# ATIS-1000651.a.1996(R2011)

# Mobility Management Application Protocol (MMAP) - Extensions

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Is an American National Standard developed by the **ATIS Packet Technologies and Systems Committee (PTSC)**.

American National Standard
for Telecommunications –

# Mobility Management Application Protocol (MMAP) – Extensions

Secretariat

**Alliance for Telecommunications Industry Solutions**

Approved December 9, 1996

**American National Standards Institute, Inc.**

## Abstract

This standard provides an application layer protocol for the exchange of information between peer applications running in a radio system and other network elements (e.g., mobility management platforms, switching systems, and other radio systems). The basic provisions of the protocol provide the semantics and syntax for operations necessary to support the mobility aspects of telecommunication services and call control in a wireless environment. This supplement provides additions and modifications to ANSI T1.651-1996.

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**Tables**

**Foreword** (This foreword is not part of American National Standard T1.651a-1996.)

This document is a supplement to ANSI T1.651-1996. It provides changes and additional operations for the RACF-SCF and RACF-RACF interfaces.

This standard has one annex. Annex A is informative and is not considered part of this standard; that is, this annex does not include requirements for this specification, but provides information about this specification.

Suggestions for improvement of this standard will be welcome. They should be sent to the T1 Secretariat, c/o Alliance for Telecommunications Industry Solutions, 1200 G Street, N.W., Suite 500, Washington, D.C. 20005.

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# Mobility Management Application Protocol (MMAP) – Extensions

## 1 Scope, purpose, and application

### 1.1 Scope

The Mobility Management Application Protocol (MMAP) is a communication protocol between a radio system and other network elements (e.g., mobility management platforms, switching systems, and other radio systems). The scope of the radio systems supported are the wireless Personal Communications Services (PCS) radio systems defined by T1 and TIA. The scope of the information and operations is the support of personal and terminal mobility in a wireless environment and includes functionality such as registration, location updating, authentication, roaming, handover, and billing.

In addition, the scope of the protocol includes the exchange of information and invocation of operations as necessary to support the mobility aspects of telecommunication services (e.g., call waiting, call forwarding, short message service) and call control (e.g., call origination, call termination, call clearing) in a wireless environment.

### 1.2 Purpose

The purpose of this document is to provide additional functionalities beyond that specified in ANSI T1.651-1996. The document also provides revisions to operations previously defined in ANSI T1.651-1996.

### 1.3 Application

The operations defined in this supplement are applicable to the interfaces between PCS radio systems and other network elements such as the interfaces defined by the ISDN "A" Interface in TIA and the "C" and "D" interface in T1.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ANSI J-STD-007-1996, *Telecommunications – Air interface specification for 1.8 to 2.0 GHz frequency Hopping time division multiple access (TDMA) for personal communication services* [1]

ANSI J-STD-008-1996, *Telecommunications – Personal station-base station compatibility requirements for 1.8 to 2.0 GHz code division multiple access (CDMA) personal communication systems* [1]

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[1]  This standard is currently in production. Contact the secretariat for more recent information.

ANSI J-STD-018-1996 (Proposed Trial-Use Standard), *Telecommunications – A composite CDMA/TDMA air interface compatibility standard for personal communications in 1.85 – 1.99 GHz for licenced applications* [1]

ANSI T1.114-1996, *Telecommunications – Signaling System No.7 (SS7) – Transaction capabilities application part (TCAP)*

ANSI T1.702-1995, *Telecommunications – Personal communications terminology*

CCITT X.200, *Reference model of open systems interconnection for CCITT applications* [2]

CCITT X.208, *Specification of abstract syntax notation one (ASN.1)* [2]

CCITT X.219, *Remote operations:  Model, notation and service definition* [2]

CCITT X.229, *Remote operations:  Protocol specification* [2]

TIA/EIA IS-41, *Cellular radio telecommunications intersystem operations, Revision C* [3]

TIA/EIA IS-651, *SS7 based A-interface standard for PCS* [3]

TIA/EIA IS-652, *PCN to PCN intersystem operations based on PCS-1900* [3]

TIA/EIA TSB76, *IS-41-C enhancements for PCS multi-band support* [3]

TIA/EIA TSB80, *MSC-BS interface for public 800Mhz* [3]


## 3  Definitions and acronyms

### 3.1  Definitions

The following terms, used in this document, have definitions as previously defined in other standards. The relevant document to reference for the definition is provided.

**Terms from ANSI T1.702-1995 – Personal Communications Terminology:**

> alerting identifier
>
> anchor
>
> authentication
>
> base station
>
> bearer service
>
> call
>
> call control agent functional entity
>
> call control functional entity
>
> call waiting
>
> cell
>
> encryption
>
> handover
>
> home SCF

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[2]  Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036. (CCITT is now known as ITU-T.)

[3]  Available from the Telecommunications Industry Association, 2500 Wilson Blvd., Suite 300, Arlington, VA 22201-3834.

2

       identification

       international mobile equipment identifier

       international mobile subscriber identity

       paging

       personal communications services

       PCS system

       personal terminal

       radio system

       registration

       roaming

       routing number

       service control function

       service profile

       service switching function

       subscriber identification

       supplementary service

       teleservice

       temporary mobile subscriber identification

       terminal identifier

       user profile

       validation

**Terms from CCITT X.200:**

       application-service-element

**Terms from CCITT X.219:**

       remote operations

       remote operation service element

**3.2  Acronyms**

```
ASE       - Application Service Element
ASN       - Abstract Syntax Notation
CCF       - Call Control Function
CCT       - Composite CDMA/TDMA
CDMA      - Code Division Multiple Access
ESN       - Electronic Serial Number
HLR       - Home Location Register
HSCF      - Home SCF
IMEI      - International Mobile Equipment Identifier
IMSI      - International Mobile Subscriber Identity
IN        - Intelligent Network
ISDN      - Integrated Services Digital Network
LA        - Location Area
```

| | |
|---|---|
| LMSI | - Local Mobile Subscriber Identity |
| MIN | - Mobile Identification Number |
| MMAP | - Mobility Management Application Protocol |
| MO | - Mobile Origination |
| MSC | - Mobile Switching Center |
| MTP | - Message Transfer Part |
| MWD | - Message Waiting Data |
| OMC | - Operation & Maintenance Center |
| PACS | - Personal Access Communications System |
| PCS | - Personal Communications Services |
| RACF | - Radio Access Control Function |
| RCF | - Radio Control Function |
| ROSE | - Remote Operations Service Element |
| RTF | - Radio Terminal Function |
| SCF | - Service Control Function |
| SCP | - Service Control Point |
| SM | - Short Message |
| SMS | - Short Message Service |
| SS | - Supplementary Service |
| SSF | - Service Switching Function |
| SS7 | - Signaling System 7 |
| TCAP | - Transaction Capabilities Application Part |
| TMSI | - Temporary Mobile Subscriber Identity |
| USSD | - Unstructured Supplementary Service Data |
| VLR | - Visiting Location Register |

## 4  Overview

### 4.1  Document structure

This MMAP specification defines the semantics and syntax for MMAP operations as well as the mapping of the operations to lower layer protocols. The specification is organized as follows:

*Clause 5 Protocol architecture*

The protocol architecture clause defines the MMAP application layer structure, model for the operations, and the mapping of operations to lower layer protocols.

*Clause 6 Operations descriptions*

The operations descriptions clause describes the semantics of the MMAP operations including operational rules, operation type, and operation parameters. The operations are organized by common operations which apply to multiple radio systems and radio-specific operations. The operations within the common and radio-specific clauses are further organized by peer-to-peer communication (i.e., communication between functional entities such as RACF-to-SCF).

*Clause 7 ASN.1*

The ASN.1 clause defines the abstract syntax for the operations and the ASEs. The ASEs are developed on the basis of peer-to-peer communication (i.e., communication between functional entities). Two modules are defined for each radio system supported and the common operations:

Module 1 defines the Abstract Syntax for the operations

Module 2 defines the Application Service Elements

### 4.2  Functional architecture

See ANSI T1.651.

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## 5  Protocol architecture

### 5.1   Application layer structure

See ANSI T1.651.

### 5.2   Mapping of mobility management operations

See ANSI T1.651.

#### 5.2.1  Mapping to ROSE

See ANSI T1.651.

The operations specified in 6.3.3 are not intended to be carried by ROSE.

#### 5.2.2  Mapping to NCAS

See ANSI T1.651.

#### 5.2.3  Mapping to TCAP

This subclause details the mapping (convergence) of the operations defined in this supplement to TCAP.

The mapping shall follow the guidelines set forth in IS-41 Revision C Part 5.

For SS7-based transport services, all operations are MTP message priority 0.

**Table 1 – Mapping of PCS1900 operations to TCAP package and component types**

| Operation Name | Component Type | Package Type |
|---|---|---|
| Activate_SS | | |
|    Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
|    Success | RETURN RESULT (LAST) | RESPONSE |
|    Failure | RETURN ERROR | RESPONSE |
|    Rejection | REJECT | RESPONSE |
| Activate_Trace_Mode | | |
|    Argument | INVOKE (LAST) | QUERY WITH PERMISSION[1] CONVERSATION WITHOUT PERMISSION[2] |
|    Success | RETURN RESULT (LAST) | RESPONSE[1] CONVERSATION WITH PERMISSION[2] |
|    Failure | RETURN ERROR | RESPONSE[1] CONVERSATION WITH PERMISSION[2] |
|    Rejection | REJECT | RESPONSE[1] CONVERSATION WITH PERMISSION[2] |
| Deactivate_SS | | |
|    Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
|    Success | RETURN RESULT (LAST) | RESPONSE |
|    Failure | RETURN ERROR | RESPONSE |
|    Rejection | REJECT | RESPONSE |
| Deactivate_Trace_Mode | | |
|    Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
|    Success | RETURN RESULT (LAST) | RESPONSE |
|    Failure | RETURN ERROR | RESPONSE |
|    Rejection | REJECT | RESPONSE |
| Erase_SS | | |
|    Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
|    Success | RETURN RESULT (LAST) | RESPONSE |
|    Failure | RETURN ERROR | RESPONSE |
|    Rejection | REJECT | RESPONSE |
| Forward_Check_SS_Indication | | |
|    Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
|    Success | N.A | N.A |
|    Failure | N.A | N.A |
|    Rejection | REJECT | RESPONSE |
| Forward_SMS | | |
|    Argument | INVOKE (LAST) | QUERY WITH PERMISSION[3] CONVERSATION WITH PERMISSION[4] |
|    Success | RETURN RESULT (LAST) | CONVERSATION WITH PERMISSION[5] RESPONSE[6] |
|    Failure | RETURN ERROR | RESPONSE |
|    Rejection | REJECT | RESPONSE |

[1] When initiated in standalone mode.
[2] When initiated as part of location update or data restoration.
[3] On the initial forward SMS operation.
[4] On subsequent forward SMS operations.
[5] When more SMS messages are expected.
[6] On the final forward SMS response.

*(continued)*

**Table 1** *(continued)*

| Operation Name | Component Type | Package Type |
|---|---|---|
| Get_Password | | |
|    Argument | INVOKE (LAST) | CONVERSATION WITH PERMISSION |
|    Success | RETURN RESULT (LAST) | CONVERSATION WITH PERMISSION |
|    Failure | N.A. | N.A. |
|    Rejection | REJECT | RESPONSE |
| Interrogate_SS | | |
|    Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
|    Success | RETURN RESULT (LAST) | RESPONSE |
|    Failure | RETURN ERROR | RESPONSE |
|    Rejection | REJECT | RESPONSE |
| Process_Unstructured_SS_Request | | |
|    Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
|    Success | RETURN RESULT (LAST) | RESPONSE |
|    Failure | RETURN ERROR | RESPONSE |
|    Rejection | REJECT | RESPONSE |
| Ready_for_SM | | |
|    Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
|    Success | RETURN RESULT (LAST) | RESPONSE |
|    Failure | RETURN ERROR | RESPONSE |
|    Rejection | REJECT | RESPONSE |
| Register_Password | | |
|    Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
|    Success | RETURN RESULT (LAST) | RESPONSE |
|    Failure | RETURN ERROR | RESPONSE |
|    Rejection | REJECT | RESPONSE |
| Register_SS | | |
|    Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
|    Success | RETURN RESULT (LAST) | RESPONSE |
|    Failure | RETURN ERROR | RESPONSE |
|    Rejection | REJECT | RESPONSE |
| Reset | | |
|    Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
|    Success | N.A | N.A |
|    Failure | N.A | N.A |
|    Rejection | REJECT | RESPONSE |
| Restore_Data | | |
|    Argument | INVOKE (LAST) | CONVERSATION WITH PERMISSION |
|    Success | RETURN RESULT (LAST) | RESPONSE |
|    Failure | RETURN ERROR | RESPONSE |
|    Rejection | REJECT | RESPONSE |
| Unstructured_SS_Notify | | |
|    Argument | INVOKE (LAST) | QUERY WITHOUT PERMISSION [7] CONVERSATION WITHOUT PERMISSION [8] |
|    Success | RETURN RESULT (LAST) | CONVERSATION WITHOUT PERMISSION |
|    Failure | RETURN ERROR | CONVERSATION WITHOUT PERMISSION |
|    Rejection | REJECT | CONVERSATION WITHOUT PERMISSION |

[7] Only when the network initiates a USSD procedure.
[8] Subsequent requests during network or RTF initiated USSD procedures.

*(continued)*

**Table 1** *(concluded)*

| Operation Name | Component Type | Package Type |
|---|---|---|
| Unstructured_SS_Request | | |
| Argument | INVOKE (LAST) | QUERY WITHOUT PERMISSION[7] |
| | | CONVERSATION WITHOUT PERMISSION[8] |
| Success | RETURN RESULT (LAST) | |
| Failure | RETURN ERROR | CONVERSATION WITHOUT PERMISSION |
| Rejection | REJECT | CONVERSATION WITHOUT PERMISSION |
| | | CONVERSATION WITHOUT PERMISSION |
| Validate_MO_SMS | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |

**Table 2 – Mapping of common operations to TCAP package and component types**

| Operation Name | Component Type | Package Type |
|---|---|---|
| Call_Indication | | |
| Argument | INVOKE (LAST) | UNIDIRECTIONAL |
| Success | N.A. | N.A. |
| Failure | N.A. | N.A. |
| Rejection | N.A. | N.A. |

PCS1900 specific dialogue control operations

The MMAP dialogue establishment, continuation and termination are achieved in the same way as specified in IS-652 (Section III Ch 12.1-12.5). The dialogue control operations Open, Close, Accept, Refuse, User_Abort and Provider_Abort are used for this purpose and are specified in 6.3.3. These dialogue control operations are carried in the dialogue portion of the TCAP package along with MMAP operations which are carried in the component portion. The mapping of these dialogue control operations on to package type is given below.

**Table 3 – Mapping of PCS1900 dialogue control operations to TCAP package types**

| Operation Name | Package Type |
|---|---|
| Accept | RESPONSE |
| | CONVERSATION WITH PERMISSION |
| | CONVERSATION WITHOUT PERMISSION |
| Close | RESPONSE |
| Open | QUERY WITH PERMISSION |
| | QUERY WITHOUT PERMISSION |
| Provider_Abort | ABORT |
| Refuse | RESPONSE |
| User_Abort | ABORT |

## 6 Operations descriptions

### 6.1 PACS operations descriptions

#### 6.1.1 RACF <--> SCF operations

##### 6.1.1.1 Common operations used by PACS

In addition to the operations listed in 6.1.1.1 of ANSI T1.651, PACS uses the following common operation, as defined in 6.6 of this supplement:

Call_Indication

##### 6.1.1.2 PACS specific operations

There are no new PACS specific RACF-to-SCF operations.

#### 6.1.2 RACF <--> RACF operations

##### 6.1.2.1 Common operations used by PACS

PACS does not utilize any new RACF-to-RACF common operations.

##### 6.1.2.2 PACS specific operations

There are no new PACS specific RACF-to-RACF operations.

### 6.2 CDMA operations descriptions

#### 6.2.1 RACF <--> SCF operations

##### 6.2.1.1 Common operations used by CDMA

In additions to the operations listed in 6.2.1.1 of ANSI T1.651, CDMA uses the following common operations:

Handover_Performed_Indication as defined in 6.6 of ANSI T1.651.

Call_Indication as defined in 6.6 of this supplement.

##### 6.2.1.2 CDMA specific operations

There are no new CDMA specific RACF-to-SCF operations.

#### 6.2.2 RACF <--> RACF operations

##### 6.2.2.1 Common operations used by CDMA

CDMA does not utilize any new RACF-to-RACF common operations.

##### 6.2.2.2 CDMA specific operations

There are no new CDMA-specific RACF-to-RACF operations, but 6.2.2.2.1 replaces 6.2.2.2.1 of ANSI T1.651.

##### 6.2.2.2.1 CDMA facilities directive 3

Name:            Facilities_Directive_3

Direction:            Anchor RACF ----> Target RACF

Description:

This operation is used to request CDMA channel resource(s) of the target RCF when it is under the control of an RACF which is different from the one controlling the anchor RCF. This operation is only used for the "initial" handover in which a bearer channel must be established between the RCFs.

Operational Rules:

If the appropriate resource(s) can be found, then the target RCF responds with a return result. Otherwise, a return error specifying the cause of the failure (e.g., ResourceShortage) is sent.

The target RACF/RCF may include the subrate channel information to confirm the subrate channels selected by the anchor in the Invoke.

If the target RCF is at the border of the target RACF coverage area, the return result must provide the target RCF neighbor information ( e.g., neighbor pilot list and RACF address) so that the anchor RACF can potentially request a handoff of the target RCF neighbors. For example, an RTF which is to be handed off from RACF A to an RCF in RACF B which borders RACF C, requires that RACF B include the RACF C neighbors of its target RCF along with the address of RACF C.

Either Subscriber_ID or Terminal_ID is required.

A terminal identifier is required when voice privacy is inactive.

ROSE Operation Class:                    Class 2

Parameters:

|  | Name | Type | Usage |
|---|---|---|---|
| **Request:** | | | |
| | billing_ID | Billing_ID | M |
| | subscriber | Subscriber_ID | O |
| | terminal | Terminal_ID | O |
| | station_Class_Mark | Station_Class_Mark | O |
| | mobile_Protocol_Revision | Mobile_Protocol_Revision | O |
| | serving_Cell_ID | Cell_ID | O |
| | serving_One_Way_Delay | One_Way_Delay | O |
| | serving_Channel_Data | Channel_Data | O |
| | target_MAHO_List | Target_MAHO_List | O |
| | subrate_Channel_ID_List | Subrate_Channel_ID_List | O |
| | desired_Confidentiality | Confidentiality_Modes | O |
| | sme_Key | Signaling_Message_Encryption_Key | O |
| | mask | Private_Long_Code_Mask | O |
| | handoff_Reason | Handoff_Reason | O |
| | handoff_Mode | Handoff_Mode | O |
| | priority | Priority | O |
| | terminal_Location | Coordinates | O |
| | transcoder_Mode | Transcoder_Mode | O |
| | serving_Cell_ID_List | Cell_ID_List | O |
| | req_Service_Config_rec | Service_Configuration_Record | O |
| | req_Service_Option_List | Service_Option_List | O |
| | band_Class | Band_Class | O |
| | band_Class_List | Band_Class_List | O |
| | private_Parameters | Private_Parameters | O |
| **Response:** | | | |
| **Success:** | | | |
| | interface_DN | Digits | O |
| | subrate_Channel_ID_List | Subrate_Channel_ID_List | O |
| | target_Channel_Data | Channel_Data | O |
| | code_Channel_List | Code_Channel_List | O |
| | channel_Number_List | Channel_Number_List | O |
| | actual_Confidentiality | Confidentiality_Modes | O |

| handoff_Power_Level | Handoff_Power_Level | O |
| neighbor_List | Neighbor_List | O |
| hard_Handoff_Parameters | Hard_Handoff_Parameters | O |
| forward_Power_Control | Forward_Power_Control_Params | O |
| transcoder_Handoff_Time | Transcoder_Handoff_Time | O |
| resp_Service_Config_Rec | Service_Configuration_Record | O |
| resp_Service_Option_List | Service_Option_List | O |
| private_Parameters | Private_Parameters | O |

Errors:

| facilities_Directive_Error | Error_Code | M |
| cause | Cause | O |
| parameter_In_Error | Faulty_Parameter | O |

Parameter Definitions:

| billing_ID | - IS41 billing identification for billing record correlation |
| subscriber | - identifies the subscriber:<br>MIN: Mobile Identification Number<br>IMSI: International Mobile Station Identity<br>TMSI: Temporary Mobile Station Identity |
| terminal | - identifies the terminal (ESN: Electronic Serial Number) |
| station_Class_Mark | - RTF capabilities, (e.g., power class, slotted mode, etc.) |
| mobile_Protocol_Revision | - RTF protocol revision number |
| serving_Cell_ID | - RTF active set member having shortest signal path to the RTF (time reference cell) |
| serving_One_Way_Delay | - estimated one way delay between the RTF and cell |
| serving_Channel_Data | - RTF current serving CDMA channel |
| target_MAHO_List | - RTF reported downlink measurements |
| subrate_Channel_ID_List | - identifies the location of the bearer's subrate channel(s) |
| desired_Confidentiality | - desired mode for SME and VP |
| sme_Key | - key to be used for encrypting appropriate signaling message fields |
| mask | - private long code mask used for Voice Privacy |
| handoff_Reason | - reason for handoff |
| handoff_Mode | - desired and acceptable type (hard or soft) of handoff |
| priority | - one of 14 handoff priorities |
| terminal_Location | - estimated RTF longitude and latitude |
| transcoder_Mode | - information to be used by the target RCF in initialization of the transcoder |
| serving_Cell_ID_List | - a list of cells that the RTF may be connected to in a soft handoff |
| req_Service_Config_rec | - indicates the requested service configuration |
| req_Service_Option_List | - indicates the state information for the requested service option(s) |
| band_Class | - identifies the band class an RTF is capable of supporting |
| band_Class_List | - identifies the band class information to be used in a multi-band handoff |
| private_Parameters | - manufacturer specific information |
| interface_DN | - the directory number of the radio system interface |
| target_Channel_Data | - RTF current serving CDMA |
| code_Channel_List | - list of code channel information |
| channel_Number_List | - logical number(s) assigned to the equipment providing the traffic channel; useful for statistics, billing, and call trace operations |
| actual_Confidentiality | - desired mode for SME and VP |
| handoff_Power_Level | - the target RCF desired RTF handoff power level |
| neighbor_List | - target RCF neighbor information, e.g., neighbor pilots and RACF address |
| hard_Handoff_Parameters | - information needed by the source RTF to perform hard handoff |
| forward_Power_Control | - information regarding various power control parameters needed by the mobile |
| transcoder_Hnadoff_Time | - alternate time for transcoder handoff indicated by the target RCF during a drop source procedure |
| resp_Service_Config_Rec | - indicates the granted service configuration |

resp_Service_Option_List    - indicates the state information for the granted service option(s)
facilities_Directive_Error    - identifies an error
cause    - provides additional information regarding the failure
parameter_In_Error    - a parameter in error

Error Definitions:

Error_Code    - this can be one of the following values:
        Unrecognized_MIN
        Unrecognized_ESN
        MIN_HLR_Mismatch
        Operation_Sequence_Problem
        Resource_Shortage
        Operation_Not_Supported
        Trunk_Unavailable
        Parameter_Error
        System_Failure
        Unrecognized_Parameter_Value
        Feature_Inactive
        Missing_Parameter
        Requested_Information_Unavailable
Cause    - see IS-651 Part IIIb
Faulty_Parameter    - see IS-41C

**6.3   PCS 1900 operations descriptions**

**6.3.1   RACF <----> SCF operations**

**6.3.1.1   Common operations used by PCS1900**

PCS1900 does not utilize any RACF-to-SCF common operations.

