of call related activity, the MS shall send the SS version indicator in the 3GPP TS 24.008 [48] message containing the invoke component of the related operation. The version of the service being invoked is indicated. This procedure applies on a per operation basis and shall be repeated for each call related operation.

5.5.2.1.1 MS procedure for version 3 or higher operations

The relevant stage 3 specification for each service shall state if the operation requires the use of SS version 3 or higher for MS initiated operations.

The SS version indicator is used within the network to define the MAP Application Context used for a specific operation (see 3GPP TS 29.002 [45]). An MS initiating an SS version 3 or higher operation must be able to decode all of the possible returned information from the MAP Version 3 Application Context of the operation invoked.

If an SS version 3 or higher operation has been initiated at the MS, then:

- in the case of call independent activity, the MS shall send the SS version 3 or higher indicator at the beginning of the transaction indicating the version of the SS operation being invoked. No further indication shall be sent by the MS during the transaction. No operations shall be sent within the same transaction which are not compliant with the SS version indicated.

- in the case of call related activity, the MS shall send the SS version 3 or higher indicator in the 3GPP TS 24.008 [48] message containing the invoke component of the related operation. The version of the service being invoked is indicated. This procedure applies on a per operation basis and shall be repeated for each call related operation.

5.5.2.2   Network procedure

5.5.2.2.1   Call independent SS activity

When a new transaction is set up for call independent SS activity the network shall check for the SS version indicator and note, for the duration of the transaction, whether the indicator was present, and if present, the value of the indicator.

The network shall use this indication to establish the correct MAP application context in the network for the processing of all operations made on that transaction. The network shall discard this information at the end of the transaction. If the indicator was not present the network shall operate according to Phase 1. If the indicator was present and indicates Phase 2 the network shall operate according to the Phase 2 standards. If the value of the indicator is unrecognised the network shall attempt to handle the communication at its highest possible version. The detailed interworking for this situation is described in subclause 5.5.4.

The screening indicator shall not be taken into account for processing transactions that start with MS initiated operations.

Special procedures concerning SS version indicator values other than Phase 2 will be described in future standards if required.

5.5.2.2.2   Call related SS activity

When a call related common information element SS operation is received by the network, the network shall check the 3GPP TS 24.008 [48] carrier message for the SS version indicator. The network shall note whether the indicator was present, and if present, what value was provided.

The network shall use this information to operate in a compatible way and set up compatible contexts in the fixed network. If the indicator was not present the network shall operate according to Phase 1. If the indicator was present and indicates Phase 2 the network shall operate according to the Phase 2 standards. If the value of the indicator is unrecognised the network shall attempt to handle the communication at its highest possible version.

The network shall discard the indicated information when the operation has been completed, i.e. when a result, error or reject is provided. If no response is expected to an operation the indicator is discarded immediately after the operation has been processed.

The screening indicator shall not be taken into account for processing MS initiated operations.

If the version indicator is received but no supplementary service information is supplied the network shall ignore the indicator.

Special procedures concerning SS version indicator values other than Phase 2 will be described in future versions of the standards if required.

5.5.3   Extension mechanism procedures

The handling of the extension mechanism (ellipsis) is a detailed protocol matter and is described in the MAP version 2, 3GPP TS 29.002 [45].

5.5.4   SS version indicator - MAP context interworking

5.5.4.1   Call independent interworking

The compatibility mechanisms described in these subclauses concern the radio interface. The fixed network protocol MAP also specifies compatibility mechanisms. The interworking between these mechanisms occurs at the MSC/VLR.

The MSC shall operate and set up contexts according to the version indicated by the MS wherever possible. If the MS signals a higher version than the MSC/VLR is capable of supporting, the MSC/VLR shall attempt to support service at the highest version which is supported. If this is not possible then the communication is rejected.

Detailed interworking is described in 3GPP TS 29.011.

5.5.4.2 Call related interworking

No interworking identified.

5.6 Development of future protocol versions

As a general rule all future versions of protocol should be designed such that they are a superset of the previous protocol. This provides backward compatibility.

