
# ATIS-1000651.1996(R2011)

# Mobility Management Application Protocol (MMAP)

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American National Standard
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# Mobility Management Application Protocol (MMAP)

Secretariat

**Alliance for Telecommunications Industry Solutions**

Approved March 8, 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.

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## Contents

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

T1S1 began addressing PCS requirements in ad-hoc committees in 1993. In response to the industry's desire to have a standard solution for support of PCS mobility, T1S1 established the Mobility Management Application Protocol subworking group in 1994 with a charter to create a stage 3 protocol for supporting the mobility management requirements of the radio systems defined by T1P1 and TR46 over the T1P1 'C' and 'D' interface and the TR46 'A' interface.

This document is the first issue of the MMAP to address the immediate industry needs. Future issues are planned to support aspects such as additional radio systems, alternate functional distributions, additional interfaces, convergence function definitions, and additional services.

This standard contains two annexes, which are for information only and are not considered part of this standard.

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, NW, Suite 500, Washington, DC 20005.

This standard was processed and approved for submittal to ANSI by Accredited Standards Committee on Telecommunications, T1. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the T1 Committee had the following members:

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# Mobility Management Application Protocol (MMAP)

## 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, and handover.

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) and call control (e.g., call origination, call termination, call clearing) in a wireless environment. The scope of the protocol is limited to complementary call management functions (e.g., call setup, call manipulation, call clearing, call progress indication).

### 1.2 Purpose

The purpose of MMAP is to provide a mechanism for the exchange of information between radio systems and other network elements to support personal and terminal mobility in a wireless environment.

### 1.3 Application

The MMAP is 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, *Air Interface Specification for 1.8 to 2.0 GHz Frequency Hopping Time Division Multiple Access (TDMA) for Personal Communication Services*

ANSI J-STD-008-1996, *Personal Station-Base Station Compatibility Requirements for 1.8 to 2.0 GHz Code Division Multiple Access (CDMA) Personal Communications Systems*

ANSI J-STD-011-1996, *PCS IS-136 Based Air Interface Compatibility 1900 MHz Standard*

ANSI J-STD-014-1996, *Personal Access Communications System Air Interface Standard*

ANSI J-STD-018-1996, *Recommended Minimum Performance Requirements for 1.8 to 2.0 GHz Code Division Multiple Access (CDMA) Personal Stations*

ANSI T1.114-1996, *Telecommunications – Signaling System Number 7 (SS7) – Transaction Capability Application Part (TCAP)*

ANSI T1.702-1995, *Telecommunications – Personal Communications Terminology*

ANSI T1.704-1996, *Telecommunications – Stage 2 Service Description for Personal Communications Service – Circuit-Mode Bearer Services*

CCITT Recommendation X.200, *Reference Model Of Open Systems Interconnection For CCITT Recommendation Applications* [1)]

CCITT Recommendation X.208, *Specification Of Abstract Syntax Notation One (ASN.1)* [1)]

CCITT Recommendation X.209, *Specification Of Basic Encoding Rules For Abstract Syntax Notation One (ASN.1)* [1)]

CCITT Recommendation X.210, *Open Systems Interconnection Layer Service Definition Conventions* [1)]

CCITT Recommendation X.217, *Association Control Service Definition for Open Systems Interconnection For CCITT RecommendationApplications* [1)]

CCITT Recommendation X.219, *Remote Operations: Model, Notation And Service Definition* [1)]

CCITT Recommendation X.227, *Association Control Protocol Specification For Open Systems Interconnection For CCITT RecommendationApplications* [1)]

CCITT Recommendation X.229, *Remote Operations: Protocol Specification* [1)]

ISO/IEC 9545: 1994, *Information Technology – Open Systems Interconnection – Application Layer structure (ALS)* [1)]

TIA IS-41, *Cellular Radio Telecommunications Intersystem Operations, Revision B and C* [2)]

TIA IS-651, *SS7 Based A-Interface Standard for PCS* [2)]

TIA IS-652, *PCN to PCN Intersystem Operations Based on PCS-1900* [2)]

TIA IS-653 *ISDN Based A-interface (Radio System – PCS) for 1800 MHz Personal Communications Systems* [2)]

## 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:**

alerting identifier
anchor
anchor identity
authentication
base station

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1) Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.