**6.3.1.2   PCS 1900 specific operations**

**6.3.1.2.1   Activate SS**

Name:            Activate_SS

Direction:                RACF ---> SCF

Description:

This operation is used between the RACF and the SCF to activate a supplementary service.

Operational Rules:

The activation procedure is used to activate a supplementary service in the HSCF. The activation procedure is a fully transparent communication between the RTF and the HSCF.

When the RTF initiates the supplementary service activation, the RACF transfers the information received from the RTF to the SCF in the Activate_SS request without checking the contents of the service request.

Upon receipt of the Activate_SS request, the SCF further transfers the information to the HSCF without checking the contents of the service request. When the SCF receives the response from the HSCF, it will transfer the information to the RACF in the Activate_SS response without checking its contents.

The RACF will further transfer the information contained in the Activate_SS response to the RTF.

Note that password may be needed for activation of some supplementary services. In those cases the Get_Password operation is performed before the response of the Activate_SS is returned.

ROSE Operation Class:        Class 2

Parameters:

| Name | Type | Usage |
|------|------|-------|
| **Request:** | | |
| ss_Code | SS_Code | M |
| basic_Service | Basic_Service_Code | O |
| **Response:** | | |
| **Success:** | | |
| fwd_Info | Forwarding_Info | O |
| call_Barring_Info | Call_Barring_Info | O |
| ss_Data | SS_Data | O |
| **Errors:** | | |
| activate_SS_Error | see definitions below | M |

Parameter Definitions:

ss_Code                    - This parameter indicates the supplementary service which the PCS subscriber wants to activate.

basic_Service — This parameter indicates for which basic service groups the requested supplementary service(s) should be activated. If it is not included, the activation request applies to all basic services.

fwd_Info — This parameter is returned if the activation request concerns Call Forwarding.

call_Barring_Info — This parameter is returned if the activation request concerns Call Barring.

ss_Data — This parameter is returned if the activation request concerns for example Call Waiting.

Error Definitions:

system_Failure — The task cannot be performed because of a problem in another entity.

data_Missing — An optional parameter required by the context is missing.

unexpected_Data_Value — A data type is formally correct but its value or presence is unexpected in the current context.

bearer_Service_Not_Provisioned
— This error is returned only if not even a subset of the requested bearer service group has been subscribed to.

tele_Service_Not_Provisioned
— This error is returned only if not even a subset of the requested teleservice group has been subscribed to.

call_Barred — The access to supplementary services has been barred.

illegal_SS_Operation — The operation violates the rules applicable to the particular supplementary service.

ss_Error_Status — The operation on the supplementary service is incompatible with the current status of the service.

ss_Subscription_Violation — The action requested on the supplementary service is in contradiction with the subscription.

ss_Incompatibility — The action on the supplementary service is incompatible with the status of another supplementary service.

negative_PW_Check — The requested password has not been provided or it has been provided but does not match the valid one.

number_Of_PW_Attempts_Violation
— The RTF has attempted to access password controlled supplementary services using an erroneous password more than three times.

**6.3.1.2.2   Activate trace mode**

Name:                    Activate_Trace_Mode

Direction:                    RACF <--- SCF

Description:

This operation is used between the RACF and the SCF to activate subscriber tracing in RACF.

Operational Rules:

Activate_Trace_Mode is an operation needed to keep track of trace mode of a subscriber. This operation is used either i) in embedded mode during location updating and data restoration or ii) in stand alone mode when the home SCF activates the tracing.

When a location update is performed, if the trace mode of the subscriber is set active in home SCF, the home SCF activates subscriber tracing in the visited SCF. The visited SCF in turn forwards this information to RACF using this operation to activate tracing in RACF.

When RACF data restoration is performed, if the trace mode of the subscriber is set active in the visited SCF, then the trace is activated in RACF using this operation.

In the stand alone mode, when the subscriber is already registered, the home SCF sends the trace request to the visited SCF. The visited SCF forwards this information to RACF using this operation.


ROSE Operation Class:          Class 2

Parameters:

| | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | trace_Ref | Trace_Reference | M |
| | trace_T | Trace_Type | M |
| | subscriber | IMSI | C |
| | omc_Id | Address_String | O |
| Response: | | | |
| Success: | | | |
| | no parameters | | |
| Errors: | | | |
| | activate_Trace_Error | see definitions below | M |

Parameter Definitions:

trace_Ref                    - This is a reference associated with the tracing request. This parameter is managed by the OMC.

trace_Type                    - This parameter identifies the type of trace

subscriber                    - This parameter indicates the unique identity of the PCS subscriber and it is mandatory in a standalone operation.

omc_Id                    - This parameter refers to the identity of an operation and maintenance center.

Error Definitions:

system_Failure                    - The task cannot be performed because of a problem in another entity.

data_Missing                    - An optional parameter required by the context is missing.

unexpected_Data_Value     - A data type is formally correct but its value or presence is unexpected in the current context.

facility_Not_Supported     - The requested facility is not supported.

unidentified_Subscriber     - The subscriber cannot be identified.

tracing_Buffer_full     - The buffer used for tracing record is full.

**6.3.1.2.3   Deactivate SS**

Name:               Deactivate_SS

Direction:                  RACF ---> SCF

Description:

This operation is used between the RACF and the SCF to deactivate a supplementary service.

Operational Rules:

The deactivation procedure is used to deactivate a supplementary service in the HSCF. The deactivation procedure is a fully transparent communication between the RTF and the HSCF.

When the RTF initiates the supplementary service deactivation, the RACF transfers the information received from the RTF to the SCF in the Deactivate_SS request without checking the contents of the service request.

Upon receipt of the Deactivate_SS request, the SCF further transfers the information to the HSCF without checking the contents of the service request. When the SCF receives the response from the HSCF, it will transfer the information to the RACF in the Deactivate_SS response without checking its contents.

The RACF will further transfer the information contained in the Deactivate_SS response to the RTF.

ROSE Operation Class:          Class 2

Parameters:

| Name | Type | Usage |
|------|------|-------|
| Request: | | |
| ss_Code | SS_Code | M |
| basic_Service | Basic_Service_Code | O |
| Response: | | |
| Success: | | |
| fwd_Info | Forwarding_Info | O |
| ss_Data | SS_Data | O |
| Errors: | | |
| deactivate_SS_Error | see definitions below | M |

Parameter Definitions:

| | |
|---|---|
| ss_Code | - This parameter indicates the supplementary service which the PCS subscriber wants to deactivate. |
| basic_Service | - This parameter indicates for which basic service groups the requested supplementary service(s) should be deactivated. If it is not included, the deactivation request applies to all basic services. |
| fwd_Info | - This parameter is returned if the deactivation request concerns Call Forwarding. |
| ss_Data | - This parameter is returned if the deactivation request concerns for example Call Waiting. |

Error Definitions:

| | |
|---|---|
| system_Failure | - The task cannot be performed because of a problem in another entity |
| data_Missing | - An optional parameter required by the context is missing. |
| unexpected_Data_Value | - A data type is formally correct but its value or presence is unexpected in the current context. |
| bearer_Service_Not_Provisioned | |
| | - This error is returned only if not even a subset of the requested bearer service group has been subscribed to. |
| tele_Service_Not_Provisioned | - This error is returned only if not even a subset of the requested teleservice group has been subscribed to. |
| call_Barred | - The access to supplementary services has been barred. |
| illegal_SS_Operation | - The operation violates the rules applicable to the particular supplementary service. |
| ss_Error_Status | - The operation on the supplementary service is incompatible with the current status of the service. |
| ss_Subscription_Violation | - The action requested on the supplementary service is in contradiction with the subscription. |
| ss_Incompatibility | - The action on the supplementary service is incompatible with the status of another supplementary service. |
| negative_PW_Check | - The requested password has not been provided or it has been provided but does not match the valid one. |
| number_Of_PW_Attempts_Violation | |
| | - The RTF has attempted to access password controlled supplementary services using an erroneous password more than three times. |

**6.3.1.2.4  Deactivate trace mode**

Name:              Deactivate_Trace_Mode

Direction:                    RACF <--- SCF

Description:

This operation is used between the RACF and the SCF to deactivate subscriber tracing in RACF.

Operational Rules:

Deactivate_Trace_Mode is an operation needed to keep track of trace mode of a subscriber. This operation is used when the home SCF deactivates the tracing.

When the trace of a subscriber is to be canceled, the home SCF sends the request to the visited SCF. The visited SCF forwards this information to RACF using this operation.

ROSE Operation Class:          Class 2

Parameters:

| Name | Type | Usage |
|------|------|-------|
| **Request** | | |
| subscriber | IMSI | M |
| trace_Ref | Trace_Reference | M |
| **Response** | | |
| Success: | | |
| no parameters | | |
| Errors: | | |
| activate_Trace_Error | see definitions below | M |

Parameter Definitions:

| | |
|---|---|
| subscriber | - This parameter indicates the unique identity of the PCS subscriber. |
| trace_Ref | - This parameter indicates the reference associated with the tracing request and it is managed by the OMC. |

Error Definitions:

| | |
|---|---|
| system_Failure | - The task cannot be performed because of a problem in another entity. |
| unexpected_Data_Value | - A data type is formally correct but its value or presence is unexpected in the current context. |
| facility_Not_Supported | - The requested facility is not supported. |
| unidentified_Subscriber | - The subscriber cannot be identified. |

### 6.3.1.2.5  Erase SS

Name:            Erase_SS

Direction:            RACF ---> SCF

Description:

This operation is used to erase data related to a supplementary service.

Operational Rules:

The SS erasure procedure is a fully transparent communication between the RTF and the HSCF.

When the RTF initiates the SS erasure, the RACF transfers the information from RTF to the SCF in the Erase_SS request message without checking the contents of the request. Upon receipt of the request the SCF forwards it to HSCF without checking the contents, and then awaits the response from the HSCF.

Upon receipt of the Erase_SS response from the HSCF the SCF forwards it to RACF without checking the contents. The RACF will in turn forward the response message to RTF without checking the contents.

ROSE Operation Class:            Class 2

Parameters:

| | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | ss_Code | SS_Code | M |
| | basic_Service | Basic_Service_Code | O |
| Response: | | | |
| Success: | | | |
| | fwd_Info | Forwarding_Info | O |
| Errors: | | | |
| | erase_SS_Error | see definitions below | M |

Parameter Definitions:

ss_Code
- This parameter indicates the supplementary service which the subscriber wants to erase.

basic_Service
- This parameter indicates for which basic service group the supplementary service is to be erased. If it is not included, the erasure request applies to all basic services. If it is not included, the erasure request applies to all basic services.

fwd_Info
- This parameter is returned at successful outcome of the service, if the request concerns one or a group of Call Forwarding supplementary services.

Error Definitions:

bearer_Service_Not_Provisioned
- The referred bearer service or bearer service group has not been subscribed to.

tele_Service_not_Provisioned
- The referred teleservice or teleservice group has not been subscribed to.

illegal_SS_Operation
- The operation violates the rules applicable to the particular supplementary service.

| | |
|---|---|
| ss_Error_Status | - The operation on the supplementary service is incompatible with the current status of the service. |
| call_Barred | - The access to SS has been barred. |
| system_Failure | - The task cannot be performed because of a problem in another entity. |
| data_Missing | - An optional parameter required by the context is missing. |
| unexpected_Data_Value | - A data type is formally correct but its value or presence is unexpected in the current context. |

### 6.3.1.2.6  Forward check SS indication

Name:           Forward_Check_SS_Indication

Direction:              RACF <--- SCF

Description:

This operation is used by the SCF to indicate to a subscriber that supplementary service may have been altered.

Operational Rules:

This operation may be used by a home SCF to indicate to a personal subscriber that supplementary services parameters may have been altered, e.g. due to a restart. If received from the home SCF, the visited SCF shall forward this indication to the RACF, which in turn forwards it to the RTF. The home SCF only sends this indication after successful completion of the subscriber data retrieval  from home  SCF to visited SCF. This operation is performed before sending the response to a location update operation.

ROSE Operation Class:        Class 5


Parameters:

| Name | Type | Usage |
|------|------|-------|
| Request: | | |
| no parameters | | |
| Response:    not applicable | | |
| Success: | | |
| Errors: | | |

Parameter Definitions:        not applicable

**6.3.1.2.7  Forward SMS**

Name:            Forward_SMS

Direction:            RACF <--- SCF

Description:

This operation is used between the RACF and the visited SCF to forward RTF terminated short messages.

Operational Rules:

The short message information coming from the short message service center is forwarded to RACF by visited SCF using this operation. RACF will extract the the short message information and forward it to RTF.

ROSE Operation Class:            Class 2

Parameters:

| Name | Type | Usage |
|------|------|-------|
| **Request:** | | |
| sM_RP_DA | SM_RP_DA | O |
| sM_RP_OA | SM_RP_OA | O |
| sM_RP_UI | Signalinfo | O |
| more_Messages | More_Message_Flag | O |
| **Response:** | | |
| Success: | | |
| no parameters | | |
| Errors: | | |
| forward_SMS_Error | see definitions below | M |

Parameter Definitions:

sM_RP_DA
- This parameter represents the destination address used by the short message service relay sub-layer protocol. It can contain either an IMSI or a LMSI in case of the RTF terminated SM. The use of the LMSI is an operator option. This parameter is omitted in the subsequent SM transfers.

sM_RP_OA
- This parameter represents the origination address used by the short message service relay sub-layer protocol. The Service Center address received from the originating service center is inserted in the RTF terminated SM. This parameter is omitted in the subsequent SM transfers.

sM_RP_UI
- This parameter represents the user data field carried by the short message service relay sub-layer protocol. The short message transfer protocol data unit received from the service center is inserted in this parameter.

more_Messages
- This parameter is used to indicate whether or not the service center has more short messages to send.

Error Definitions:

unidentified_Subscriber
- The subscriber is not contained in the database and it has not, or cannot, be established whether or not a subscription exists.

absent_Subscriber
- The subscriber has activated the detach service or the system detects the absence condition. An additional indication of whether

|                              |                                                                                              |
|------------------------------|----------------------------------------------------------------------------------------------|
|                              | or not the message waiting data flag has been set may be included.                           |
| subscriber_Busy_for_MT_SMS - | The subscriber is currently busy in receiving another short message.                         |
| facility_Not_Supported       | - The requested facility is not supported by the network.                                    |
| illegal_Subscriber           | - This indicates that delivery of the RTF terminated short message failed because the RTF failed authentication. |
| illegal_Equipment            | - This indicates that delivery of the RTF terminated short message failed because an IMEI check failed, i.e. the IMEI was blacklisted or not whitelisted. |
| sM_Delivery_Failure          | - The reason of the SM delivery failure can be one of the following in the RTF terminated SM:<br>- memory capacity exceeded in the RTF;<br>- protocol error;<br>- RTF terminated short message service is not supported. |
| data_Missing                 | - An optional parameter required by the context is missing.                                  |
| unexpected_Data_Value        | - A data type is formally correct but its value or presence is unexpected in the current context. |
| system_Failure               | - The task cannot be performed because of a problem in another entity.                        |

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**6.3.1.2.8 Get password**

Name: Get_Password

Direction: RACF <--- SCF

Description:

This operation is used to request a password from the PCS subscriber in order to allow the invocation of the SS that is password protected.

Operational Rules:

The password check procedure is a fully transparent communication between the RTF and the HSCF.

When the SS related activity is invoked by the subscriber, the HSCF initiates the password check by requesting the password from the RTF. The SCF transfers the information from HSCF to the RACF in the Get_Password request message without checking the contents of the request. Upon receipt of the request the RACF forwards it to RTF without checking the contents, and then awaits the response from the RTF.

Upon receipt of the response from the RTF the RACF forwards it to SCF in Get_Password response message without checking the contents. The SCF will in turn forward the response message to HSCF without checking the contents.

ROSE Operation Class: Class 4

Parameters:

| Name | Type | Usage |
|------|------|-------|
| Request: | | |
| guidance_Info | Guidance_Info | M |
| Response: | | |
| Success: | | |
| current_Password | Password | M |
| Errors: | | |

Parameter Definitions:

guidance_Info — This parameter provides the guidance information given to a subscriber who is requested to provide a password. One of the following information may be given:
"enter password" - This information is used for checking of the old password.
"enter new password" - This information is used during password registration for the request of the first new password.
"enter new password again" - This information is used during password registration for the request of the new password again for verification.

current_Password — This parameter indicates the currently used password to be associated with supplementary service(s).

Error Definitions: not applicable

**6.3.1.2.9  Interrogate SS**

Name:              Interrogate_SS

Direction:                RACF ---> SCF

Description:

This operation is used between the RACF and the SCF to retrieve information related to a supplementary service.

Operational Rules:

When the RTF initiates the supplementary service interrogation procedure, the RACF transfers the information received from the RTF to the SCF in the Interrogate_SS request without checking the contents of the service request. The RACF then awaits the receipt of the Interrogate_SS response from the SCF. The outcome of the procedure is then reported to the RTF.

The interrogation is either answered by the SCF or by the HSCF, depending on the service interrogated.

If the interrogation is to be handled by the HSCF, on receiving the Interrogate_SS request, the SCF transfers the information to the HSCF. When the SCF receives the response from the HSCF, it shall transfer the information contained in this response to the RACF in the Interrogate_SS response without checking its contents.

ROSE Operation Class:        Class 2

Parameters:

| Name | Type | Usage |
|------|------|-------|
| Request: | | |
| ss_Code | SS_Code | M |
| basic_Service | Basic_Service_Code | O |
| Response: | | |
| Success: | | |
| ss_Status | SS_Status | O |
| basic_Serv_Group_List | Basic_Service_Group_List | O |
| fwd_Feature_List | Forwarding_Feature_List | O |
| cli_Restriction_Info | CLI_Restriction_Info | O |
| Errors: | | |
| interrogate_SS_Error | see definitions below | M |

Parameter Definitions:

ss_Code                    - This parameter indicates the supplementary service which the PCS subscriber wants to interrogate.
basic_Service              - This parameter indicates for which basic service group the given supplementary service is interrogated. If it is not included, the interrogation request applies to all basic services.
ss_Status                  - This parameter is included if the interrogated supplementary service can only be subscribed for all applicable basic services simultaneously, or if the interrogated supplementary service is not active for any of the interrogated basic services.
basic_Serv_Group_List      - This parameter list is used to include a series of basic service groups for which the interrogated supplementary service is active. If the interrogated supplementary service is not active for any of the

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interrogated (and provisioned) basic service groups, the ss_Status parameter is returned.

fwd_Feature_List - A list of one or more forwarding features is returned by the responder when the interrogation request applies to Call Forwarding supplementary service. If no basic service code parameter is provided within this sequence, the forwarding feature parameter applies to all provisioned basic services.

cli_Restriction_Info - This parameter is returned by the responder when the interrogation request applies to calling line identification restriction supplementary service.

Error Definitions:

system_Failure - The task cannot be performed because of a problem in another entity.

data_Missing - An optional parameter required by the context is missing.

unexpected_Data_Value - A data type is formally correct but its value or presence is unexpected in the current context.

bearer_Service_Not_Provisioned
- This error is returned only if not even a subset of the requested bearer service group has been subscribed to.

tele_Service_Not_Provisioned - This error is returned only if not even a subset of the requested teleservice group has been subscribed to.

call_Barred - The access to supplementary services has been barred.

illegal_SS_Operation - The operation violates the rules applicable to the particular supplementary service.

ss_Not_Available - The service is not available in the current location area.

**6.3.1.2.10   Process unstructured SS request**

Name:                    Process_Unstructured_SS_Request

Direction:                    RACF ---> SCF

Description:

This operation is used between the RACF and the SCF to relay information in order to allow unstructured supplementary service operation.

Operational Rules:

When the unstructured supplementary service is provided in the SCF or some other entity in the network, this operation is used to relay  information to SCF.

When the RACF receives a Process_Unstructured_SS_Request from the RTF, the message may be fed to an application contained locally in the RACF or to the SCF. If the message is destined for the SCF then the RACF shall transfer the message to the SCF using the Process_Unstructured_SS_Request operation.

The RACF may subsequently receive one or more Unstructured_SS_Request or Unstructured_SS_Notify requests from the SCF. These shall be sent transparently to the RTF. When a confirmation is received from the RTF this shall be returned to the SCF.

When the RACF receives a Process_Unstructured_SS_Request response from the SCF then it shall pass this to the RTF.

ROSE Operation Class:          Class 2

Parameters:

| Name | Type | Usage |
|------|------|-------|
| Request: | | |
| ussd_Data_Coding_Scheme | USSD_Data_Coding_Scheme | M |
| ussd_String | USSD_String | M |
| Response: | | |
| Success: | | |
| ussd_Data_Coding_Scheme | USSD_Data_Coding_Scheme | O |
| ussd_String | USSD_String | O |
| Errors: | | |
| process_Unstructured_SS_Request_Error | see definitions below | M |

Parameter Definitions:

ussd_Data_Coding_Scheme - This parameter contains the information of the alphabet and the language used for the unstructured information in an unstructured supplementary service operation. The coding of this parameter is according to the cell broadcast data coding scheme as specified for SMS cell broadcast in IS-652 Section II Annex D. The presence of the parameter in the response is dependent on the unstructured supplementary service application. If this parameter is present, then the ussd_String parameter shall be present.

ussd_String                - This parameter contains a string of unstructured information in an unstructured supplementary service data operation.
The presence of the parameter in the response is dependent on the unstructured supplementary service application. If this parameter is present, then the USSD_Data_Coding_Scheme parameter shall be present.

Error Definitions:

| | |
|---|---|
| system_Failure | - The task cannot be performed because of a problem in another entity. |
| unexpected_Data_Value | - This error is returned by the responder if it is not able to deal with the contents of the USSD string. |
| call_Barred | - The access to SS has been barred. |
| unknown_Alphabet | - The alphabet or language used for the unstructured information in an unstructured supplementary service data operation is not known by the network. |

**6.3.1.2.11  Ready for SM**

Name:              Ready_for_SM

Direction:                RACF ---> SCF

Description:

This operation is used between the RACF and SCF to indicate that the terminal is ready to receive short messages in situation where earlier delivery attempts have failed due to unreachability of the terminal or the lack of memory capacity in the terminal.

Operational Rules:

The delivery of a short message  to a RTF may fail because the terminal cannot be reached or it lacks sufficient memory capacity to store the message. In each of these cases an appropriate flag will be set in RACF and the home SCF is informed about this situation. The home SCF keeps record of this information to notify the Short Message Service Center (SMSC) when the RTF becomes available for short message delivery.

When RACF detects the radio contact with the terminal (e.g. a location update request) while the RTF not reachable flag is set, the RACF will send the Ready_for_SM request towards the visited SCF. The Alert Reason is set to indicate that the personal subscriber is present. If the authentication procedure is initiated and it fails, the RACF will not initiate the operation.

When memory capacity becomes available in the RTF, the terminal notifies RACF about this. Upon receipt of this notification the RACF initiates the Ready_for_SM request towards the visited SCF. The Alert Reason is set to indicate that the memory is available.