Optional information shall be introduced, where appropriate, in the extensible parts of operations.

Non-compatible protocol changes, i.e. the introduction of mandatory protocol elements or new operations shall cause an increment in the protocol version. This shall be reflected in the use of the SS version indicator. Amendments to the Phase 2 services shall specify in the relevant stage 3 specification which value of the SS version indicator to use for MS initiated operations.

The extension mechanism shall be introduced wherever possible in new operations or new constructed data types of the common information element SS protocol.

Care should also be taken that functional service changes are made in a backwards compatible manner.

6 Forward Check SS Indication

The forward check SS indication procedure is used when supplementary services data in the HLR may have become corrupted. The procedure is initiated by the network to inform the user to verify his supplementary services data. The procedure consists of the network sending the ForwardCheckSSIndication operation on a call independent SS transaction. The procedure shall create a new network initiated transaction.

The new transaction may be used on its own, or in parallel with other call independent SS transactions. The message flow is shown in figure 6.1.

MS   Network

REGISTER
<--
Facility (Invoke = ForwardCheckSSIndication)

RELEASE COMPLETE
-->
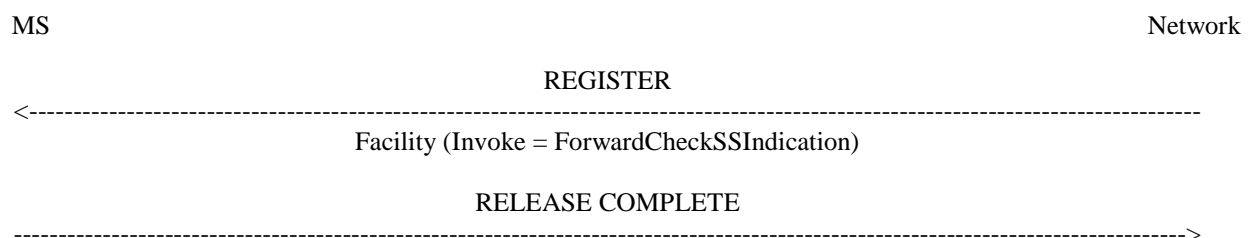
Figure 6.1: ForwardCheckSSIndication sent on new transaction

Annex A (normative):
Notation used for stage 3 description of supplementary services

The structure of the signalling used for supplementary services on the Um Interface is defined using diagrams in 3GPP TS 24.010 and the 3GPP TS 24.08x and 24.09x-series of technical specifications. These SS stage 3 diagrams show example message flows between the MS and the network.

Separate diagrams specify how supplementary services signalling shall be used to perform each defined supplementary service function. For signalling that uses the common information element approach, these diagrams are the normative definition of a number of important aspects of the supplementary services signalling:

- the diagrams normatively define the allowed responses to each supplementary service operation shown;

- the diagrams normatively define which 3GPP TS 24.008 [48] or 3GPP TS 24.080 [27] message is to be used to transport the supplementary services operations in the Facility IE;

- The diagrams normatively define which parameters are allowed and required in the invocation and response of each operation.

A.1   General structure of the SS stage 3 diagrams

In the SS stage 3 diagrams the messages that correspond to the normal case with successful outcome are shown using solid arrows. Messages for exceptional, or unsuccessful cases are shown using dashed arrows. In general, the diagrams show the initiating operation together with all possible outcomes. Obviously, in practice only one of the possible outcomes shown in the diagrams will occur when the operation is used. An example is given in figure A.1.