2) Available from the Telecommunications Industries Association, 2500 Wilson Boulevard, Suite 300, Arlington, VA 22201.

bearer service
call
call control agent functional entity
call control functional entity
call management
call waiting
cell
encryption
handover
home SCF
identification
international mobile equipment identifier
international mobile subscriber identity
interworking
paging
personal communications services
PCS system
personal terminal
privacy
radio system
registration
roaming
routing number
service control function
service data function
service profile
service switching function
serving entity
subscriber identification
supplementary service
target entity
teleservice
temporary subscriber identification
temporary mobile subscriber identification
terminal deregistration
terminal equipment
terminal mobility
terminal identifier
terminal registration
user identity module
user profile
validation
voice privacy

**Terms from CCITT Recommendation X.200:**

application-entity
application-process
application-protocol-data-unit
application-service-element
open system
real open system
real system

**Terms from CCITT Recommendation X.217:**

application-association; association
application context
association control service element

**Terms from CCITT Recommendation X.219:**

invoker-application-entity; invoker
performer-application-entity; performer
requestor
acceptor
remote operations
remote operation service element

**Terms from ISO/IEC 9545:**

single association control function
single association object

### 3.2 Acronyms

| | |
|---|---|
| ACSE | Association Control Service Element |
| AE | Application Entity |
| AEI | Application Entity Invocation |
| ALS | Application Layer Structure |
| AP | Application Process |
| APDU | Application Protocol Data Unit |
| API | Application Programmer Interface |
| ASE | Application Service Element |
| ASN | Abstract Syntax Notation |
| BRI | Basic Rate Interface |
| CCAF | Call Control Agent Function |
| CCF | Call Control Function |
| CCT | Composite CDMA/TDMA |
| CDMA | Code Division Multiple Access |

| | |
|---|---|
| DSS1 | Digital Subscriber Signaling System No. 1 |
| ESN | Electronic Serial Number |
| FE | Functional Entity |
| HLR | Home Location Register |
| IDN | Interface Directory Number |
| IMEI | International Mobile Equipment Identifier |
| IMSI | International Mobile Subscriber Identity |
| ISDN | Integrated Services Digital Network |
| ISO | International Standards Organization |
| LA | Location Area |
| MIN | Mobile Identification Number |
| MMAP | Mobility Management Application Protocol |
| MTP | Message Transfer Part |
| NANP | North American Numbering Plan |
| NCAS | Non-Call Associated Signaling |
| OAM&P | Operations, Administration, Maintenance, and Provisioning |
| OSI | Open Systems Interconnection |
| PACS | Personal Access Communications System |
| PCI | Protocol Control Information |
| PCS | Personal Communications Services |
| PDU | Protocol Data Unit |
| PRI | Primary Rate Interface |
| PS | Personal Station |
| RACF | Radio Access Control Function |
| RCF | Radio Control Function |
| RO-APDU | Remote Operations – Application Protocol Data Unit |
| ROSE | Remote Operations Service Element |
| RPT | Radio Personal Terminal |
| RTF | Radio Terminal Function |
| SACF | Single Association Control Function |
| SAO | Single Association Object |
| SCCP | Signaling Connection Control Part |
| SCF | Service Control Function |
| SCP | Service Control Point |
| SDF | Service Data Function |
| SRF | Specialized Resource Function |
| SSD | Shared Secret Data |
| SSF | Service Switching Function |
| SSP | Service Switching Point |
| SS7 | Signaling System 7 |
| TCAP | Transaction Capabilities Application Part |
| TDMA | Time Division Multiple Access |
| TMSI | Temporary Mobile Subscriber Identity |
| UIM | User Identity Module |
| VLR | Visiting Location Register |

# 4 Overview

## 4.1 Document structure

The 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

The Application Service Elements modules define the ASEs.

### 4.2 Functional architecture

MMAP is based on the functional model depicted in figure 1.