The visited SCF will forward the Ready_for_SM request towards the home SCF, that will notify the SMSC that the terminal has become available for short message delivery. The SMSC in turn will initiate short message delivery to terminal.

ROSE Operation Class:        Class 2

Parameters:

| Name | Type | Usage |
|------|------|-------|
| Request: | | |
| subscriber | IMSI | M |
| alert_Reason | Alert_Reason | M |
| Response: | | |
| Success: | | |
| no parameters | | |
| Errors: | | |
| ready_for_SM_Error | see definitions below | M |

Parameter Definitions:

subscriber                        - This is a unique identity of the user.
alert_Reason                    - This parameter indicates that the RTF is present (i.e. has radio contact with the system) or that it has memory available for short message reception.

Error Definitions:

unknown_Subscriber          - No subscription exists.
facility_Not_Supported      - The requested facility is not supported by the network.

system_Failure            - The task cannot be performed because of a problem in another entity.

unexpected_Data_Value - A data type is formally correct but its value or presence is unexpected in the current context.

**6.3.1.2.12  Register password**

Name:          Register_Password

Direction:          RACF ---> SCF

Description:

This operation is used to request the HSCF to allocate and return a new password for use with SS activation.

Operational Rules:

The password registration procedure is a fully transparent communication between the RTF and the HSCF.

When the RTF initiates the password registration, the RACF transfers the information from RTF to the SCF in the Register_Password request message without checking the contents of the request. Upon receipt of the request the SCF forwards it to HSCF without checking the contents, and then awaits the response from the HSCF.

The HSCF performs the Get_Password  operation to verify the old password and get the new password. Then the HSCF sends Register_Password response.

Upon receipt of the Register_Password response from the HSCF the SCF forwards it to RACF without checking the contents. The RACF will in turn forward the response message to RTF without checking the contents.

ROSE Operation Class:          Class 2

Parameters:

| Name | Type | Usage |
|------|------|-------|
| Request: | | |
| ss_Code | SS_Code | M |
| Response: | | |
| Success: | | |
| new_Password | Password | O |
| Errors: | | |
| register_Password_Error | see definitions below | M |

Parameter Definitions:

| | |
|---|---|
| ss_Code | - This parameter indicates the supplementary service(s) for which the password should be registered. |
| new_Password | - This parameter indicates the new password to be associated with supplementary service(s). |

Error Definitions:

| | |
|---|---|
| ss_Subscription_Violation | - The action requested on the supplementary service is in contradiction with the subscription. |
| pw_Registration_Failure | - There is a failure due to wrong inputs from the subscriber. |
| negative_PW_Check | - The requested password has not been provided or it has been provided but does not match the valid one. |
| number_of_PW_Attempts_Violation | |
| | - The RTF has attempted to access password controlled supplementary services using an erroneous password more than three times. |
| call_Barred | - The access to SS has been barred. |

| system_Failure | - The task cannot be performed because of a problem in another entity. |
| unexpected_Data_Value | - A data type is formally correct but its value or presence is unexpected in the current context. |

**6.3.1.2.13   Register SS**

Name:                 Register_SS

Direction:                        RACF ---> SCF

Description:

This operation is used to register data related to a supplementary service.

Operational Rules:

The SS registration procedure is a fully transparent communication between the RTF and the HSCF.

When the RTF initiates the SS registration, the RACF transfers the information from RTF to the SCF in the Register_SS request message without checking the contents of the request. Upon receipt of the request the SCF forwards it to HSCF without checking the contents, and then awaits the response from the HSCF.

Upon receipt of the Register_SS response the SCF forwards it to RACF without checking the contents. RACF will in turn forward the response message to RTF without checking the contents.

ROSE Operation Class:         Class 2

Parameters:

| Name | Type | Usage |
|------|------|-------|
| Request: | | |
| ss_Code | SS_Code | M |
| basic_Service | Basic_Service_Code | O |
| forwarded_To_Number | Address_String | O |
| forwarded_To_Subaddress | ISDN_SubaddressString | O |
| no_Reply_Condition_Time | No_Reply_Condition_Time | O |
| Response: | | |
| Success: | | |
| fwd_Info | Forwarding_Info | O |
| Errors: | | |
| register_SS_Error | see definitions below | M |

Parameter Definitions:

ss_Code                            - This parameter indicates the supplementary service which the subscriber wants to register.

basic_Service                      - This parameter indicates for which basic service group the supplementary service is to be registered. If it is not included, the registration request applies to all basic services.

forwarded _to_Number              - This parameter is required if the registration applies to one or more call forwarding supplementary services.

forwarded_to _Subaddress          - This parameter is associated with forwarded _to_Number.

no_Reply_Condition_Time           - This parameter is included if the registration applies to the Call Forwarding on No Reply supplementary service (or a superset of this service) and the personal subscriber supplies a value for this time.

fwd_Info                           - This parameter is returned at successful registration, if the registration request concerns one or a group of Call Forwarding supplementary services.

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Error Definitions:

bearer_Service_Not_Provisioned
- The referred bearer service or bearer service group has not been subscribed to.

tele_Service_Not_Provisioned  - The referred the teleservice or teleservice group has not been subscribed to.

illegal_SS_Operation  - The operation violates the rules applicable to the particular supplementary service

ss_Error_Status  - The operation on the supplementary service is incompatible with the current status of the service.

ss_Incompatibility  - An action on one supplementary service is incompatible with the status of another supplementary service.

call_Barred  - Access to SS has been barred.

system_Failure  - The task cannot be performed because of a problem in another entity.

data_Missing  - An optional parameter required by the context is missing.

unexpected_Data_Value  - A data type is formally correct but its value or presence is unexpected in the current context.

### 6.3.1.2.14   Reset

Name:               Reset

Direction:                   RACF <-- SCF

Description:

This operation is used between SCF and RACF to indicate to a list of RACFs that a failure has occurred in SCF.

Operational Rules:

This operation is used by the SCF to indicate to a list of RACFs that a failure has occurred in either home or visited SCF. After receiving this information, RACF sets a flag for each affected mobile to indicate that  the location information  of  the mobile is not confirmed in either home  or visited SCF. When this flag is set, the location update triggered by authenticated  radio contact is sent to SCF (even when  the mobile is previously registered in the same RACF). On successful completion of the location update, this flag is reset.

ROSE Operation Class:          Class 5

Parameters:

| Name | Type | Usage |
|------|------|-------|
| **Request:** | | |
| home_SCF_List | HLR_List | O |
| **Response:** not applicable | | |
| **Success:** | | |
| **Errors:** | | |

Parameter Definitions:

home_SCF_List                  - This is a list identifying home SCFs. If the  parameter is present in the message, the RACF may use this list to restore subscriber data; the subscribers affected by the reset are those whose IMSI leading digits are equal to one of the numbers in the list. If the parameter is absent, all subscribers are to be restored. This parameter may be present only in the case of home SCF reset operation.

**6.3.1.2.15   Restore data**

Name:              Restore_Data

Direction:                   RACF --> SCF

Description:

This operation is used between the RACF and the SCF to restore the subscriber data in the RACF.

Operational Rules:

This operation is invoked by the RACF on receipt of a Provide_Roaming_Number indication for an unknown IMSI. The operation is used to update the LMSI in the SCF if provided, and to notify the SCF to update all data to the RACF that are to be stored in the subscriber's IMSI record.

ROSE Operation Class:          Class 2

Parameters:

| | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | IMSI | M |
| | local_Subscriber | LMSI | O |
| Response: | | | |
| Success: | | | |
| | home_SCF | ISDN_AddressString | O |
| | ps_Not_Reachable | PS_Not_Reachable_Flag | O |
| Errors: | | | |
| | restore_Data_Error | see definitions below | M |

Parameter Definitions:

| | |
|---|---|
| subscriber | - This parameter indicates the unique identity of the PCS subscriber. |
| local_Subscriber | - This parameter indicates the local identity of the subscriber within the RACF for internal management of data. |
| home_SCF | - This parameter indicates the address of the home SCF of the subscriber. |
| ps_Not_Reachable | - This parameter is a flag in visited SCF that indicates if the RTF is reachable. |

Error Definitions:

| | |
|---|---|
| system_Failure | - The task cannot be performed because of a problem in another entity. |
| data_Missing | - An optional parameter required by the context is missing. |
| unexpected_Data_Value | - A data type is formally correct but its value or presence is unexpected in the current context. |
| unknown_Subscriber | - The subscriber data cannot be located or subscription does not exist. |

### 6.3.1.2.16 Unstructured SS notify

Name:               Unstructured_SS_Notify

Direction:               RACF <--- SCF

Description:

This operation is used between the SCF and the RACF when the invoking entity requires a notification to be sent to the RTF in connection with unstructured supplementary services handling.

Operational Rules:

This procedure may be invoked either by the HSCF or by a USSD application local to SCF. In both cases the SCF will send the Unstructured_SS_Notify to the RACF. The RACF will then take the necessary actions and pass the request to the RTF.

Once the response is received from the RTF, the RACF will send the Unstructured_SS_Notify response to the SCF, which then forwards the response to the HSCF or USSD application as appropriate.

ROSE Operation Class:          Class 2

Parameters:

| | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | ussd_Data_Coding_Scheme | USSD_Data_Coding_Scheme | M |
| | ussd_String | USSD_String | M |
| Response: | | | |
| Success: | no parameters | | |
| Errors: | | | |
| | unstructured_SS_Notify_Error | see definitions below | M |

Parameter Definitions:

ussd_Data_Coding_Scheme  - This parameter contains the information of the alphabet and the language used for the unstructured information in an unstructured supplementary service operation. The coding of this parameter is according to the cell broadcast data coding scheme as specified for SMS cell broadcast in IS-652 Section II Annex D.

ussd_String                    - This parameter contains a string of unstructured information in an unstructured supplementary service data operation.

Error Definitions:

system_Failure               - The task cannot be performed because of a problem in another entity.

unexpected_Data_Value    - This error is returned by the responder if it is not able to deal with the contents of the USSD string.

absent_Subscriber           - The subscriber has activated the detach service or the system detects the absence condition.

illegal_Subscriber            - This error indicates that delivery of the unstructured supplementary service data failed because the RTF failed authentication.

illegal_Equipment            - The IMEI check procedure has shown that the IMEI is blacklisted or not whitelisted.

ussd_Busy                    - The RTF is not able to process an unstructured supplementary service data operation due to an on-going user interaction or an already existing call independent supplementary service transaction.

unknown_Alphabet       - The alphabet or language used for the unstructured information in an unstructured supplementary service data operation is not known by the RTF.

### 6.3.1.2.17  Unstructured SS request

Name:          Unstructured_SS_Request

Direction:              RACF <--- SCF

Description:

This operation is used between the SCF and the RACF when the invoking entity requires information from the RTF in connection with unstructured supplementary service handling.

Operational Rules:

This procedure may be invoked either by the HSCF or by a USSD application local to SCF. In both cases the SCF will send the Unstructured_SS_Request to the RACF. The RACF will pass the request to the RTF.

Once the response is received from the RTF, the RACF will send the Unstructured_SS_Request response to the SCF, which then forwards the response to the HSCF or unstructured supplementary service  application as appropriate.

ROSE Operation Class:          Class 2

Parameters:

| | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | ussd_Data_Coding_Scheme | USSD_Data_Coding_Scheme | M |
| | ussd_String | USSD_String | M |
| Response: | | | |
| Success: | | | |
| | ussd_Data_Coding_Scheme | USSD_Data_Coding_Scheme | O |
| | ussd_String | USSD_String | O |
| Errors: | | | |
| | unstructured_SS_Request_Error | see definitions below | M |

Parameter Definitions:

ussd_Data_Coding_Scheme  - This parameter contains the information of the alphabet and the language used for the unstructured information in an Unstructured supplementary service operation. The coding of this parameter is according to the cell broadcast data coding scheme as specified for SMS cell broadcast in IS-652 Section II Annex D. The presence of the parameter in the response is dependent on the RTF's input. If this parameter is present, then the ussd_String parameter shall be present.

ussd_String                        - This parameter contains a string of unstructured information in an unstructured supplementary service data operation. The presence of this parameter in the response is dependent on the RTF's input. If this parameter is present, then the USSD_Data_Coding_Scheme parameter shall be present.

Error Definitions:

system_Failure                  - The task cannot be performed because of a problem in another entity.

unexpected_Data_Value    - This error is returned by the responder if it is not able to deal with the contents of the USSD string.

absent_Subscriber — The subscriber has activated the detach service or the system detects the absence condition.

illegal_Subscriber — This error indicates that delivery of the unstructured supplementary service data failed because the RTF failed authentication.

illegal_Equipment — The IMEI check procedure has shown that the IMEI is blacklisted or not whitelisted.

ussd_Busy — The RTF is not able to process an Unstructured supplementary service data operation due to an on-going input of the user or an already existing call independent supplementary service transaction.

unknown_Alphabet — The alphabet or language used for the unstructured information in an unstructured supplementary service data operation is not known by the RTF.

**6.3.1.2.18   Validate MO SMS**

Name:                Validate_MO_SMS

Direction:                    RACF ---> SCF

Description:

This operation is used to validate the service related parameters for mobile originated short message service.

Operational Rules:

Before the mobile originated short message is to be forwarded to the network the user subscription for short message service is to be validated. Upon receiving this message, the SCF checks the user service profile and either permits or denies the service.

In a successful case the service request is acknowledged to the RACF, which will then forward the short message to the network by using the service center address parameter.

In a validation failure case the short message is discarded by the RACF and the reserved resources are released.

ROSE Operation Class:        Class 2

Parameters:

| Name | Type | Usage |
|------|------|-------|
| Request | | |
| subscriber | IMSI | M |
| service_Center_Address | Address_String | M |
| Response | | |
| Success: | | |
| psISDN | ISDN_Address_String | O |
| Errors: | | |
| validate_MO_SMS _Error | see definitions below | M |

Parameter Definitions:

| subscriber | - This indicates the unique identity of a PCS subscriber. |
| service_Center_Address | - This indicates the address of a short message service center. |
| psISDN | - This indicates the subscriber directory number. |

Error Definitions:

| tele_Service_Not_Provisioned | - Short message service has not been subscribed to. |
| call_Barred | - Short message service has been barred. |
| system_Failure | - The task cannot be performed because of a problem in another entity. |
| unexpected_Data_Value | - A data type is formally correct but its value or presence is unexpected in the current context. |

**6.3.2 RACF <----> RACF operations**

**6.3.2.1 Common operations used by PCS1900**

PCS1900 does not utilize any RACF-to-RACF common operations.

**6.3.2.2 PCS 1900 specific operations**

There are no new PCS1900 specific RACF-to-RACF operations other than those specified in 6.3.3.

**6.3.3 Dialogue control operations**

This clause contains the description of dialogue control operations that may be used for establishment, continuation and termination of MMAP dialogue between peer entities in the RACF-SCF and RACF-RACF communications.

**6.3.3.1 Open**

Name**:** Open

Direction**:** RACF <---> SCF or RACF <---> RACF

Description:

This dialogue control operation is used between RACF and SCF or between RACF and RACF to convey MMAP information when opening a MMAP dialogue. This dialogue control operation may be used for operator specific protocol extension.

Operational Rules**:**

This dialogue control operation may be sent when the MMAP dialogue is initiated.

ROSE OperationClass: not applicable

Parameters:

| Name | Type | Usage |
|------|------|-------|
| destination_Reference | Address_String | O |
| origination_Reference | Address_String | O |

Parameter Definitions:

destination_Reference     - This parameter is a reference which refines the identification of the called process. This parameter is always used when the dialogue is opened for any of the following operations:

        Register_SS
        Erase_SS
        Activate_SS
        Deactivate_SS
        Interrogate_SS
        Register_Password
        Process_Unstructured_SS_Request
        Unstructured_SS_Request
        Unstructured_SS_Notify
        Forward_Short_Message

In these cases this parameter is populated with the unique identity of the PCS subscriber. This parameter is not used with any other operations.

origination_Reference          - This parameter is a reference which refines the identification of the calling process. This parameter is always used when the dialogue is opened for any of the following operations:

      Register_SS
      Erase_SS
      Activate_SS
      Deactivate_SS
      Interrogate_SS
      Register_Password
      Process_Unstructured_SS_Request

In these cases this parameter is populated with the ISDN number of the RACF originating the dialogue control operation. This parameter is not used with any other operations.

### 6.3.3.2  Accept

Name**:**          Accept

Direction**:**                    RACF <--> SCF or RACF <--> RACF

Description**:**

This dialogue control operation is used between  RACF and SCF or between RACF and RACF to convey that MMAP dialogue is accepted. This dialogue control operation may be used for operator specific protocol extension.

Operational Rules**:**

This dialogue control operation may be sent when the MMAP dialogue is accepted.

ROSE Operation Class:          not applicable

Parameters:     None

Parameter Definitions**:** not applicable

### 6.3.3.3  Close

Name**:**          Close

Direction**:**                    RACF <--> SCF or RACF <--> RACF

Description**:**

This dialogue control operation is used between RACF and SCF or between RACF and RACF to convey that MMAP dialogue is being closed. This dialogue control operation may be used for operator specific protocol extension.

Operational Rules**:**

This dialogue control operation may be sent when the MMAP dialogue is terminated.

ROSE Operation Class:          not applicable

Parameters:     None

Parameter Definitions**:** not applicable

### 6.3.3.4  Refuse

Name**:**        Refuse

Direction**:**            RACF <--> SCF or RACF <--> RACF

Description**:**

This dialogue control operation is used between RACF and SCF or between RACF and RACF to convey MMAP information when refusing a MMAP dialogue. This dialogue control operation may be used for operator specific protocol extension.

Operational Rules**:**

This dialogue control operation may be sent when the MMAP dialogue is not accepted.

ROSE Operation Class:        not applicable

Parameters:

| Name | Type | Usage |
|------|------|-------|
| reason | Reason | M |

Parameter Definitions:

reason                         - This parameter indicates the reason for the refusal of the dialogue. It can take on the following values:
>                No reason given
>                Invalid destination reference
>                Invalid originating reference

### 6.3.3.5  User abort

Name**:**        User_Abort

Direction**:**            RACF <--> SCF or RACF <--> RACF

Description**:**

This dialogue control operation is used between RACF and SCF or between RACF and RACF to convey MMAP information when aborting a MMAP dialogue on request of the user. This dialogue control operation may be used for operator specific protocol extension.

Operational Rules**:**

This dialogue control operation is sent when the MMAP dialogue is needs to be aborted by the user. In this dialogue control operation, one and only one of the parameters must be present.

ROSE Operation Class:        not applicable

Parameters:

| Name | Type | Usage |
|------|------|-------|
| user_Specific_Reason | User_Specific_Reason | O |
| user_Resource_Limitation | User_Resource_Limitation | O |
| resource_Unavailable | Resource_Unavailable_Reason | O |
| appl_Procedure_Cancellation | Procedure_Cancellation_Reason | O |

Parameter Definitions:

| | |
|---|---|
| user_Specific_Reason | - The presence of this parameter indicates that the requested user resource is unavailable due to unidentified user specific reason. |
| user_Resource_Limitation | - The presence of this parameter indicates that the requested user resource is unavailable due to congestion. |
| resource_Unavailable | - The presence of this parameter indicates that the requested user resource is unavailable for reasons other than congestion. This parameter can take on the following values: |

short term problem
long term problem

appl_Procedure_Cancellation - The presence of this parameter indicates that the procedure is canceled for reason detailed in the value of the parameter. The parameter can take on the following values:

handover cancellation
radio channel release
network path release
call release
associated procedure failure
tandem dialogue released
remote operations failure

### 6.3.3.6 Provider abort

Name**:**          Provider_Abort

Direction**:**          RACF <--> SCF or RACF <--> RACF

Description**:**

This dialogue control operation is used between RACF and SCF or between RACF and RACF to convey MMAP information  when MMAP decides to abort the  dialogue. This dialogue control operation may be used for operator specific protocol extension.

Operational Rules:

This dialogue control operation may be sent when the MMAP dialogue needs to be aborted.

ROSE Operation Class:          not applicable

Parameters:

| Name | Type | Usage |
|---|---|---|
| provider_Abort_Reason | Provider_Abort_Reason | M |

Parameter Definitions:

provider_Abort_Reason          - This parameter can take on the following values:

abnormal dialogue
invalid PDU

### 6.4  Composite CDMA/TDMA (CCT) operations descriptions

There are no new  operations in CCT.

### 6.5  TDMA operations descriptions

There are no new  operations in TDMA

**6.6   Common operations descriptions**

**6.6.1   RACF <---> SCF operations**

**6.6.1.1   Call indication**

Name:            Call_Indication

Direction:              RACF ---> SCF

Description:

This operation is sent from the RACF to the visited SCF to provide indication at the visited SCF that the call is being or has been established. Such an indication may be used by the visited SCF to mark the busy status of the RTF and is useful in implementation of supplementary service such as Call Forward on Busy. It is also useful for record keeping and billing at the visited SCF.

Operational Rules:

The RACF sends this message when a call is being or has been established. The message shall contain RTF's identity, and may contain the time stamps relatedto call setup and call connection.

ROSE Operation Class:          Class 5

Parameters:

| Name | Type | Usage |
|------|------|-------|
| Request | | |
| subscriber | Subscriber_Id | M |
| terminal | Terminal_Id | O |
| call_Reference | Call_Reference | O |
| setup_Time | Time_Stamp | O |
| connect_Time | Time_Stamp | O |
| channel_Number_List | Channel_Number_List | O |
| interface_DN | Digits | O |

Response       not applicable

            Success:

            Errors:

Parameter Definitions:

| | |
|---|---|
| subscriber | - identifies the subscriber: |
| | MIN: Mobile Identification Number |
| | IMSI: International Mobile Station Identity |
| | TMSI: Temporary Mobile Station Identity |
| terminal | - identifies the terminal (ESN or IMEI). |
| call_Reference | - identifies the party connected in multiparty calls. |
| setup_Time | - time of radio traffic channel establishment. |
| channel_Number_List | - logical number(s) assigned to the equipment providing the traffic channel(s). |
| connect_Time | - time of call connect. |
| interface_DN | - the directory number of the radio system interface. |

**6.6.1.2  Routing request**

This clause replaces  the 6.6.1.13 of T1.651-1996.

Name:        Routing_Request

Direction:        RACF <--- SCF

Description:

This operation is sent from the SCF to the one or more RACFs in the location area to page the visiting subscriber and to inquire as to the preferred method of routing a pending call to the visiting subscriber.

Operational Rules:

When a visited SCF receives a routing request from a home SCF to locate an RTF that is currently registered at the visited SCF according to home SCF's records, it checks its internal tables to determine the call activity status of the indicated RTF (e.g., is the subscriber active on a call?)  If the SCF determines that the RTF is not active on a call, it sends the Routing_Request to the RACF where the RTF is currently registered according to the SCF's records. Otherwise call waiting procedures may be invoked.

When an RACF receives the Routing_Request from the SCF, it shall initiate paging of the RTF. Where a paging response is received from the RTF, an interface DN shall be assigned, and identified in the response to the SCF. Where no paging response is received from the RTF, the RACF shall respond to the SCF with the Access_Denied_Reason set to "No Page Response". Optionally, the Qualification_Request  message may be sent in response to the Routing_Request message.