MS   Network

Initiating Operation
--->

Normal, Successful Outcome
<---

Unsuccessful Outcome 1
<- -

Unsuccessful Outcome 2
<- -
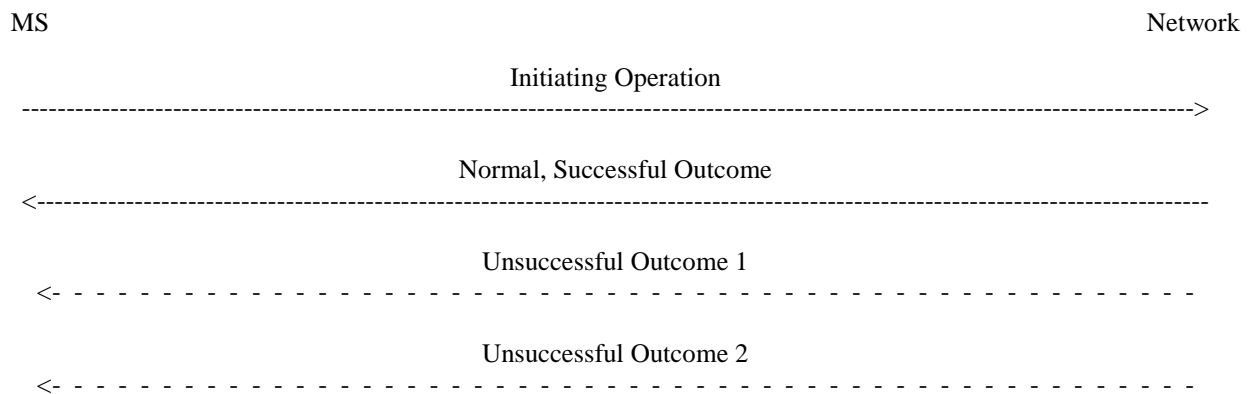
Figure A.1: Example of the general structure of the SS stage 3 diagrams

A.1.1   Exceptional release procedures

To prevent transactions being kept open following exceptional cases, either side of the transaction may release it by sending a RELEASE COMPETE message without a Facility IE. This procedure can be used to release any call independent SS procedure, at any time while supplementary service support is established. For clarity this is not shown on the specific diagrams in the 3GPP TS 24.08x and 24.09x series, though it is still available.
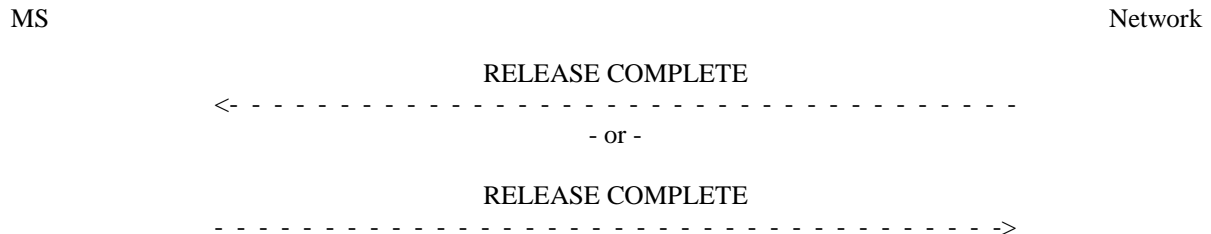
MS   Network

RELEASE COMPLETE
<- -

- or -

RELEASE COMPLETE
- ->

Figure A.2: Exceptional release procedures

A.2   Messages used to transport operations

The message used to transport the supplementary service operation is shown above the arrow. If a single message or a list of messages is specified then only these messages shall be used to transport the operation shown in the context shown. If the letters "e.g." are included before the message name or a list of messages then the messages shown are only suggested examples. If "e.g." is used then any message that carries the Facility information element which is consistent with the transaction state may be used for the SS operation.

A.3   Contents of messages

The contents of messages is specified below the arrow. The diagrams do not show the SS version indicator, or other parts of the message contents unless they are directly related to the service shown. The names of relevant information elements are shown, and the associated contents is shown in brackets.

If the information element is the Facility IE then the contents information includes:

-   the type of component that shall be used for the operation (e.g. invoke, return result, return error, reject);

-   the name of the operation to be used (for the invoke and return result components only);

-   the parameters that shall be included in the operation. For the function described by the diagram, only those parameters shown in the diagram are allowed. Unless stated otherwise all the parameters shown in the diagram shall be present when the operation is used for the function described by the diagram.