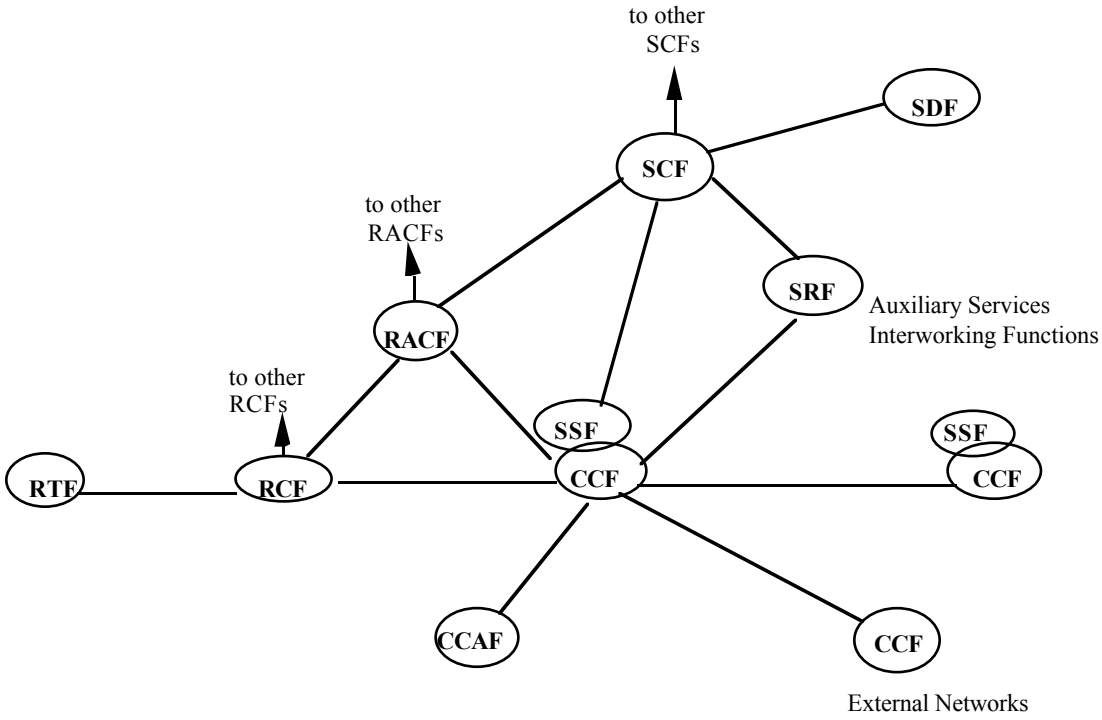


**Figure 1 – Functional model**

## 5 Protocol architecture

### 5.1 Application layer structure

In terms of Open Systems Interconnection (OSI), MMAP is at application layer 7. The information flows and elements of interest are those that are not provided by current protocols such as DSS1, SS7, or X.25. These information flows include those that are related to a call (e.g., Call Delivery) as well as those that are not related to a specific call (e.g., Terminal Registration). MMAP is encapsulated and conveyed by these underlying protocols which provide transport and call/connection control, as illustrated in figure 2.

The MMAP protocol is defined according to ISO recommendations. MMAP operations are included in one or more Application Service Elements (ASEs). MMAP ASEs, along with other ASEs such as Remote Operations Service Element (ROSE) and Association Control Service Element (ACSE), are included in an Application Entity (AE). Object Identifiers may be assigned to AEs and thus identify an Application Context (AC). Peer applications may then communicate via this AC as identified by its Object Identifier.

The MMAP standard defines MMAP operations, MMAP abstract syntax modules, MMAP ASE modules and MMAP ASEs. The MMAP standard does not define MMAP Application Contexts.

The methodology used to carry the MMAP operations is dependent upon the underlying protocols:

MMAP operations can be conveyed via ROSE (interface “a” in figure 2) at the application layer, and then mapped onto the OSI Presentation Layer or X.25.

MMAP operations can be conveyed via TCAP (interface “b” in figure 2) at the application layer, and then mapped onto SS7 or X.25.

MMAP operations can be conveyed via NCAS (interface “c” in figure 2) at the application layer, and then mapped onto ISDN.

In each of the above scenarios, a convergence function maps the MMAP operations to the underlying protocol.

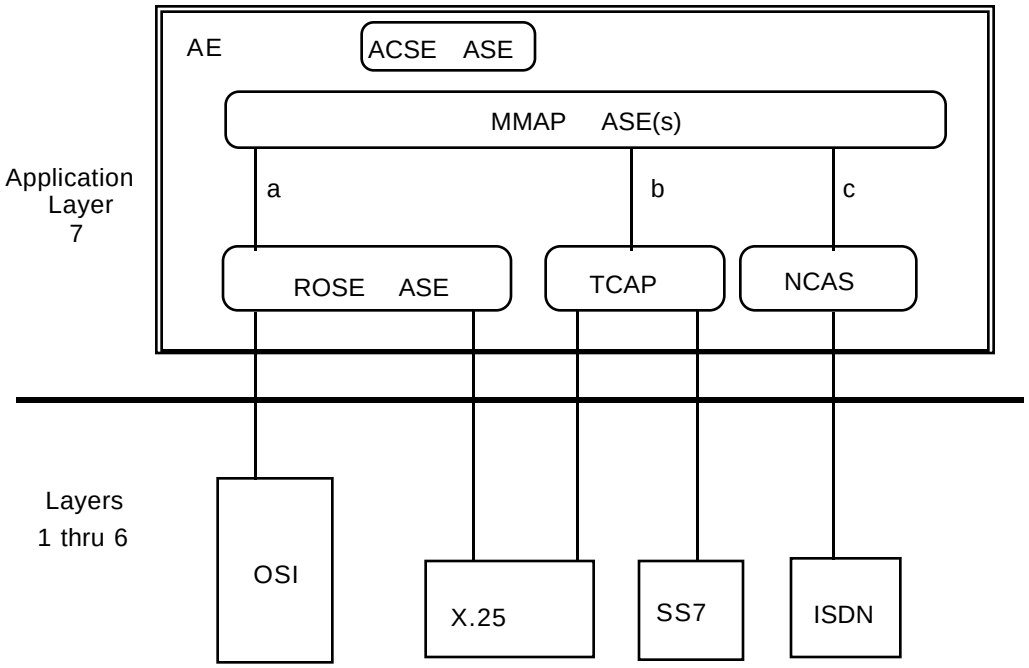


**Figure 2 – Protocol architecture**

The following ROSE operation classes are used to indicate the type of operation:

Operation Class 2 – Asynchronous, reporting success or error
Operation Class 3 – Asynchronous, reporting error only
Operation Class 4 – Asynchronous, reporting success only
Operation Class 5 – Asynchronous, outcome not reported

MMAP application protocol data units and data elements are transferred using Basic Encoding Rules as described in CCITT Recommendation X.209.