ROSE Operation Class:            Class 2

Parameters:

| Name | Type | Usage |
|------|------|-------|
| **Request:** | | |
| subscriber | Subscriber_ID | M |
| billing | Billing_ID | M |
| scf | Node_ID | O |
| terminal | Terminal_ID | O |
| location_Area | Location_Area_ID | O |
| alert_Identifier | Alert_Value | O |
| station_Class_Mark | Class_Mark | O |
| slot_Cycle_Index | Slot_Cycle_Index | O |
| mobile_Protocol_Revision | Mobile_Protocol_Revision | O |
| service_Option | Service_Option | O |
| mobile_Bearer_Reqs | Mobile_Bearer_Characteristics | O |
| paging_Frame_Class | Paging_Frame_Class | O |
| cell_Identifier | Cell_Id | O |
| **Response:** | | |
| **Success:** | | |
| racf | Node_ID | O |
| access_Denied | Access_Denied_Reason | O |
| routing_Number | Digits | O |
| **Errors:** | | |
| routing_Request_Error | Error_code | M |
| cause | Cause | O |
| parameter_In_Error | Faulty_Parameter | O |

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Parameter Definitions:

| | |
|---|---|
| subscriber | - dentifies the subscriber: |
| | MIN: Mobile Identification Number |
| | IMSI: International Mobile Station Identity |
| | TMSI: Temporary Mobile Station Identity |
| billing | - billing identifier |
| scf | - identifies the  originating SCF |
| terminal | - identifies the terminal (ESN or IMEI) |
| location_Area | - identifies the present location area of the RTF |
| alert_Identifier | - identifies the current temporary RTF alias for alerting |
| station_Class_Mark | - RTF-specific operating parameters (e.g., mob_term, slotted_mode) |
| slot_Cycle_Index | - contains the index used for slotted paging |
| mobile_Protocol_Revision | - contains the protocol version of the RTF |
| service_Option | - contains the type of service requested by the RTF |
| mobile_Bearer_Reqs | - identifies the mobile bearer capabilities required for data services |
| paging_Frame_Class | - defines the length of the sleep mode |
| cell_identifier | - identifies the cell |
| racf | - identifies the RACF |
| access_Denied | - indicates the reason access is denied |
| routing_Number | - identifies the destination of the call |
| routing_Request_Error | - identifies an error |
| cause | - provides additional information regarding the failure |
| parameter_In_Error | - a parameter in error |

Error Definitions:

| | |
|---|---|
| Error_Code | - this can be one of the following values: |
| | Unrecognized_MIN |
| | Unrecognized_ESN |
| | MIN_HLR_Mismatch |
| | Operation_Sequence_Problem |
| | Resource_Shortage |
| | Operation_Not_Supported |
| | Trunk_Unavailable |
| | Parameter_Error |
| | System_Failure |
| | Unrecognized_Parameter_Value |
| | Feature_Inactive |
| | Missing_Parameter |
| | Requested_Information_Unavailable |
| Cause | - see IS-651 Part IIIb |
| Faulty_Parameter | - see IS-41C |

## 6.6.2  RACF <---> RACF operations

There are no new RACF-to-RACF common operations.

## 7 ASN

Object identifiers are assigned to each module and each ASE. The MMAP object identifiers assigned in this supplement are given below:

CDMA:

MMAP-CDMA-abstract-syntax-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) cdma (2) abstract-syntax-module (1) v(2)}

MMAP-CDMA--abstract-service-elements-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) cdma (2)  ase-module (2) v(2)}

mMAP-CDMA-RACF-RACF-ASE
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) cdma (2) ase-module (2) v(2) racf-racf-ase (1) v(1)}

PCS1900:

MMAP-PCS1900-abstract-syntax-module-v2
{iso (1) member-body (2) uSA (840) mmap (10042) pcs1900 (3) abstract-syntax-module (1) v(2)}

MMAP-DialogueInformation
{iso (1) member-body (2) uSA (840) mmap (10042) pcs1900 (3) dialogue-information (3) v(1)}

mmap-DialogueAS
{iso (1) member-body (2) uSA (840) mmap (10042) pcs1900 (3) Dialogue-AS (4) v(1)}

MMAP-PCS1900--abstract-service-elements-module-v2
{iso (1) member-body (2) uSA (840) mmap (10042) pcs1900 (3)  ase-module (2) v(2)}

mMAP-PCS1900-RACF-SCF-ASE
{iso (1) member-body (2) uSA (840) mmap (10042) pcs1900 (3) ase-module (2) v(2) racf-scf-ase (1) v(1)}

mMAP-PCS1900-RACF-RACF-ASE
{iso (1) member-body (2) uSA (840) mmap (10042) pcs1900 (3) ase-module (2) v(2) racf-racf-ase (2) v(1)}

mMAP-PCS1900-RACF-SCF-SUPPLEMENT-ASE
{iso (1) member-body (2) uSA (840) mmap (10042) pcs1900 (3) ase-module (2) v(2) racf-scf-supplement-ase (3) v(1)}

CCT:

MMAP-CCT-abstract-syntax-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) cct (4) abstract-syntax-module (1) v(2)}

MMAP-CCT--abstract-service-elements-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) cct (4)  ase-module (2) v(2)}

mMAP-CCT-RACF-RACF-ASE
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) cct (4) ase-module (2) v(2) racf-racf-ase (1) v(1)}

Common:

MMAP-COMMON-abstract-syntax-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) common (0) abstract-syntax-module (1) v(2)}

MMAP-COMMON--abstract-service-elements-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) common (0)  ase-module (2) v(2)}

mMAP-COMMON-RACF-SCF-ASE
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) common (0) ase-module (2) v(2) racf-scf-ase (1) v(1)}

## 7.1  PACS ASN

### 7.1.1  PACS abstract syntax

There is no specific abstract syntax for PACS. PACS is supported by the common abstract syntax.

### 7.1.2  PACS ASEs

There are no specific ASEs for PACS. PACS is supported by the common ASEs.

## 7.2  CDMA ASN

### 7.2.1  CDMA abstract syntax

MMAP-CDMA-abstract-syntax-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) cdma (2) abstract-syntax-module (1) v(2)}

DEFINITIONS  ::=

BEGIN

EXPORTS

-- data types

CellID,
ChannelNumberList,

-- operation values

cdmaFacilitiesDirective3;

IMPORTS

OPERATION,
ERROR

FROM Remote-Operations-Notation
{joint-iso-ccitt remote-operations(4) notation(0)};

BillingID,
Classmark,
Digits,
MobileProtocolRevision,
PrivateLongCodeMask,
RacfNodeID,
SignalingMessageEncryptionKey,
SubscriberID,
TerminalID

FROM MMAP-COMMON-abstract-syntax-module
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) common (0) abstract-syntax-module (1)
    v(1)};


ErrorCode,
ErrorParameter

FROM MMAP-COMMON-abstract-syntax-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) common (0) abstract-syntax-module (1)
    v(2)};



-- CDMA RACF to RACF operations

CDMAFacilitiesDirective3  ::=
                            OPERATION
                            ARGUMENT     CDMAFacilitiesDirective3Argument
                            RESULT       CDMAFacilitiesDirective3Result
                            ERRORS       CDMAFacilitiesDirective3Error

CDMAFacilitiesDirective3Argument  ::=  SEQUENCE
  {
    billingID                                      BillingID
    subscriber              [0]                    SubscriberID                              OPTIONAL,
    terminal                [1]                    TerminalID                                OPTIONAL,
    stationClassMark        [2]    IMPLICIT        ClassMark                                 OPTIONAL,
    mobileProtocolRevision  [3]    IMPLICIT        MobileProtocolRevision                    OPTIONAL,
    servingCellID           [4]    IMPLICIT        CellID                                    OPTIONAL,
    servingOneWayDelay      [5]    IMPLICIT        OneWayDelay                               OPTIONAL,
    servingChannelData      [6]    IMPLICIT        ChannelData                               OPTIONAL,
    targetMAHOList          [7]    IMPLICIT        TargetMAHOList                            OPTIONAL,
    subrateChannelIDList    [8]    IMPLICIT        SubrateChannelIDList                      OPTIONAL,
    desiredConfidentiality  [9]    IMPLICIT        ConfidentialityModes                      OPTIONAL,
    smeKey                  [10]   IMPLICIT        SignalingMessageEncryptionKey             OPTIONAL,
    mask                    [11]   IMPLICIT        PrivateLongCodeMask                       OPTIONAL,
    handoffReason           [12]   IMPLICIT        HandoffReason                             OPTIONAL,
    handoffMode             [13]   IMPLICIT        HandoffMode                               OPTIONAL,
    priority                [14]   IMPLICIT        Priority                                  OPTIONAL,
    terminalLocation        [15]   IMPLICIT        Coordinates                               OPTIONAL,
    transcoderMode          [16]   IMPLICIT        TranscoderMode                            OPTIONAL,
    servingCellIDList       [17]   IMPLICIT        CellIDList                                OPTIONAL,
    reqServiceConfigRec     [18]   IMPLICIT        ServiceConfigurationRecord                OPTIONAL,
    reqServiceOptionList    [19]   IMPLICIT        ServiceOptionList                         OPTIONAL,
    bandClass               [20]   IMPLICIT        BandClass                                 OPTIONAL,
    bandClassList           [21]   IMPLICIT        BandClassList                             OPTIONAL,
    privateParameters       [22]   IMPLICIT        PrivateParameters                         OPTIONAL}


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```
CDMAFacilitiesDirective3Result  ::=  SEQUENCE
  {
    interfaceDN              [0]    IMPLICIT     Digits                          OPTIONAL,
    subrateChannelIDList     [1]    IMPLICIT     SubrateChannelIDList            OPTIONAL,
    targetChannelData        [2]    IMPLICIT     ChannelData                     OPTIONAL,
    codeChannelList          [3]    IMPLICIT     CodeChannelList                 OPTIONAL,
    channelNumberList        [4]    IMPLICIT     ChannelNumberList               OPTIONAL,
    actualConfidentiality    [5]    IMPLICIT     ConfidentialityModes            OPTIONAL,
    handoffPowerLevel        [6]    IMPLICIT     HandoverPowerLevel              OPTIONAL,
    neighborList             [7]    IMPLICIT     NeighborList                    OPTIONAL,
    hardHandoffParameters    [8]    IMPLICIT     HardHandoffParameters           OPTIONAL,
    forwardPowerControl      [9]    IMPLICIT     ForwardPowerControlParams       OPTIONAL,
    transcoderHandoffTime    [10]   IMPLICIT     TranscoderHandoffTime           OPTIONAL,
    respServiceConfigRec     [11]   IMPLICIT     ServiceConfigurationRecord      OPTIONAL,
    respServiceOptionList    [12]   IMPLICIT     ServiceOptionList               OPTIONAL,
    privateParameters        [13]   IMPLICIT     PrivateParameters               OPTIONAL}

CDMAFacilitiesDirective3Error  ::=
                        ErrorCode
                        PARAMETER  ErrorParameter


-- CDMA Data Types


BandClass  ::=            OCTET STRING    --  CDMABandClass as defined in IS-41C TSB76

BandClassList  ::=       OCTET STRING    --  CDMABandClassList as defined in IS-41C TSB76

CellID  ::=              OCTET STRING    --  ServingCellID as defined in IS-41C

CellIDList  ::=          SEQUENCE OF CellID

ChannelData  ::=         OCTET STRING    --  CDMAChannelData as defined in IS-41C

ChannelNumberList  ::=   OCTET STRING    --  Channel Number as defined in TSB80

CodeChannelList  ::=     OCTET STRING    --  CDMACodeChannelList as defined in IS-41C

ConfidentialityModes  ::=  OCTET STRING  --  ConfidentialityModes as defined in IS-41C

Coordinates  ::=         OCTET STRING    --  MSLocation as defined in IS-41C

ExtHandoffDirectionParams  ::=  OCTET STRING  --  Extended Handoff Direction Parameters as
                                                  defined in TSB80

ForwardPowerControlParams  ::=  OCTET STRING  --  Forward Power Control Parameters as
                                                  defined in TSB80

HandoffPowerLevel  ::=   OCTET STRING    --  Handoff Power Level as defined in TSB80

HandoffReason  ::=       OCTET STRING    --  HandoffReason as defined in IS-41C
```

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```
HandoffMode ::=              ENUMERATED
{
    hoNotAcceptable            (0),
    hardHOAnalogReq            (1),
    hardHOCDMAReq              (2),
    hardHOCDMAAnalogReq        (3),
    softHOReq                  (4),
    softHardAnalogHOReq        (5),
    softHardCDMAHOReq          (6),
    softHardCDMAAnalogHOReq  (7)}
```

HardHandoffParameters  ::=  OCTET STRING     –   Hard Handoff Parameters as defined in TSB80

NeighborConfig  ::=  OCTET STRING    –    NGHBR-CONFIG as defined in ANSI J-STD-008

```
NeighborInformation  ::=  SEQUENCE
  {
    neighborPN           [0]   IMPLICIT    NeighborPN                          OPTIONAL,
    neighborConfig       [1]   IMPLICIT    NeighborConfig                      OPTIONAL,
    pilotInc             [2]   IMPLICIT    PilotInc                            OPTIONAL,
    sID                  [3]   IMPLICIT    Sid                                 OPTIONAL,
    nID                  [4]   IMPLICIT    Nid                                 OPTIONAL,
    racfAddress          [5]   IMPLICIT    RacfNodeID                          OPTIONAL,
    extHandoffDirParams  [6]   IMPLICIT    ExtHandoffDirectionParams           OPTIONAL}
```

NeighborList  ::=              SEQUENCE OF NeighborInformation

NeighborPN  ::=              OCTET STRING    –    NGHBR_PN as defined in ANSI J-STD-008

Nid  ::=                     OCTET STRING    –    NID as defined in ANSI J-STD-008

OneWayDelay  ::=             OCTET STRING    –    CDMAOneWayDelay as defined in IS-41C

PilotInc  ::=               OCTET STRING    –    PILOT_INC as defined in ANSI J-STD-008

Priority  ::=              OCTET STRING    –    Priority as defined in TSB80

PrivateParameters ::=      OCTET STRING    –    PrivateParameters as defined in TSB80

ServiceConfigurationRecord  ::=  OCTET STRING   –   CDMAServiceConfigurationRecord as defined
                                                    in IS-41C TSB76

ServiceOptionList  ::=      OCTET STRING    –    CDMAServiceOptionList as defined in IS-41C
                                                TSB76

Sid  ::=                    OCTET STRING    –    SID as defined in ANSI J-STD-008

SubrateChannelIDList  ::=    OCTET STRING    –    Circuit Identity Code Extension as defined
                                                in TSB80

TargetMAHOList  ::=         OCTET STRING    –    TargetMAHOList as defined in IS-41C

TranscoderHandoffTime  ::=  OCTET STRING    –    Transcoder Handoff Time as defined in TSB80

TranscoderMode  ::=         OCTET STRING    –    Transcoder Mode as defined in TSB80

-- CDMA Error Definitions

| | | | |
|---|---|---|---|
| unrecognizedMIN | UnrecognizedMIN | ::= localValue | 1 |
| unrecognizedESN | UnrecognizedESN | ::= localValue | 2 |
| minHLRMismatch | MINHLRMismatch | ::= localValue | 3 |
| operationRequestProblem | OperationRequestProblem | ::= localValue | 4 |
| resourceShortage | ResourceShortage | ::= localValue | 5 |
| operationNotSupported | OperationNotSupported | ::= localValue | 6 |
| trunkUnavailable | TrunkUnavailable | ::= localValue | 7 |
| parameterError | ParameterError | ::= localValue | 8 |
| systemFailure | SystemFailure | ::= localValue | 9 |
| unrecognizedParameterValue | UnrecognizedParameterValue | ::= localValue | 10 |
| featureInactive | FeatureInactive | ::= localValue | 11 |
| missingParameter | MissingParameter | ::= localValue | 12 |
| requestedInformationUnavailable | RequestedInformationUnavailable | ::= localValue | 13 |

-- CDMA Operation Values

| | | | |
|---|---|---|---|
| cdmaFacilitiesDirective3 | CDMAFacilitiesDirective3 | ::= localValue | 20 |

END

## 7.2.2  CDMA ASEs

MMAP-CDMA--abstract-service-elements-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) cdma (2)  ase-module (2) v(2)}

DEFINITIONS  ::=

BEGIN

EXPORTS      mMAP-CDMA-RACF-RACF-ASE;

IMPORTS

cdmaFacilitiesDirective3

FROM
MMAP-CDMA-abstract-syntax-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) cdma (2) abstract-syntax-module (1) v(2)};

APPLICATION-SERVICE-ELEMENT

FROM
Remote-Operations-Notation
{joint-iso-ccitt remote-operations(4) notation-extension(2)};

MMAP-CDMA-RACF-RACF-ASE ::=  APPLICATION-SERVICE-ELEMENT

OPERATIONS                    -- RACF invokes
  {
  cdmaFacilitiesDirective3}

mMAP-CDMA-RACF-RACF-ASE  ::=  MMAP-CDMA-RACF-RACF-ASE
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) cdma (2) ase-module (2) v(2) racf-racf-
    ase (1) v(1)}

END

### 7.3 PCS1900 ASN

The object identifier tree in the following figure shows the leaf nodes for the PCS1900 extensions (Dialogue Info, Dialogue AS, racf_scf_ase, racf_racf_ase, and racf_scf_supp_ase) defined in this supplement.
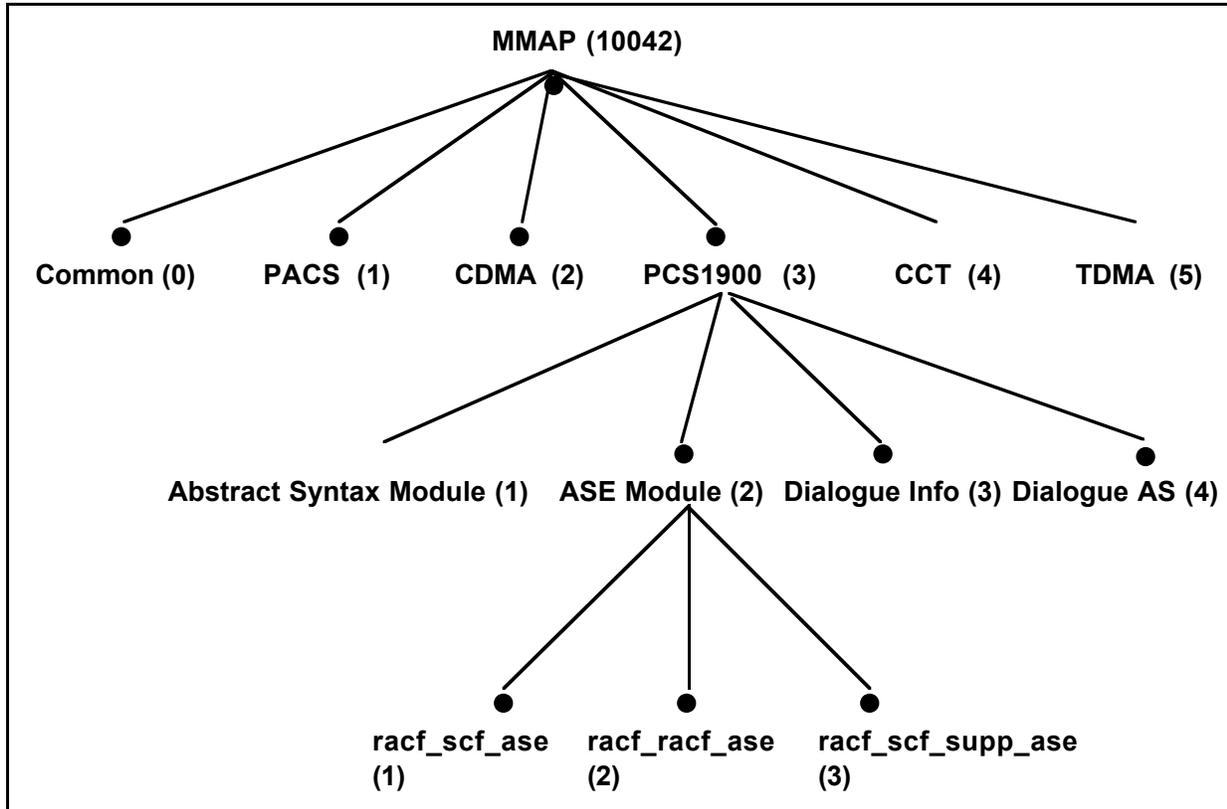


**Figure 1 – MMAP object identifier tree for PCS1900**

### 7.3.1 PCS1900 abstract syntax

MMAP-PCS1900-abstract-syntax-module-v2
{iso (1) member-body (2) uSA (840) mmap (10042) pcs1900 (3) abstract-syntax-module (1) v(2)}

DEFINITIONS  ::=

BEGIN

EXPORTS

-- RACF-to-SCF operations

    -- MMAP V1 operations

authenticationInformationRequest,
cancelLocationRequest,
completeCall,
provideRoamingNumber,
purgeUser,
updateLocationRequest,
validateOutgoingCall,

    -- MMAP V2 operations

reset,
forwardCheckSS-Indication,
restoreData,
activateTraceMode,
deactivateTraceMode,
registerSS,
eraseSS,
activateSS,
deactivateSS,
interrogateSS,
processUnstructuredSS-Request,
unstructuredSS-Request,
unstructuredSS-Notify,
registerPassword,
getPassword,
forwardSM,
readyForSM,
validateMoSMS,

-- RACF-to-RACF operations

forwardAccessSignaling,
prepareHandover,
prepareSubsequentHandover,
processAccessSignaling,
sendEndSignal,
sendIdentification;

IMPORTS

OPERATION,
ERROR

FROM Remote-Operations-Notation
{joint-iso-ccitt remote-operations(4) notation(0)};

      -- RACF-to-SCF operations

authenticationInformationRequest,
cancelLocationRequest,
completeCall,
provideRoamingNumber,
purgeUser,
updateLocationRequest,
validateOutgoingCall,

-- RACF-to-RACF operations

forwardAccessSignaling,
prepareHandover,
prepareSubsequentHandover,
processAccessSignaling,
sendEndSignal,
sendIdentification

FROM MMAP-PCS1900-abstract-syntax-module
{iso (1) member-body (2) uSA (840) mmap (10042) pcs1900 (3) abstract-syntax-module (1) v(1)};

SystemFailure,
DataMissing,
UnexpectedDataValue,
FacilityNotSupported,
UnknownSubscriber,
UnidentifiedSubscriber,
IllegalSubscriber,
IllegalEquipment,
BearerServiceNotProvisioned,
TeleserviceNotProvisioned,
TracingBufferFull,
AbsentSubscriber,
CallBarred,
IllegalSS-Operation,
SS-ErrorStatus,
SS-NotAvailable,
SS-SubscriptionViolation,
SS-Incompatibility,
UnknownAlphabet,
USSD-Busy,
PW-RegistrationFailure,
NegativePW-Check,
NumberOfPW-AttemptsViolation,
SubscriberBusyForMT-SMS,
SM-DeliveryFailure

FROM MAP-Errors
{0 4 0 mobileDomain (0) pcs-Network (1) modules (3) map-Errors (10) version2 (2)};

RegisterSS-Arg,
SS-Info,
SS-ForBS-Code,
InterrogateSS-Res,
SS-UserData,
USSD-Arg,
USSD-Res,
Password,
GuidanceInfo,
BeginSubscriberActivityArg

FROM MAP-SS-DataTypes
{0 4 0 mobileDomain (0) pcs-Network (1) modules (3) map-SS-DataTypes (14) version2 (2)};