The detailed encoding of the operations and parameters shown in the diagrams is defined in 3GPP TS 24.080 [27] and 3GPP TS 29.002 [45]. Appropriate ASN.1 structures from these specifications shall be used to align with the diagrams.

The examples in figure A.2 illustrate the encoding. The first example shows a common information element operation where the operation name is shown. The second example shows a common information element operation where the operation name is not shown. Items in italics would be substituted with the appropriate identifiers.

<div align="center">

MESSAGE NAME

-->

Facility (Component Type = OperationName (parameters))

MESSAGE NAME

-->

Facility (Component Type (parameters))

</div>
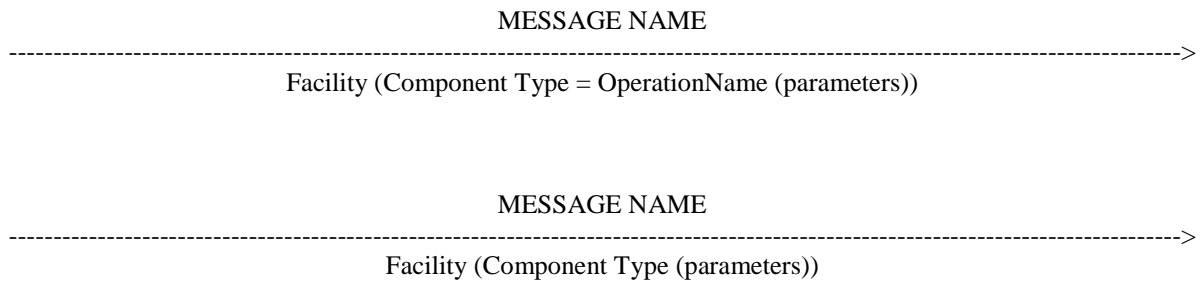
Figure A.2: Examples of the contents of messages

Annex B (informative):
Change history

Change history						
TSG CN#	**Spec**	**Version**	**CR**	**<Phase>**	**New Version**	**Subject/Comment**
Apr 1999	GSM 04.10	7.0.0				Transferred to 3GPP CN1
CN#03	24.010			R99	3.0.0	Approved at CN#03
CN#08	24.010	3.0.0	001	R99	3.1.0	Alignment of SS protocol with current MM/GMM integrity protection rules
CN#11	24.010	3.1.0		Rel-4	4.0.0	Version increased from R99 to Rel-4 after CN#11
CN#11	24.010	3.1.0	002r1	Rel-4	4.0.0	Adaptation of SS to PS domain
CN#13	24.010	4.0.0	003	Rel-4	4.1.0	Clarification on the signalling connection for PS domain
CN#14	24.010	4.1.0	005	Rel-4	4.2.0	Usage of SS Version Indicator
CN#16	24.010	4.2.0		Rel-5	5.0.0	Version increased from Rel-4 to Rel-5 after CN#16
CN#26	24.010	5.0.0		Rel-6	6.0.0	Version increased from Rel-5 to Rel-6 after CN#26
CT#36	24.010	6.0.0		Rel-7	7.0.0	Upgraded unchanged from Rel-6
CT#42	24.010	7.0.0		Rel-8	8.0.0	Upgraded unchanged from Rel-7
2009-12	24.010	8.0.0	-	Rel-9	9.0.0	Update to Rel-9 version (MCC)
2011-03	24.010	9.0.0	-	Rel-10	10.0.0	Update to Rel-10 version (MCC)
2011-06	24.010	10.0.0		Rel-10	10.1.0	Correction of references to non-existent specifications
2012-09	24.010	10.1.0		Rel-11	11.0.0	Update to Rel-11 version (MCC)
2014-09	24.010	11.0.0	-	Rel-12	12.0.0	Update to Rel-12 version (MCC)
2015-12	24.010	12.0.0	-	Rel-13	13.0.0	Update to Rel-13 version (MCC)

History

Document history		
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