SS-Code

FROM MAP-SS-Code
{0 4 0 mobileDomain (0) pcs-Network (1) modules (3) map-SS-Code (15) version2 (2)};

ActivateTraceModeArg,
DeactivateTraceModeArg

FROM MAP-OM-DataTypes
{0 4 0 mobileDomain (0) pcs-Network (1) modules (3) map-OM-DataTypes (12) version2 (2)};

ForwardSM-Arg,
ReadyForSM-Arg

FROM MAP-SM-DataTypes
{0 4 0 mobileDomain (0) pcs-Network (1) modules (3) map-SM-DataTypes (16) version2 (2)};

ResetArg,
RestoreDataArg,
RestoreDataRes

FROM MAP-MS-DataTypes
{0 4 0 mobileDomain (0) pcs-Network (1) modules (3) map-MS-DataTypes (11) version2 (2)};

IMSI,
AddressString

FROM MAP-CommonDataTypes
{ 0 4 0  mobileDomain (0) pcs-Network(1) modules (3) map-CommonDataTypes (18) version2 (2)};

authenticationInformationRequest::=
                          MMAP-PCS1900-abstract-syntax-
module.authenticationInformationRequest

cancelLocationRequest        ::= MMAP-PCS1900-abstract-syntax-module.cancelLocationRequest

completeCall                 ::= MMAP-PCS1900-abstract-syntax-module.completeCall

provideRoamingNumber         ::= MMAP-PCS1900-abstract-syntax-module.provideRoamingNumber

purgeUser                    ::= MMAP-PCS1900-abstract-syntax-module.purgeUser

updateLocationRequest        ::= MMAP-PCS1900-abstract-syntax-module.updateLocationRequest

validateOutgoingCall         ::= MMAP-PCS1900-abstract-syntax-module.validateOutgoingCall

forwardAccessSignaling       ::= MMAP-PCS1900-abstract-syntax-module.forwardAccessSignaling

prepareHandover              ::= MMAP-PCS1900-abstract-syntax-module.prepareHandover

prepareSubsequentHandover ::= MMAP-PCS1900-abstract-syntax-module.prepareSubsequentHandover

processAccessSignaling       ::= MMAP-PCS1900-abstract-syntax-module.processAccessSignaling

sendEndSignal                ::= MMAP-PCS1900-abstract-syntax-module.sendEndSignal

sendIdentification           ::= MMAP-PCS1900-abstract-syntax-module.sendIdentification

-- operation codes

| | | |
|---|---|---|
| reset | Reset | ::= localValue 37 |
| forwardCheckSS-Indication | ForwardCheckSS-Indication | ::= localValue 38 |
| restoreData | RestoreData | ::= localValue 57 |
| activateTraceMode | ActivateTraceMode | ::= localValue 50 |
| deactivateTraceMode | DeactivateTraceMode | ::= localValue 51 |
| registerSS | RegisterSS | ::= localValue 10 |
| eraseSS | EraseSS | ::= localValue 11 |
| activateSS | ActivateSS | ::= localValue 12 |
| deactivateSS | DeactivateSS | ::= localValue 13 |
| interrogateSS | InterrogateSS | ::= localValue 14 |
| processUnstructuredSS-Request | ProcessUnstructuredSS-Request | ::= localValue 59 |
| unstructuredSS-Request | UnstructuredSS-Request | ::= localValue 60 |
| unstructuredSS-Notify | UnstructuredSS-Notify | ::= localValue 61 |
| registerPassword | RegisterPassword | ::= localValue 17 |
| getPassword | GetPassword | ::= localValue 18 |
| forwardSM | ForwardSM | ::= localValue 46 |
| readyForSM | ReadyForSM | ::= localValue 66 |
| validateMoSMS | ValidateMoSMS | ::= localValue 5 |

-- error codes

| | | |
|---|---|---|
| systemFailure | SystemFailure | ::= localValue 34 |
| dataMissing | DataMissing | ::= localValue 35 |
| unexpectedDataValue | UnexpectedDataValue | ::= localValue 36 |
| facilityNotSupported | FacilityNotSupported | ::= localValue 21 |
| unknownSubscriber | UnknownSubscriber | ::= localValue 1 |
| unidentifiedSubscriber | UnidentifiedSubscriber | ::= localValue 5 |
| illegalSubscriber | IllegalSubscriber | ::= localValue 9 |
| illegalEquipment | IllegalEquipment | ::= localValue 12 |
| bearerServiceNotProvisioned | BearerServiceNotProvisioned | ::= localValue 10 |
| teleserviceNotProvisioned | TeleserviceNotProvisioned | ::= localValue 11 |
| tracingBufferFull | TracingBufferFull | ::= localValue 40 |
| absentSubscriber | AbsentSubscriber | ::= localValue 27 |
| callBarred | CallBarred | ::= localValue 13 |
| illegalSS-Operation | IllegalSS-Operation | ::= localValue 16 |
| ss-ErrorStatus | SS-ErrorStatus | ::= localValue 17 |
| ss-NotAvailable | SS-NotAvailable | ::= localValue 18 |
| ss-SubscriptionViolation | SS-SubscriptionViolation | ::= localValue 19 |
| ss-Incompatibility | SS-Incompatibility | ::= localValue 20 |
| unknownAlphabet | UnknownAlphabet | ::= localValue 71 |
| ussd-Busy | USSD-Busy | ::= localValue 72 |
| pw-RegistrationFailure | PW-RegistrationFailure | ::= localValue 37 |
| negativePW-Check | NegativePW-Check | ::= localValue 38 |
| numberOfPW-AttemptsViolation | NumberOfPW-AttemptsViolation | ::= localValue 43 |
| subscriberBusyForMT-SMS | SubscriberBusyForMT-SMS | ::= localValue 31 |
| sm-DeliveryFailure | SM-DeliveryFailure | ::= localValue 32 |

-- operations

Reset ::= OPERATION
        ARGUMENT    ResetArg

ForwardCheckSS-Indication ::= OPERATION

```
RestoreData ::= OPERATION
        ARGUMENT    RestoreDataArg
        RESULT      RestoreDataRes
        ERRORS {
                SystemFailure,
                DataMissing,
                UnexpectedDataValue,
                UnknownSubscriber}


-- O&M related operations

ActivateTraceMode ::= OPERATION
        ARGUMENT    ActivateTraceModeArg
        RESULT
        ERRORS {
                SystemFailure,
                DataMissing,
                UnexpectedDataValue,
                FacilityNotSupported,
                UnidentifiedSubscriber,
                TracingBufferFull}


DeactivateTraceMode ::= OPERATION
        ARGUMENT    DeactivateTraceModeArg
        RESULT
        ERRORS {
                SystemFailure,
                UnexpectedDataValue,
                FacilityNotSupported,
                UnidentifiedSubscriber}


-- supplementary service handling operations

RegisterSS ::= OPERATION
        ARGUMENT    RegisterSS-Arg
        RESULT      SS-Info
                -- optional
        ERRORS {
                SystemFailure,
                DataMissing,
                UnexpectedDataValue,
                BearerServiceNotProvisioned,
                TeleserviceNotProvisioned,
                CallBarred,
                IllegalSS-Operation,
                SS-ErrorStatus,
                SS-Incompatibility}
```

```
EraseSS ::= OPERATION
        ARGUMENT    SS-ForBS-Code
        RESULT          SS-Info
                -- optional
        ERRORS {
                SystemFailure,
                DataMissing,
                UnexpectedDataValue,
                BearerServiceNotProvisioned,
                TeleserviceNotProvisioned,
                CallBarred,
                IllegalSS-Operation,
                SS-ErrorStatus
}

ActivateSS ::= OPERATION
        ARGUMENT    SS-ForBS-Code
        RESULT          SS-Info
                -- optional
        ERRORS {
                SystemFailure,
                DataMissing,
                UnexpectedDataValue,
                BearerServiceNotProvisioned,
                TeleserviceNotProvisioned,
                CallBarred,
                IllegalSS-Operation,
                SS-ErrorStatus,
                SS-SubscriptionViolation,
                SS-Incompatibility,
                NegativePW-Check,
                NumberOfPW-AttemptsViolation}

DeactivateSS ::= OPERATION
        ARGUMENT    SS-ForBS-Code
        RESULT          SS-Info
                -- optional
        ERRORS {
                SystemFailure,
                DataMissing,
                UnexpectedDataValue,
                BearerServiceNotProvisioned,
                TeleserviceNotProvisioned,
                CallBarred,
                IllegalSS-Operation,
                SS-ErrorStatus,
                SS-SubscriptionViolation,
                SS-incompatibility,
                NegativePW-Check,
                NumberOfPW-AttemptsViolation}
```

```
InterrogateSS ::= OPERATION
        ARGUMENT    SS-ForBS-Code
        RESULT      InterrogateSS-Res
        ERRORS {
                SystemFailure,
                DataMissing,
                UnexpectedDataValue,
                BearerServiceNotProvisioned,
                TeleserviceNotProvisioned,
                CallBarred,
                IllegalSS-Operation,
                SS-NotAvailable}

ProcessUnstructuredSS-Request ::= OPERATION
        ARGUMENT    USSD-Arg
        RESULT      USSD-Res
        ERRORS {
                SystemFailure,
                UnexpectedDataValue,
                UnknownAlphabet,
                CallBarred}

UnstructuredSS-Request ::= OPERATION
        ARGUMENT    USSD-Arg
        RESULT      USSD-Res
                -- optional
        ERRORS {
                SystemFailure,
                UnexpectedDataValue,
                AbsentSubscriber,
                IllegalSubscriber,
                IllegalEquipment,
                UnknownAlphabet,
                USSD-Busy}

UnstructuredSS-Notify ::= OPERATION
        ARGUMENT    USSD-Arg
        RESULT
        ERRORS {
                SystemFailure,
                UnexpectedDataValue,
                AbsentSubscriber,
                IllegalSubscriber,
                IllegalEquipment,
                UnknownAlphabet,
                USSD-Busy}
```

```
RegisterPassword ::= OPERATION
        ARGUMENT    SS-Code
        RESULT      Password
        ERRORS {
                SystemFailure,
                DataMissing,
                UnexpectedDataValue,
                CallBarred,
                SS-SubscriptionViolation,
                PW-RegistrationFailure,
                NegativePW-Check,
                NumberOfPW-AttemptsViolation}
        LINKED {
                GetPassword}

GetPassword ::= OPERATION
        ARGUMENT    GuidanceInfo
        RESULT      Password

-- short message service handling operations

ForwardSM ::= OPERATION
        ARGUMENT    ForwardSM-Arg
        RESULT
        ERRORS {
                SystemFailure,
                DataMissing,
                UnexpectedDataValue,
                FacilityNotSupported,
                UnidentifiedSubscriber,
                IllegalSubscriber,
                IllegalEquipment,
                AbsentSubscriber,
                SubscriberBusyForMT-SMS,
                SM-DeliveryFailure}

ReadyForSM ::= OPERATION
        ARGUMENT    ReadyForSM-Arg
        RESULT
        ERRORS {
                SystemFailure,
                UnexpectedDataValue,
                FacilityNotSupported,
                UnknownSubscriber}

ValidateMoSMS ::= OPERATION
        ARGUMENT    ValidateMoSMS-Arg
        RESULT
        ERRORS {
                UnexpectedDataValue,
                TeleserviceNotProvisioned,
                CallBarred}
```

```
ValidateMoSMS-Arg ::= SEQUENCE {
            subscriber        IMSI,
            serviceCenterAddress  AddressString
        }

END

MMAP-DialogueInformation
{iso (1) member-body (2) uSA (840) mmap (10042) pcs1900 (3) dialogue-information (3) v(1)}

DEFINITIONS

IMPLICIT TAGS ::=

BEGIN

EXPORTS
        mmap-DialogueAS,
        MMAP-DialoguePDU;

IMPORTS

        AddressString

FROM MAP-CommonDataTypes
{ 0 4 0  mobileDomain (0) pcs-Network(1) modules (3) map-CommonDataTypes (18) version2 (2)};

mmap-DialogueAS  OBJECT IDENTIFIER ::=
{iso (1) member-body (2) uSA (840) mmap (10042) pcs1900 (3) Dialogue-AS (4) v(1)}

MMAP-DialoguePDU ::= CHOICE {
        open          [0] OpenInfo,
        accept        [1] AcceptInfo,
        close         [2] CloseInfo,
        refuse        [3] RefuseInfo,
        userAbort     [4] UserAbortInfo,
        providerAbort [5] ProviderAbortInfo}

OpenInfo ::= SEQUENCE {
        destinationReference  [0] AddressString       OPTIONAL,
        originationReference  [1] AddressString       OPTIONAL,
        ...}

AcceptInfo ::= SEQUENCE {
        ...}

CloseInfo ::= SEQUENCE {
        ...}

RefuseInfo ::= SEQUENCE {
        reason Reason,
        ...}

Reason ::= ENUMERATED {
        noReasonGiven                 (0),
        invalidDestinationReference   (1),
        invalidOriginatingReference   (2)}
```

```
UserAbortInfo ::= SEQUENCE {
        map-UserAbortChoice  UserAbortChoice,
        ...}

UserAbortChoice ::= CHOICE {
        userSpecificReason                [0] NULL,
        userResourceLimitation            [1] NULL,
        resourceUnavailable               [2] ResourceUnavailableReason,
        applicationProcedureCancellation  [3] ProcedureCancellationReason}

ResourceUnavailableReason ::= ENUMERATED {
        shortTermResourceLimitation     (0),
        longTermResourceLimitation      (1)}

ProcedureCancellationReason ::= ENUMERATED {
        handoverCancellation            (0),
        radioChannelRelease             (1),
        networkPathRelease              (2),
        callRelease                     (3),
        associatedProcedureFailure      (4),
        tandemDialogueRelease           (5),
        remoteOperationsFailure         (6)}

ProviderAbortInfo ::= SEQUENCE {
        map-ProviderAbortReason      ProviderAbortReason,
        ...}

ProviderAbortReason ::= ENUMERATED {
        abnormalDialogue                (0),
        invalidPDU                      (1)}

END
```

### 7.3.2 PCS1900 ASEs

MMAP-PCS1900--abstract-service-elements-module-v2
{iso (1) member-body (2) uSA (840) mmap (10042) pcs1900 (3)  ase-module (2) v(2)}

DEFINITIONS  ::=

BEGIN

EXPORTS

mMAP-PCS1900-RACF-SCF-ASE,
mMAP-PCS1900-RACF-SCF-SUPPLEMENT-ASE,
mMAP-PCS1900-RACF-RACF-ASE;

IMPORTS

APPLICATION-SERVICE-ELEMENT

FROM
Remote-Operations-Notation
{joint-iso-ccitt(2) remote-operations(4) notation-extension(2)};

authenticationInformationRequest,
purgeUser,
updateLocationRequest,
validateOutgoingCall,
cancelLocationRequest,
completeCall,
provideRoamingNumber,
activateSS,
deactivateSS,
eraseSS,
interrogateSS,
processUnstructuredSS-Request,
readyForSM,
registerPassword,
registerSS,
restoreData,
validateMoSMS,
activateTraceMode,
deactivateTraceMode,
forwardCheckSS-Indication,
forwardSM,
getPassword,
reset,
unstructuredSS-Request,
unstructuredSS-Notify,
forwardAccessSignaling,
prepareHandover,
prepareSubsequentHandover,
processAccessSignaling,
sendEndSignal,
sendIdentification

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FROM
MMAP-PCS1900-abstract-syntax-module-v2
{iso (1) member-body (2) uSA (840) mmap (10042) pcs1900 (3) abstract-syntax-module (1) v(2)};

MMAP-PCS1900-RACF-SCF-ASE ::= APPLICATION-SERVICE-ELEMENT

CONSUMER INVOKES          -- RACF invokes
  {
    authenticationInformationRequest,
    purgeUser,
    updateLocationRequest,
    validateOutgoingCall}

SUPPLIER INVOKES          -- SCF invokes
  {
    cancelLocationRequest,
    completeCall,
    provideRoamingNumber}

mMAP-PCS1900-RACF-SCF-ASE  ::=  MMAP-PCS1900-RACF-SCF-ASE
{iso (1) member-body (2) uSA (840) mmap (10042) pcs1900 (3) ase-module (2) v(2) racf-scf-ase (1)
    v(1)}

MMAP-PCS1900- RACF-SCF-SUPPLEMENT-ASE ::=  APPLICATION-SERVICE-ELEMENT

CONSUMER INVOKES          -- RACF invokes
{
        activateSS,
        deactivateSS,
        eraseSS,
        interrogateSS,
        processUnstructuredSS-Request,
        readyForSM,
        registerPassword,
        registerSS,
        restoreData,
        validateMoSMS
}

SUPPLIER INVOKES          -- SCF invokes
{
        activateTraceMode,
        deactivateTraceMode,
        forwardCheckSS-Indication,
        forwardSM,
        getPassword,
        reset,
        unstructuredSS-Request,
        unstructuredSS-Notify
}

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mMAP-PCS1900-RACF-SCF-SUPPLEMENT-ASE  ::=  MMAP-PCS1900-RACF-SCF-SUPPLEMENT-
    ASE
{iso (1) member-body (2) uSA (840) mmap (10042) pcs1900 (3) ase-module (2) v(2) racf-scf-
    supplement-ase (3) v(1)}

MMAP-PCS1900-RACF-RACF-ASE ::=  APPLICATION-SERVICE-ELEMENT

OPERATIONS                    --  RACF invokes
  {
    forwardAccessSignaling,
    prepareHandover,
    prepareSubsequentHandover,
    processAccessSignaling,
    sendEndSignal,
    sendIdentification}

mMAP-PCS1900-RACF-RACF-ASE  ::=  MMAP-PCS1900-RACF-RACF-ASE
{iso (1) member-body (2) uSA (840) mmap (10042) pcs1900 (3) ase-module (2) v(2) racf-racf-ase (2)
    v(1)}

END

## 7.4   CCT ASN

### 7.4.1   CCT abstract syntax

MMAP-CCT-abstract-syntax-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) cct (4) abstract-syntax-module (1) v(2)}

DEFINITIONS  ::=

BEGIN

EXPORTS

--  operation values

cctHandoverRequest;

IMPORTS

OPERATION,
ERROR

FROM  Remote-Operations-Notation
{joint-iso-ccitt remote-operations(4) notation(0)};

BillingID,
Digits,
MobileBearerCharacteristics,
NodeID,
SubscriberID,
TerminalID

FROM  MMAP-COMMON-abstract-syntax-module
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) common (0) abstract-syntax-module (1)
    v(1)};

ErrorCode,
ErrorParameter

FROM MMAP-COMMON-abstract-syntax-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) common (0) abstract-syntax-module (1) v(2)};

-- CCT RACF to RACF operations

CCTHandoverRequest  ::=
                              OPERATION
                              ARGUMENT    CCTHandoverRequestArgument
                              RESULT        CCTHandoverRequestResult
                              ERRORS        CCTHandoverRequestError

CCTHandoverRequestArgument  ::=  SEQUENCE
  {
    subscriber                              SubscriberID,
    targetCell                              NodeID,
    sourceCell                              NodeID,
    billing                                 BillingID,
    mobileBearerCapabilities                MobileBearerCharacteristics,
    terminal                                TerminalID                      OPTIONAL}

CCTHandoverRequestResult ::=  SEQUENCE
  {
    subscriber                              SubscriberID,
    handoverNumber                          HandoverNumber,
    terminal                                TerminalID                      OPTIONAL}

CCTHandoverRequestError  ::=
                              ErrorCode
                              PARAMETER  ErrorParameter

-- CCT Data Types

HandoverNumber  ::=      Digits

-- CCT Error Definitions

| unrecognizedMIN | UnrecognizedMIN | ::= localValue | 1 |
| unrecognizedESN | UnrecognizedESN | ::= localValue | 2 |
| minHLRMismatch | MINHLRMismatch | ::= localValue | 3 |
| operationRequestProblem | OperationRequestProblem | ::= localValue | 4 |
| resourceShortage | ResourceShortage | ::= localValue | 5 |
| operationNotSupported | OperationNotSupported | ::= localValue | 6 |
| trunkUnavailable | TrunkUnavailable | ::= localValue | 7 |
| parameterError | ParameterError | ::= localValue | 8 |
| systemFailure | SystemFailure | ::= localValue | 9 |
| unrecognizedParameterValue | UnrecognizedParameterValue | ::= localValue | 10 |
| featureInactive | FeatureInactive | ::= localValue | 11 |
| missingParameter | MissingParameter | ::= localValue | 12 |
| requestedInformationUnavailable | RequestedInformationUnavailable ::= localValue | 13 |

-- CCT Operation Values

cctHandoverRequest            CCTHandoverRequest          ::= localValue      30

END

### 7.4.2   CCT ASEs

MMAP-CCT--abstract-service-elements-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) cct (4)  ase-module (2) v(2)}

DEFINITIONS  ::=

BEGIN

EXPORTS       mMAP-CCT-RACF-RACF-ASE;

IMPORTS

cctHandoverRequest

FROM MMAP-CCT-abstract-syntax-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) cct (4) abstract-syntax-module (1) v(2)};

APPLICATION-SERVICE-ELEMENT

FROM  Remote-Operations-Notation
{joint-iso-ccitt remote-operations(4) notation-extension(2)};

MMAP-CCT-RACF-RACF-ASE ::=  APPLICATION-SERVICE-ELEMENT

OPERATIONS                    -- RACF invokes
  {
    cctHandoverRequest}

mMAP-CCT-RACF-RACF-ASE  ::=  MMAP-CCT-RACF-RACF-ASE
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) cct (4) ase-module (2) v(2) racf-racf-ase
   (1) v(1)}

END

### 7.5   TDMA ASN

### 7.5.1   TDMA abstract syntax

There is no specific abstract syntax for TDMA. TDMA is supported by the common abstract syntax.

### 7.5.2   TDMA ASEs

There are no specific ASEs for TDMA. TDMA is supported by the common ASEs.

### 7.6   Common ASN

### 7.6.1   Common abstract syntax

MMAP-COMMON-abstract-syntax-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) common (0) abstract-syntax-module (1)
   v(2)}

DEFINITIONS  ::=

BEGIN

EXPORTS

-- Operation Values

authenticationDirective,
authenticationFailureIndication,
callIndication,
callWaitingNotification,
clearRequest,
handoverCompleteIndication,
handoverPerformedIndication,
networkChallengeRequest,
qualificationDirective,
qualificationRequest,
racfAuthenticationRequest,
registrationCancellationIndication,
registrationRequest,
routingRequest,
statusRequest,
tmsiAssignmentRequest,

-- Error Values

unrecognizedMIN,
unrecognizedESN,
minHLRMismatch,
operationRequestProblem,
resourceShortage,
operationNotSupported,
trunkUnavailable,
parameterError,
systemFailure,
unrecognizedParameterValue,
featureInactive,
missingParameter,
requestedInformationUnavailable,

-- Data Types

ErrorCode,
ErrorParameter;

IMPORTS

OPERATION,
ERROR

FROM Remote-Operations-Notation
{joint-iso-ccitt remote-operations(4) notation(0)};

-- RACF-to-SCF operations

authenticationDirective,
authenticationFailureIndication,
callWaitingNotification,
clearRequest,
handoverCompleteIndication,
handoverPerformedIndication,
networkChallengeRequest,
qualificationDirective,
qualificationRequest,
racfAuthenticationRequest,
registrationCancellationIndication,
registrationRequest,
statusRequest,
tmsiAssignmentRequest,

-- Data Types

AccessDeniedReason,
AlertValue,
BillingID,
CallReference,
Cause,
ClassMark,
Digits,
LocationAreaID,
MobileBearerCharacteristics,
MobileProtocolRevision,
NodeID,
PagingFrameClass,
ServiceOption,
SlotCycleIndex,
SubscriberID,
TerminalID,
TimeStamp

FROM MMAP-COMMON-abstract-syntax-module
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) common (0) abstract-syntax-module (1)
    v(1)};

CellID,
ChannelNumberList

FROM MMAP-CDMA-abstract-syntax-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) cdma (2) abstract-syntax-module (1)
    v(2)};

```
CallIndication               ::=
                    OPERATION
                    ARGUMENT    CallIndicationArgument
```

```
CallIndicationArgument  ::=  SEQUENCE
  {
    subscriber                            SubscriberID,
    terminal            [0]               TerminalID              OPTIONAL,
    callReference       [1]   IMPLICIT    CallReference           OPTIONAL,
    setupTime           [2]   IMPLICIT    TimeStamp               OPTIONAL,
    connectTime         [3]   IMPLICIT    TimeStamp               OPTIONAL,
    channelNumberList   [4]   IMPLICIT    ChannelNumberList       OPTIONAL,
    interfaceDN         [5]   IMPLICIT    Digits                  OPTIONAL}

RoutingRequest          ::=
                            OPERATION
                            ARGUMENT    RoutingRequestArgument
                            RESULT      RoutingRequestResult
                            ERRORS      RoutingRequestError

RoutingRequestArgument  ::=  SEQUENCE
  {
    subscriber                            SubscriberID,
    billing                               BillingID,
    scf                 [0]               NodeID                  OPTIONAL,
    terminal            [1]               TerminalID              OPTIONAL,
    locationArea        [2]   IMPLICIT    LocationAreaID          OPTIONAL,
    alertIdentifier     [3]   IMPLICIT    AlertValue              OPTIONAL,
    stationClassMark    [4]   IMPLICIT    ClassMark               OPTIONAL,
    slotCycleIndex      [5]   IMPLICIT    SlotCycleIndex          OPTIONAL,
    mobileProtocolRevision [6] IMPLICIT   MobileProtocolRevision  OPTIONAL,
    serviceOption       [7]   IMPLICIT    ServiceOption           OPTIONAL,
    mobileBearerReqs    [8]   IMPLICIT    MobileBearerCharacteristics OPTIONAL,
    pagingFrameClass    [9]   IMPLICIT    PagingFrameClass        OPTIONAL,
    cellID              [10]  IMPLICIT    CellID                  OPTIONAL}

RoutingRequestResult  ::=  SEQUENCE
  {
    racf                [0]               NodeID                  OPTIONAL,
    accessDenied        [1]   IMPLICIT    AccessDeniedReason      OPTIONAL,
    routingNumber       [2]   IMPLICIT    Digits                  OPTIONAL}

RoutingRequestError  ::=      ErrorCode
                              PARAMETER  ErrorParameter
```

**-- Error Definitions**

```
ErrorCode  ::=  Choice
  {
    UnrecognizedMIN,
    UnrecognizedESN,
    MINHLRMismatch,
    OperationRequestProblem,
    ResourceShortage,
    OperationNotSupported,
    TrunkUnavailable,
    ParameterError,
    SystemFailure,
    UnrecognizedParameterValue,
    FeatureInactive,
    MissingParameter,
    RequestedInformationUnavailable}
```

```
ErrorParameter  ::=  SEQUENCE
  {
    cause               [0]   IMPLICIT   Cause                              OPTIONAL,
    parameter           [1]   IMPLICIT   FaultyParameter                    OPTIONAL}

FaultyParameter ::=         OCTET STRING    -- FaultyParameter as defined in IS-41C

UnrecognizedMIN                   ::=  ERROR
UnrecognizedESN                   ::=  ERROR
MINHLRMismatch                    ::=  ERROR
OperationRequestProblem           ::=  ERROR
ResourceShortage                  ::=  ERROR
OperationNotSupported             ::=  ERROR
TrunkUnavailable                  ::=  ERROR
ParameterError                    ::=  ERROR
SystemFailure                     ::=  ERROR
UnrecognizedParameterValue        ::=  ERROR
FeatureInactive                   ::=  ERROR
MissingParameter                  ::=  ERROR
RequestedInformationUnavailable   ::=  ERROR

-- Error Values

unrecognizedMIN                   UnrecognizedMIN                 ::=  localValue   1
unrecognizedESN                   UnrecognizedESN                 ::=  localValue   2
minHLRMismatch                    MINHLRMismatch                  ::=  localValue   3
operationRequestProblem           OperationRequestProblem         ::=  localValue   4
resourceShortage                  ResourceShortage                ::=  localValue   5
operationNotSupported             OperationNotSupported           ::=  localValue   6
trunkUnavailable                  TrunkUnavailable                ::=  localValue   7
parameterError                    ParameterError                  ::=  localValue   8
systemFailure                     SystemFailure                   ::=  localValue   9
unrecognizedParameterValue        UnrecognizedParameterValue      ::=  localValue   10
featureInactive                   FeatureInactive                 ::=  localValue   11
missingParameter                  MissingParameter                ::=  localValue   12
requestedInformationUnavailable   RequestedInformationUnavailable ::=  localValue   13

-- Operation Values

authenticationDirective           ::=  MMAP-COMMON-abstract-syntax-module.authenticationDirective

authenticationFailureIndication   ::=  MMAP-COMMON-abstract-syntax-
                                        module.authenticationFailureIndication

callWaitingNotification           ::=  MMAP-COMMON-abstract-syntax-module.callWaitingNotification

clearRequest                      ::=  MMAP-COMMON-abstract-syntax-module.clearRequest

handoverCompleteIndication        ::=  MMAP-COMMON-abstract-syntax-module.handoverCompleteIndication

handoverPerformedIndication       ::=  MMAP-COMMON-abstract-syntax-
                                        module.handoverPerformedIndication

networkChallengeRequest           ::=  MMAP-COMMON-abstract-syntax-module.networkChallengeRequest

qualificationDirective            ::=  MMAP-COMMON-abstract-syntax-module.qualificationDirective
```

| | | |
|---|---|---|
| qualificationRequest | ::= | MMAP-COMMON-abstract-syntax-module.qualificationRequest |
| racfAuthenticationRequest | ::= | MMAP-COMMON-abstract-syntax-module.racfAuthenticationRequest |
| registrationCancellationIndication | ::= | MMAP-COMMON-abstract-syntax-module.registrationCancellationIndication |
| registrationRequest | ::= | MMAP-COMMON-abstract-syntax-module.registrationRequest |
| statusRequest | ::= | MMAP-COMMON-abstract-syntax-module.statusRequest |
| tmsiAssignmentRequest | ::= | MMAP-COMMON-abstract-syntax-module.tmsiAssignmentRequest |

| | | | |
|---|---|---|---|
| callIndication | CallIndication | ::= localValue | 16 |
| routingRequest | RoutingRequest | ::= localValue | 13 |

### 7.6.2  Common ASEs

MMAP-COMMON--abstract-service-elements-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) common (0)  ase-module (2) v(2)}

DEFINITIONS  ::=

BEGIN

EXPORTS      mMAP-COMMON-RACF-SCF-ASE;

IMPORTS

authenticationDirective,
authenticationFailureIndication,
callIndication,
callWaitingNotification,
clearRequest,
handoverCompleteIndication,
handoverPerformedIndication,
networkChallengeRequest,
qualificationDirective,
qualificationRequest,
racfAuthenticationRequest,
registrationCancellationIndication,
registrationRequest,
routingRequest,
statusRequest,
tmsiAssignmentRequest

FROM MMAP-COMMON-abstract-syntax-module-v2
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) common (0) abstract-syntax-module (1)
    v(2)};

APPLICATION-SERVICE-ELEMENT

FROM Remote-Operations-Notation
{joint-iso-ccitt remote-operations(4) notation-extension(2)};

MMAP-COMMON-RACF-SCF-ASE ::=  APPLICATION-SERVICE-ELEMENT

CONSUMER INVOKES        -- RACF invokes
  {
    callIndication,
    clearRequest,
    handoverCompleteIndication,
    networkChallengeRequest,
    qualificationRequest,
    racfAuthenticationRequest,
    registrationRequest}

SUPPLIER INVOKES        -- SCF invokes
  {
    authenticationDirective,
    authenticationFailureIndication,
    callWaitingNotification,
    clearRequest,
    handoverPerformedIndication,
    qualificationDirective,
    registrationCancellationIndication,
    routingRequest,
    statusRequest,
    tmsiAssignmentRequest}

mMAP-COMMON-RACF-SCF-ASE  ::=  MMAP-COMMON-RACF-SCF-ASE
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) common (0) ase-module (2) v(2) racf-scf-
    ase (1) v(1)}

END

## Annex A

(informative)


## Signalling flows

This annex presents a number of information flows to illustrate the use of PCS1900 based MMAP operations in various situations, like registration, call handling and handover.

The following conventions are used in this Annex:

- In the figures, the MMAP messages are labeled in bold text.
- The bold arrows in the figures imply that the protocol for that interface is defined in MMAP.
- The text supporting the figures, not the figures themselves, describe optional procedures.
- If specific message names are used for interfaces other than those specified by MMAP, the message name is preceded by the protocol suite that defines these messages. For example, "ISDN" precedes messages between RACF/RCF and SSF/CCF.
- On an interface not defined in this standard, a double headed arrow is used in some cases to indicate a procedure on that interface. There may be multiple messages exchanged between the two entities to accomplish the procedure.

## A.1  Initial location registration
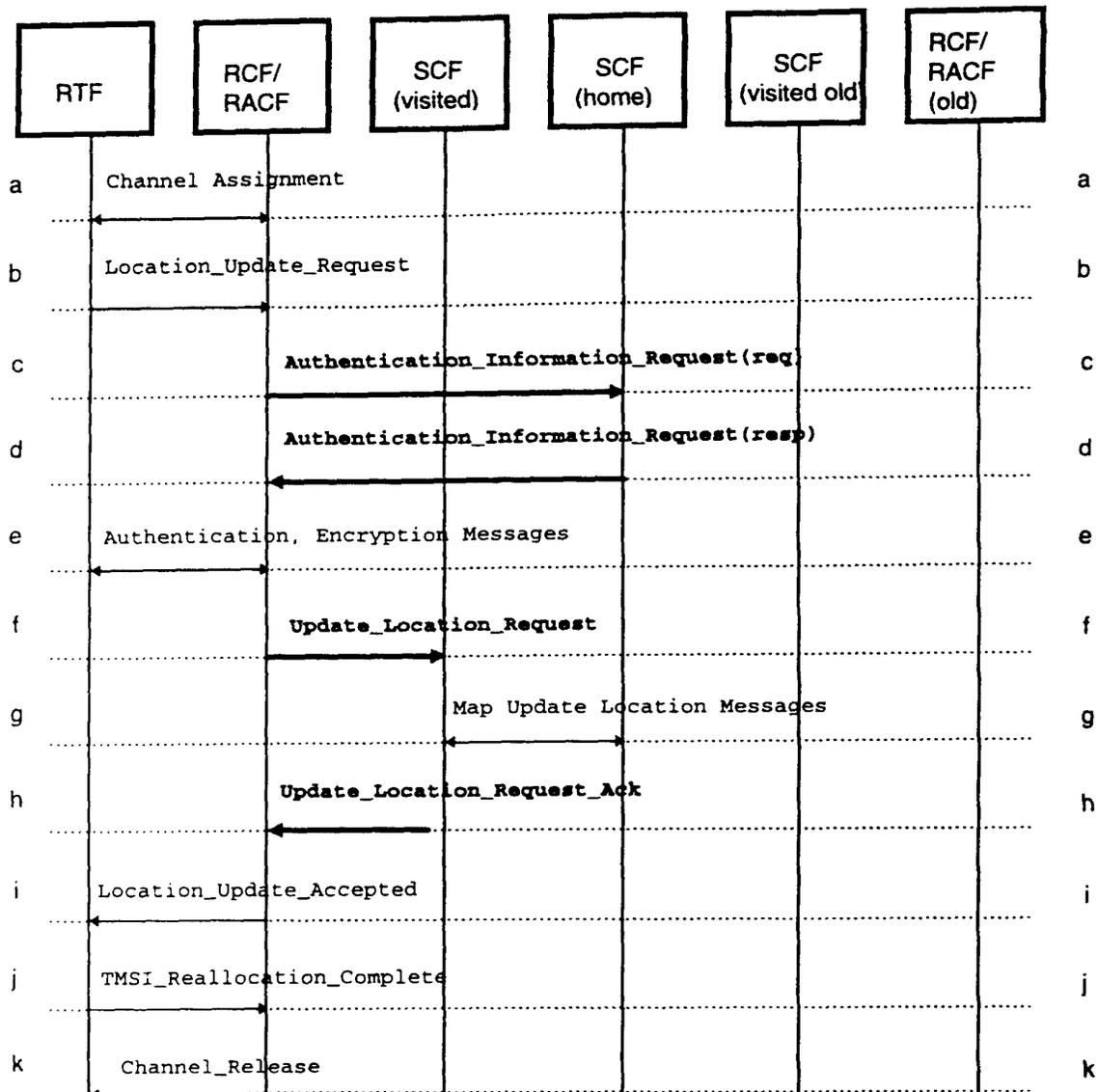


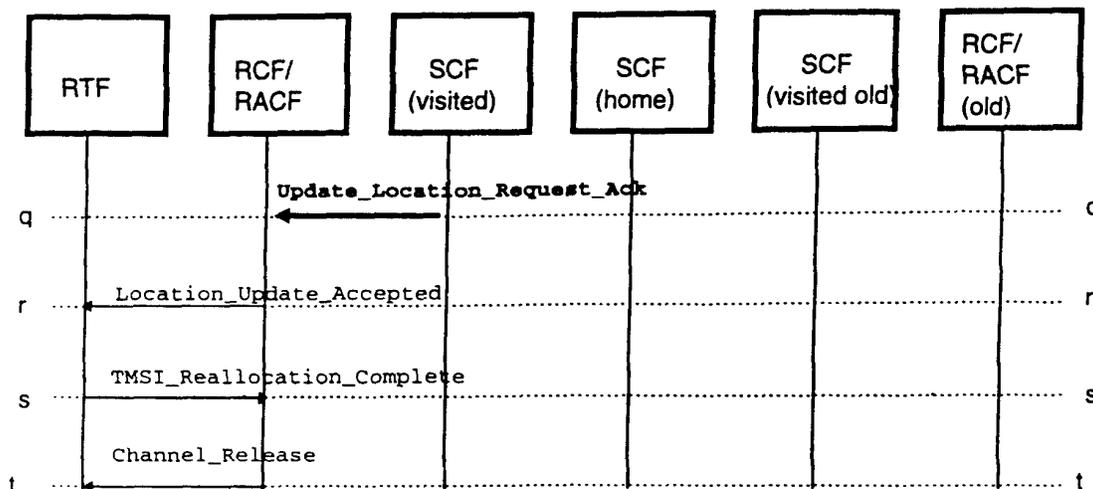**Figure A.1 – Initial location registration**

a-b)    A dedicated control channel is allocated for the RTF and the location registration is initiated by the Location_Update_Request message using IMSI to identify the user.

c-d)    The RCF/RACF requests the authentication triplets from the home SCF.

e)      Authentication of the RTF and activation of the ciphering function.

f)      The RCF/RACF updates the location of the RTF to the visited SCF.

g)      If the location is updated to a new visited SCF, that visited SCF initiates the location updating procedure towards the home SCF. That procedure is needed to enable the routing of incoming calls as well as to retrieve the user profile associated with the RTF. If the visited SCF does not change, there is no need to update the location information in the home SCF.

h)        The visited SCF acknowledges the location update to the RCF/RACF.

i-k)      As the RCF/RACF has acknowledged the location update and a new TMSI has been allocated for the RTF, the RCF/RACF releases the channel.

## A.2 Subsequent location update



| | RTF | RCF/ RACF | SCF (visited) | SCF (home) | SCF (visited old) | RCF/ RACF (old) | |
|---|---|---|---|---|---|---|---|
| a | | Channel assignment messages | | | | | a |
| b | | Location_Update_Request | | | | | b |
| c | | | **Send_Identification** → | | | | c |
| d | | | ← **Send_Identification_Ack** | | | | d |
| e | | Identity request and response messages | | | | | e |
| f | | | **Authentication_Information_Request (req)** → | | | | f |
| g | | | ← **Authentication_Information_Request(resp)** | | | | g |
| h | | Authentication and ciphering | | | | | h |
| i | | Update_Location_Request → | | | | | i |
| j | | | MAP_Update_Location → | | | | j |
| k | | | | MAP_Cancel_location → | | | k |
| l | | | | | **Cancel_location** → | | l |
| m | | | | | ← **Cancel_location_ack** | | m |
| n | | | | ← MAP_Cancel_location_ack | | | n |
| o | | | ← Downloading of subscriber data | | | | o |
| p | | | ← MAP_Update_Location Ack | | | | p |

**Figure A.2 – Subsequent location update**

**Figure A.2 – Subsequent location update** *(concluded)*

a-b)    A dedicated control channel is allocated for the RTF and the location registration is initiated by the Location_Update_Request message using TMSI to identify the user.

c-d)    The address of the old  RCF/RACF  is derived from the old Location Area Identification sent by the RTF. RCF/RACF asks for the  IMSI  and the authentication  triplets from the old RCF/RACF by using the Send_Identification message.

e-g)    If the address of the old  RCF/RACF   cannot be derived  from  the  old Location Area Identification, (incorporated in Location_Update_Request message) the RCF/RACF has to request the IMSI from the RTF. The RCF/RACF requests the authentication triplets from the home SCF by using IMSI retrieved from the RTF.

h)      Authentication of the RTF and activation of the ciphering function.

i)      The RCF/RACF updates the location of the RTF to the visited SCF.

j)      If the location is updated  to a new visited SCF, that visited SCF initiates the location updating procedure  towards  the  home  SCF. That procedure is needed  to  enable  the routing of incoming calls as well as to retrieve the user profile associated with the RTF. If the visited SCF does not change, there is no need to update  the  location  information  in  the home SCF.

k)      The home SCF initiates the location cancellation to the old visited SCF in order to  delete the subscriber record.

l-m)    The old visited SCF further sends the Cancel_Location_Request message  to  the  old RCF/RACF in order to delete the  subscriber record in the old RCF/RACF.

n)      The old visited SCF acknowledges the location cancellation to the home SCF.

o)      The subscriber data is sent from the home SCF to the new visited SCF.

p)      The home SCF acknowledges the location update to the visited SCF.

q)      The visited SCF acknowledges the location update to the RCF/RACF.

r-t)    The location  update  is  acknowledged  to RTF together  with  a  new  TMSI. The signalling channel is released.

## A.3 RTF originated call setup
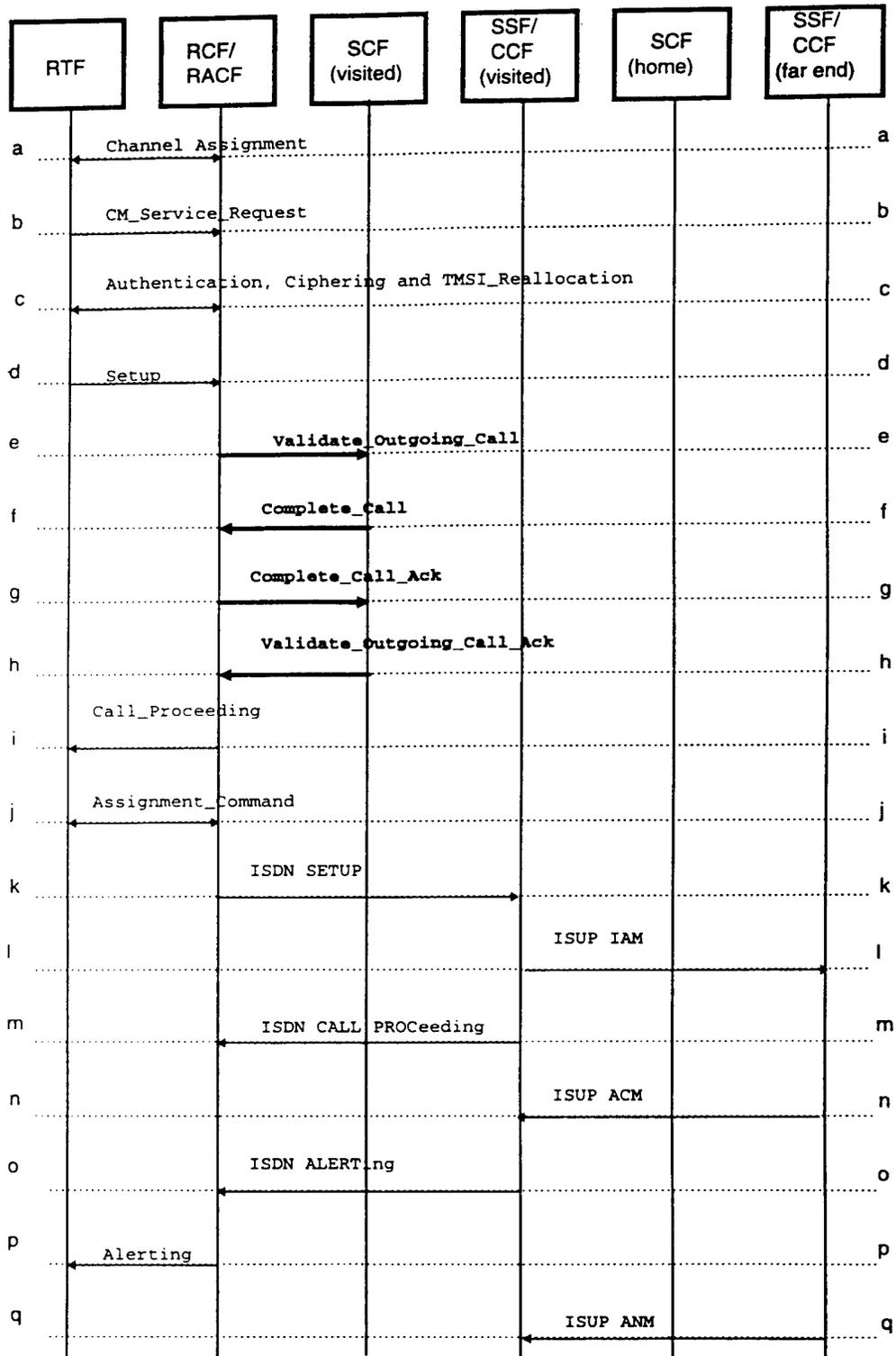


Figure A.3 – RTF originated call setup
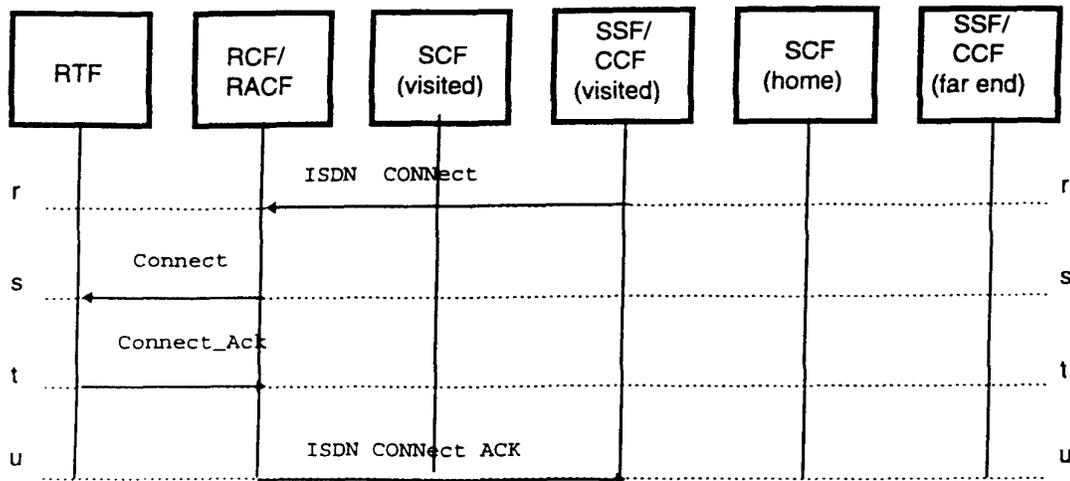
**Figure A.3 – RTF originated call setup** *(concluded)*

a-b)    The RTF initiates the call setup by reserving a signalling channel and sending the service request message to the RCF/RACF.

c)      The RCF/RACF carries out the authentication, ciphering activation and TMSI reallocation.

d)      The RTF sends the Setup message which contains e.g. the called number and the bearer capability.

e)      The RCF/RACF transfers the requested service parameters in a Validate_Outgoing_Call message to the visited SCF  for analysis and validation.

f-g)    The visited SCF provides the RCF/RACF with the information required by the RCF/RACF to reserve appropriate resources for call completion.

h)      The visited SCF acknowledges the Validate_Outgoing_Call operation.

i)      The RCF/RACF sends the Call_Proceeding message to the RTF.

j)      A traffic channel is assigned to the call by the RCF/RACF.

k)      The RCF/RACF initiates the establishment of the call on the network side by sending the ISDN Setup message to the SSF/CCF.

l-o)    ISDN call setup is progressed. As part of that process there may be some IN call processing involved. IN processing is not shown in these flows.

p)      The RTF is notified that the called party is alerted.

q-u)    The call establishment is finalized.

## A.4 RTF terminated call setup
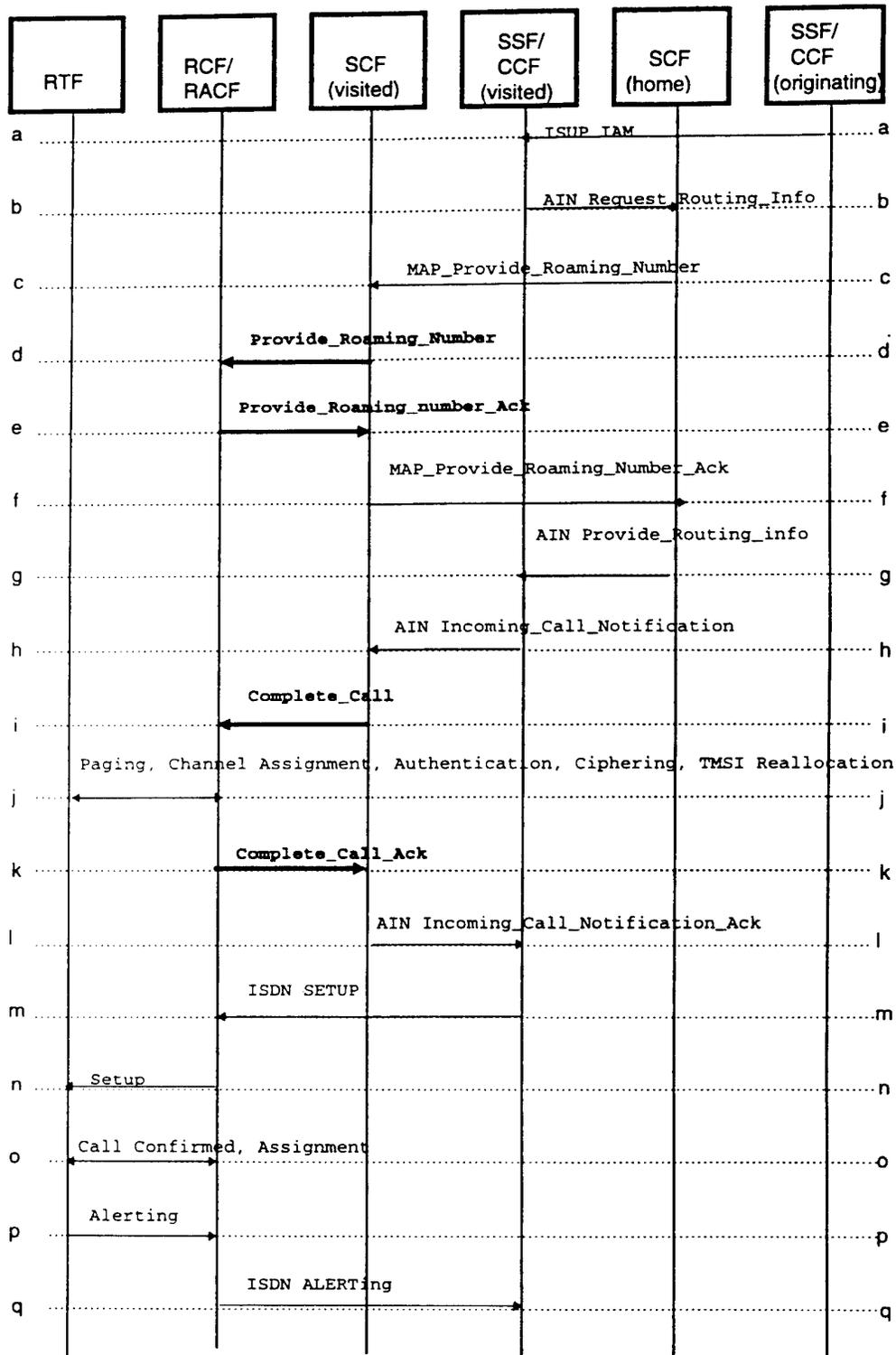


**Figure A.4 – RTF terminated call setup**
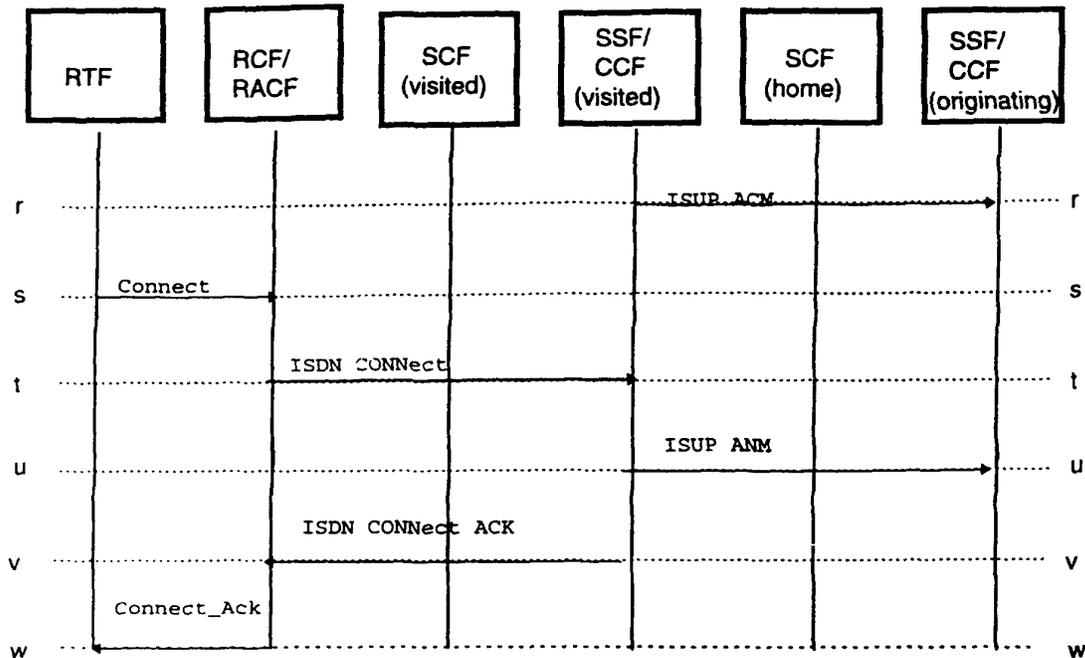
**Figure A.4 – RTF terminated call setup** *(concluded)*

a-b)     RTF terminated calls must first be routed to an SSF/CCF which is able to trigger an interrogation to HLR in order to locate the RTF. This interrogation may be of direct type (in which case the SSF/CCF would act as a gateway MSC) or of indirect type (in which case some IN processing is involved).

c-f)     The home SCF knows which visited SCF is currently serving the RTF, and it asks for the routing information (i.e. a roaming number) from there. There are three possibilities to proceed:

i)     The serving visited SCF can directly provide a roaming number by which the SSF/CCF serving the RTF can be reached.

ii)     The serving visited SCF can ask for the roaming number from the serving RCF/RACF which gives the roaming number without paging the RTF.

iii)     The serving visited SCF can ask for the roaming number from the serving RCF/RACF which gives the roaming number after paging the RTF.

Alternative ii) is presented in this signalling flow.

g-h)     The home SCF returns the roaming number to the requesting SSF/CCF. There may be IN processing involved in that response.

Once the roaming number arrives at requesting SSF/CCF, the call is routed to the SSF/CCF which has the directory number concerned. The terminating SSF/CCF notifies visited SCF about the incoming call with appropriate information. There may be IN processing involved in that notification.

i) The visited SCF sends the Complete Call message to indicate that the call has arrived to the SSF/CCF. The data necessary to complete the call on the radio system side is passed to the RCF/RACF.

j) The RTF is paged and after it has responded, the authentication, ciphering activation and TMSI reallocation are carried out by the RCF/RACF.

k-l) The RCF/RACF acknowledges the Complete_Call message to the visited SCF, which further sends an acknowledgement for the incoming call notification to SSF/CCF. There may be IN processing involved in the latter acknowledgement.

If the roaming number used to terminate the network connection to SSF/CCF did not enable the connection all the way to RS but to the SSF/CCF only (case a above), these operations are used to pass the required DN to the SSF/CCF to enable the connection between SSF/CCF and RS.

m-o) The SSF/CCF sends the ISDN Setup message to the RCF/RACF, which sends the PCS1900 Setup message to the RTF. A traffic channel for the call is assigned after the Call Confirmed message is received by the RCF/RACF.

p-w) The call setup proceeds according to ISDN procedures. After alerting and answering the call is on.

## A.5  RTF initiated call release

No MMAP operation is involved.

## A.6  Network initiated call release

No MMAP operation is involved.

## A.7 Basic handover
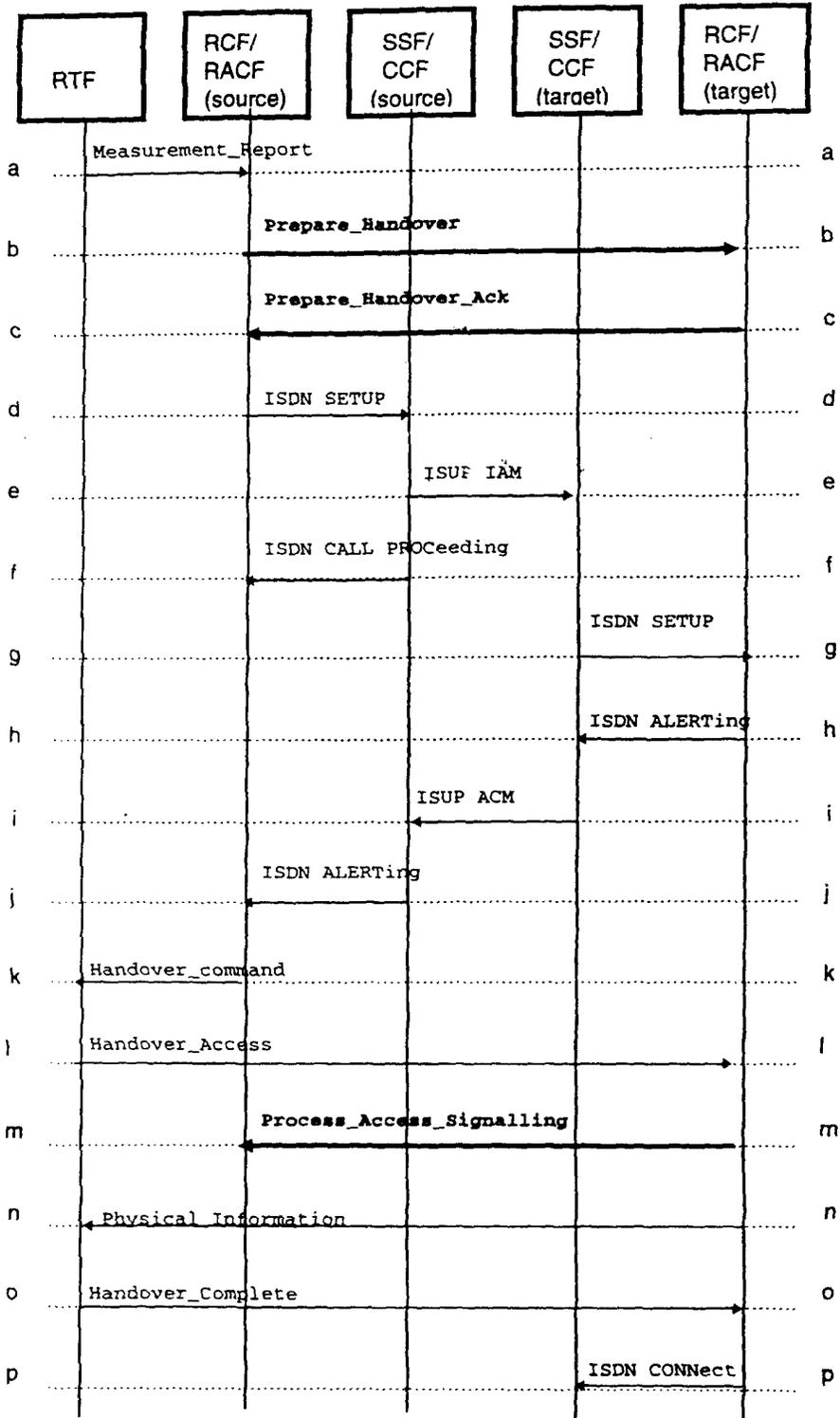


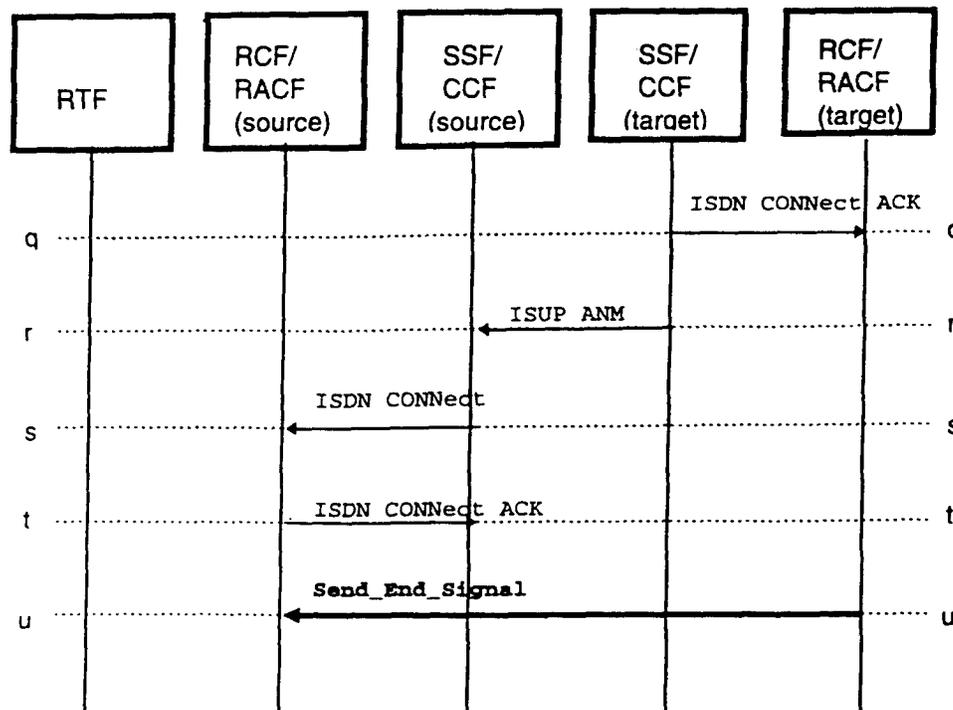**Figure A.5 – Basic handover**

**Figure A.5 – Basic handover** *(concluded)*

a-b)  Based on the measurement reports sent by a RTF the RCF/RACF(source) (currently serving the RTF) decides that the RTF needs to be handed over to another radio system (RCF/RACF(target)). RCF/RACF(source) sends a Prepare_Handover message, which contains encapsulated A_Handover_request message, to the target RCF/RACF (RCF/RACF(target)). This message contains the identification of the target cell and all the information required by the RCF/RACF(target) to allocate the necessary radio resources.

c)  The RCF/RACF(target) activates a channel from the target cell and allocates a directory number to be used in setting up a network connection between RCF/RACF(source) and RCF/RACF(target) for the purpose of handover. The identification of the target channel and the directory number are sent to the RCF/RACF(source) in the Prepare_Handover_Ack message that contains encapsulated A_Handover_Request_Ack message.

d-j)  A connection between RCF/RACF(source) and RCF/RACF(target) is initialized.

k)  When the initialization has successfully been carried out, the RCF/RACF(source) commands the RTF to switch to the new channel.

l-m)  The detection of the handover access by the RCF/RACF(target) is passed to the RCF/RACF(source) in a Process_access_signalling message that contains encapsulated A_Handover_Detect message.

n-t)  Once the RCF/RACF(target) has received the Handover_Complete message the RTF has successfully moved to the new channel. The connection setup between RCF/RACF(source) and RCF/RACF(target) can now be completed.

u)  Send_End_Signal message, whcih contains encapsulated A_Handover_Complete message, is sent from RCF/RACF(target) to RCF/RACF(source) to indicate that the handover processing in RCF/RACF(target) is completed.
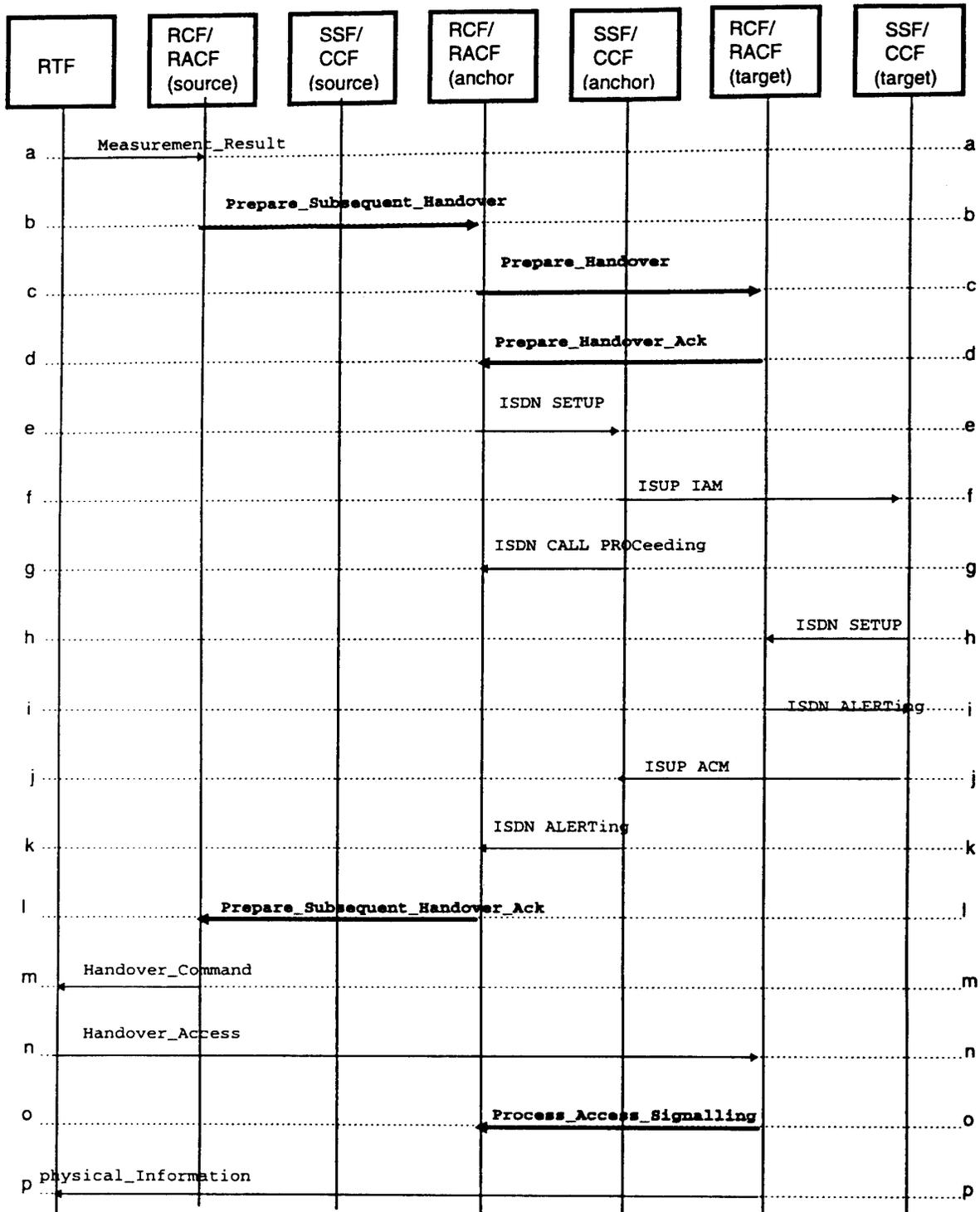
## A.8 Subsequent handover
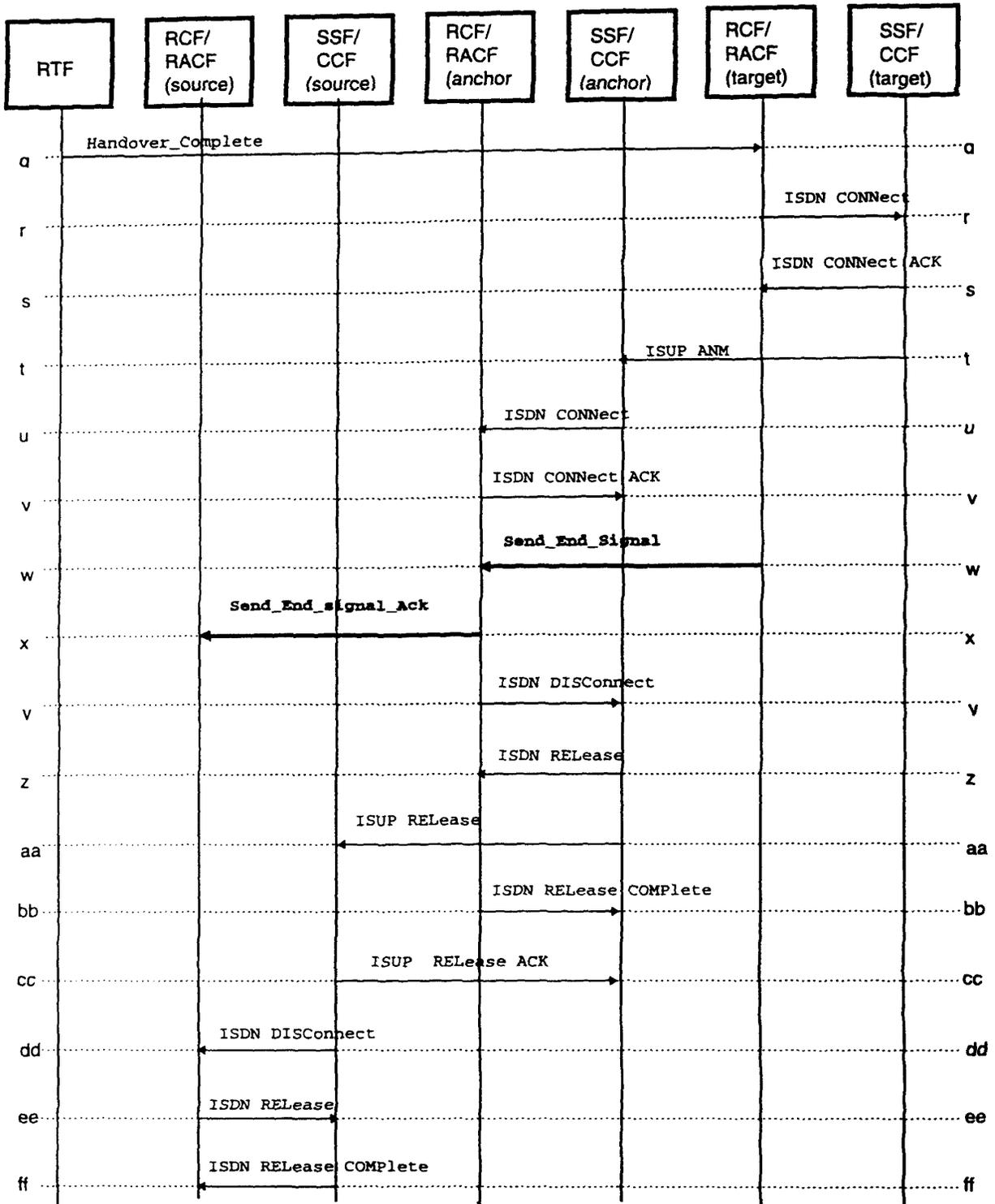


**Figure A.6 – Subsequent handover**

| RTF | RCF/ RACF (source) | SSF/ CCF (source) | RCF/ RACF (anchor | SSF/ CCF (anchor) | RCF/ RACF (target) | SSF/ CCF (target) | |
|---|---|---|---|---|---|---|---|
| q | Handover_Complete | | | | | | q |
| r | | | | | ISDN CONNect | | r |
| s | | | | | ISDN CONNect ACK | | s |
| t | | | | ISUP ANM | | | t |
| u | | | ISDN CONNect | | | | u |
| v | | | ISDN CONNect ACK | | | | v |
| w | | | Send_End_Signal | | | | w |
| x | Send_End_signal_Ack | | | | | | x |
| v | | | ISDN DISConnect | | | | v |
| z | | | ISDN RELease | | | | z |
| aa | | ISUP RELease | | | | | aa |
| bb | | | ISDN RELease COMPlete | | | | bb |
| cc | | ISUP RELease ACK | | | | | cc |
| dd | ISDN DISConnect | | | | | | dd |
| ee | ISDN RELease | | | | | | ee |
| ff | ISDN RELease COMPlete | | | | | | ff |

**Figure A.6 – Subsequent handover** *(concluded)*

a-b) Based on the measurement reports sent by a RTF, the RCF/RACF(source) (currently serving the RTF) decides that the RTF needs to be handed over to another radio system (RCF/RACF(target)). RCF/RACF(source) sends a Prepare_Subsequent_Handover message, which contains encapsulated A_Handover_Request message, to the anchor RCF/RACF (RCF/RACF(anchor)). This message contains the identification of the target cell and the address of the target radio system.

c) The anchor RCF/RACF (RCF/RACF(anchor)) sends a Prepare_Handover message, which contains encapsulated A_Handover_Request message,  to the target RCF/RACF (RCF/RACF(target)). This message contains the identification of the target cell and all the information required by the target RCF/RACF(target) to allocate the necessary radio resources.

d) The RCF/RACF(target) activates a channel from the target cell and allocates a directory number to be used in setting up a network connection between RCF/RACF(anchor) and RCF/RACF(target) for the purpose of handover. The identification of the target channel and the directory number are sent to the RCF/RACF(anchor) in the Prepare_Handover_Ack message that contains encapsulated A_Handover_Request_Ack message.

e-k) A connection between RCF/RACF(anchor) and RCF/RACF(target) is initialized.

l) When the initialization has successfully been carried out, the RCF/RACF(anchor) sends the Prepare_Subsequent_Handover_Ack that contains encapsulated A_Handover_Request_Ack message to the RCF/RACF(source). This message contains the identification of the new radio channel.

m) The RCF/RACF(source) commands the RTF to switch to the new channel.

n-o) The detection of the handover access by the RCF/RACF(target) is passed to the RCF/RACF(anchor) in a Process_access_signalling message.

p-v) Once the RCF/RACF(target) has received the Handover_Complete message the RTF has successfully moved to the new channel. The connection setup between RCF/RACF(anchor) and RCF/RACF(target) can now be completed.

w) Send_End_Signal message, which contains encapsulated A_Handover_complete message, is sent from RCF/RACF(target) to RCF/RACF(anchor) to indicate that the handover processing in RCF/RACF(target) is completed.

x) Upon receiving the Send_End_Signal message from RCF/RACF(target) the RCF/RACF(anchor) send the Send_End_Signal_Ack to the RCF/RACF(source) in order to release the radio resources in RCF/RACF(source).

y-ff) The network connection between RCF/RACF(anchor) and RCF/RACF(source) is released.

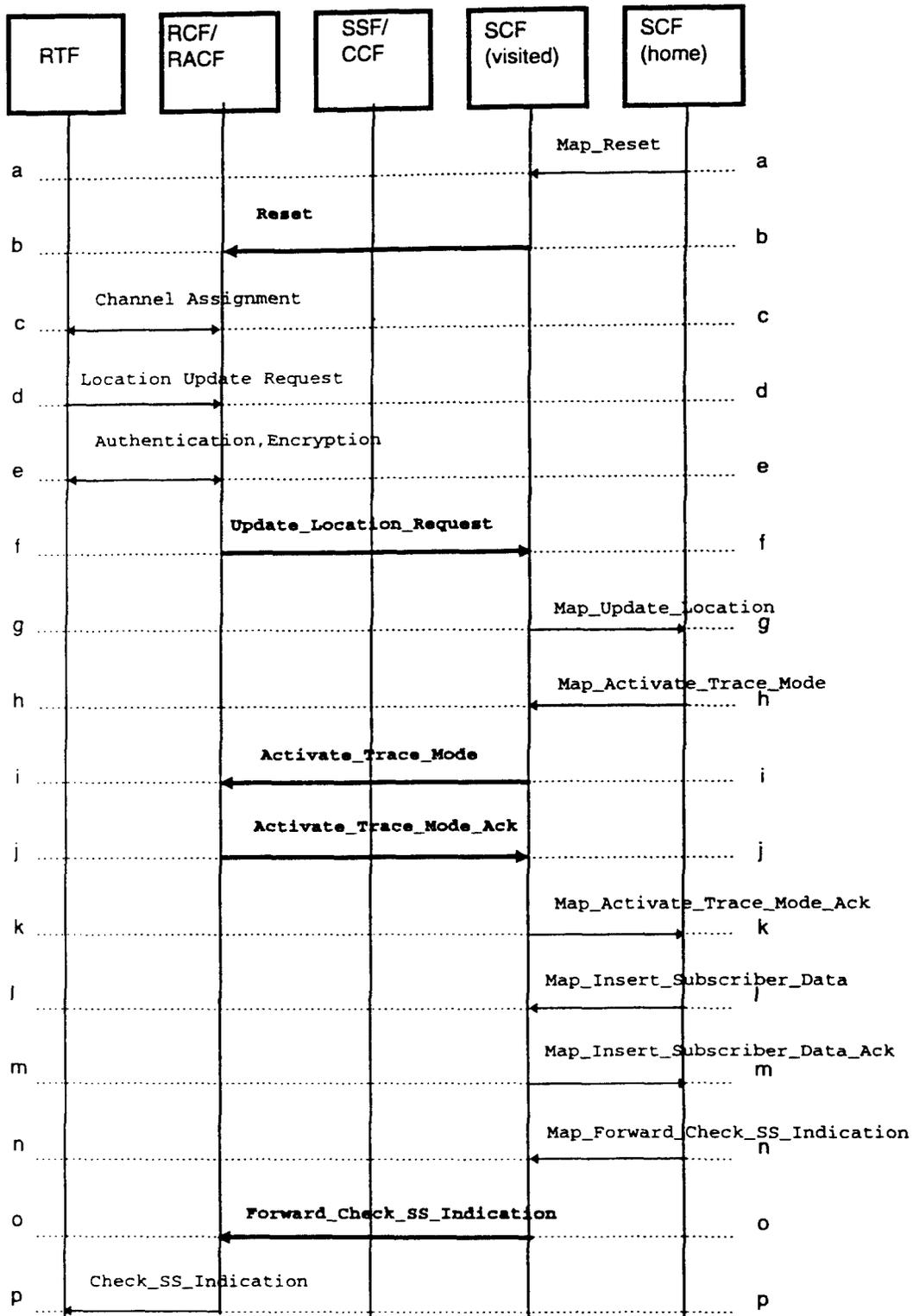## A.9  Location update after home SCF reset



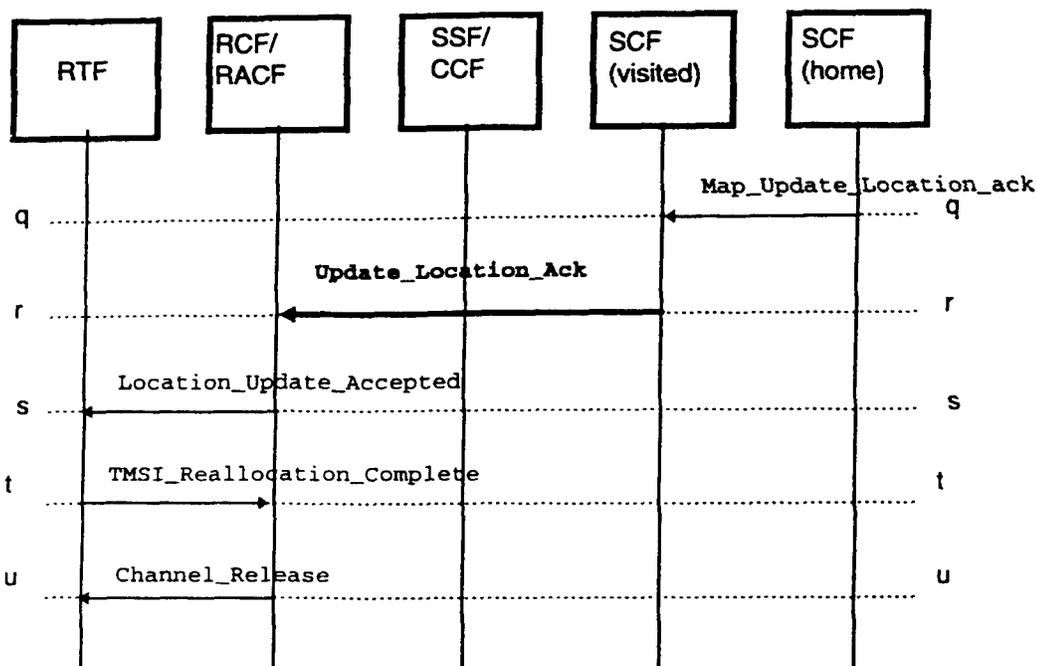**Figure A.7 – Location update after home SCF reset**

**Figure A.7 – Location update after home SCF reset** *(concluded)*

The above figure shows the scenario where home SCF has undergone a restart and a RTF is updating its location. During this first location update after home SCF restart, RTF is notified to check its Supplementary Service status which might have changed due to the restart. This figure also shows the trace mode activation during the location update.

a)    After a restart, the home SCF sends Map_Reset message to all  affected visited SCF's so that the location information  can be updated in the home SCF at the next radio contact with RTF.

b)    The visited SCF in turn  sends Reset message to all affected RACF's.

c)    A RTF accesses the network. This step occurs some time after the step b), not necessarily immediately after. Also note that all the following steps may occur for all RTF's affected by the home SCF Reset.

d-e)  The RTF sends Location_Update_Request and authentication and encryption are performed.

f)    RACF checks if the RTF is affected by the Reset. If affected, RACF always sends the Update_Location_Request to visited SCF.

g)    The visited SCF in turn recognises that the RTF is affected by the Reset and sends MAP_Update_Location to the home  SCF.

h)    The home SCF updates the location information for the RTF affected by the Reset. If the trace mode of the subscriber is active in the home SCF, it sends Map_activate_Trace_mode to visited SCF.

i-j)  The visited SCF in turn sends Activate_Trace_Mode to the RACF. The RACF activates the trace so that subsequent subscriber activities (e.g. call origination, handoff) are traced and reported to OMC. Then RACF sends the response to visited SCF.

k-m) The visited SCF forwards the trace mode activation response to the home SCF. The HSCF then updates the subscriber data in visited SCF.

n-p) Since the home SCF has undergone a restart and restored the subscriber data from the backup mechanism, the supplementary service data may have been altered. To notify the RTF about the possible discrepency, home SCF sends check_SS_indication message to visited SCF. The visited SCF in turns forwards check SS indication to the RACF and the RACFsends it to the RTF.

q-u) The home SCF sends the location update response to the RTF. And after the new TMSI is allocated to the RTF, the channel is released.

## A.10 Data restoration on RTF terminated call setup
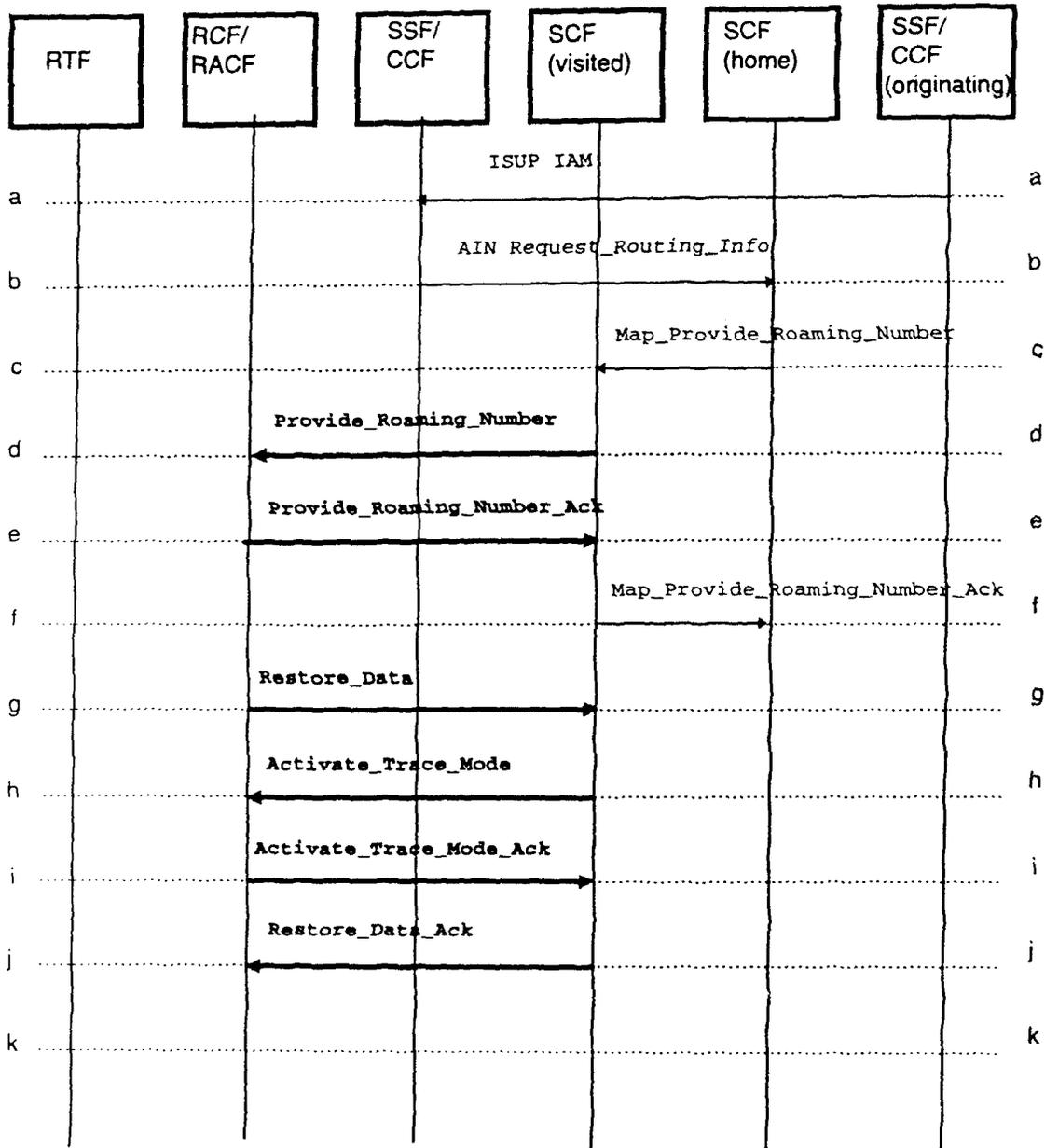


**Figure A.8 – Data restoration on RTF terminated call setup**

The above figure shows the case where RACF does not have the data for an IMSI and a call termination attempt is made through Provide_Roaming_Number message from visited SCF. In this case, the RACF gets the subscriber data from visited SCF after acknowledging the Provide_Roaming_Number. The figure also shows the trace mode activation during the restoration of data.

a-b)    RTF terminated calls must first be  routed to an SSF/CCF which is able to trigger an interrogation to the home SCF in order to locate the RTF. This interrogation may be of direct type (in which case the SSF/CCF would act as a gateway MSC) or of indirect type (in which case some IN processing is involved)

c-f)    The home SCF knows which visited SCF is currently serving the RTF, and it asks for the routing information from there. The visited SCF asks this roaming number information from RACF.

g)      The RACF does not have the data for the IMSI due to some reason (e.g. restart) and it asks the visited SCF to restore the data for the IMSI.

h-i)    If the trace mode is active in visited SCF, RACF is updated with is information and the tracing is activated in RACF.

j)      In the current MMAP there is no other data that need to be updated in RACF and the data restoration is completed.

The rest of flow  for call set up is same as shown in figure A.4 steps g-w.
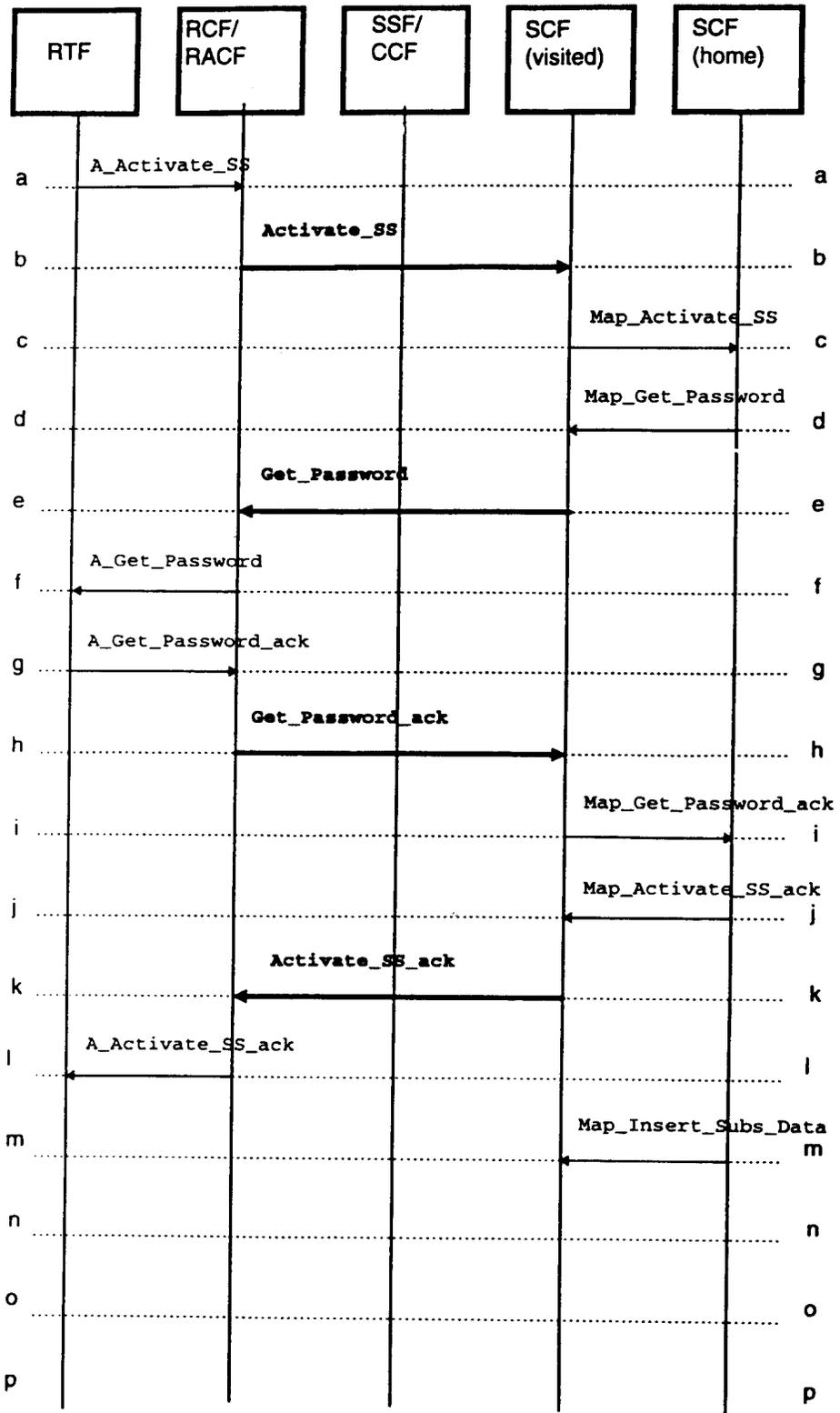
## A.11 Supplementary service activation



**Figure A.9 – Supplementary service activation**

The above figure shows the supplementary service activation which requires the password from the user.

a)      RTF accesses network for activating a supplementary service.

b)      RCF/RACF forwards this activation request to visited SCF.

c)      The visited SCF in turn forwards this activation request to home SCF.

d-f)    The home SCF requests the password from the RTF. This request is forwarded all the way upto RTF.

g-i)    RTF provides the password and it is passed to the home SCF.

j)      After successfull verification of the password, the home SCF activates the supplementary service and acknowledges the activation request. Note that if the password verification is not successful, the home SCF may request for password again.

k-l )   The activation acknowledge is forwarded to the RTF.

m)      The home SCF may optionally update the visited SCF with the subscriber data.