## 5.2 Mapping of mobility management operations

### 5.2.1 Mapping to ROSE

MMAP operations are mapped to ROSE operations according to the following:

| | | |
|---|---|---|
| MMAP Request | mapped to | ROSE Invoke |
| MMAP Success Response | mapped to | ROSE Return Result |
| MMAP Error Response | mapped to | ROSE Return Error |

### 5.2.2 Mapping to NCAS

The procedures that describe the mapping of MMAP to ISDN using NCAS in the form of information flows are provided in TIA IS-653, the ISDN Based A-Interface Standard for PCS. In addition, the message definitions including the information elements and components are described in the document.

### 5.2.3 Mapping to TCAP

MMAP operations may be transported using the services of the SS7 or X.25 protocols. To facilitate the use of either of these protocols without impacting the MMAP application protocol, the TCAP application is used. This subclause details the mapping (convergence) of the MMAP application to TCAP.

The mapping of MMAP to TCAP shall follow the guidelines set forth in TIA IS-41 Revision C Part 5.

For SS7 based transport services, all MMAP operations are MTP message priority 0, except for the following, which are priority 1:

Facilities_Directive_3
CCT_Handover_Request
Prepare_Handover
Prepare_Subsequent_Handover
Process_Access_Signaling
Forward_Access_Signaling

Table 1 provides a mapping of MMAP operations to TCAP Component and Package types. In this table, Argument corresponds to “Request” part of the message (defined in clause 6), Success corresponds to the “Success Response” part of the message, and Failure corresponds to the “Error Response” part of the message. Reject is used as defined in TIA IS-41 Revision C Part 5.

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

CDMA Specific Operations:

| Operation Name | Component Type | Package Type |
|---|---|---|
| Facilities_Directive_3 | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |

*(continued)*

**Table 1** *(continued)*

PCS 1900 Specific Operations:

| Operation Name | Component Type | Package Type |
|---|---|---|
| Authentication_Information_Request | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |
| Update_Location_Request | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |
| Cancel_Location_Request | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |
| Purge_User | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | N.A. | N.A. |
| Rejection | REJECT | RESPONSE |
| Validate_Outgoing_Call | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |
| Provide_Roaming_Number | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE[1)] or CONVERSATION WITH PERMISSION[2)] |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |
| Complete_Call | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION[1)] or CONVERSATION WITH |
| Success | RETURN RESULT (LAST) | PERMISSION[2)] RESPONSE[3)] or CONVERSATION WITH PERMISSION[4)] |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |

*(continued)*

**Table 1** *(continued)*

| | | |
|---|---|---|
| Prepare_Handover | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | CONVERSATION WITH PERMISSION |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |
| Prepare_Subsequent_Handover | | |
| Argument | INVOKE (LAST) | CONVERSATION WITH PERMISSION |
| Success | RETURN RESULT (LAST) | CONVERSATION WITH PERMISSION |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |
| Process_Access_Signaling | | |
| Argument | INVOKE (LAST) | CONVERSATION WITH PERMISSION |
| Success | N.A. | N.A. |
| Failure | N.A. | N.A. |
| Rejection | REJECT | RESPONSE |
| Forward_Access_Signaling | | |
| Argument | INVOKE (LAST) | CONVERSATION WITH PERMISSION |
| Success | N.A. | N.A. |
| Failure | N.A. | N.A. |
| Rejection | REJECT | RESPONSE |
| Send_End_Signal | | |
| Argument | INVOKE (LAST) | CONVERSATION WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | N.A. | N.A. |
| Rejection | REJECT | RESPONSE |
| Send _Identification | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |

CCT Specific Operations:

| **Operation Name** | **Component Type** | **Package Type** |
|---|---|---|
| CCT_Handover_Request | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |

*(continued)*

**Table 1** *(continued)*

Common Operations:

| Operation Name | Component Type | Package Type |
|---|---|---|
| Authentication_Directive | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |
| Authentication_Failure_Indication | | |
| Argument | INVOKE (LAST) | UNIDIRECTIONAL |
| Success | N. A. | N. A. |
| Failure | N. A. | N. A. |
| Rejection | N. A. | N. A. |
| Call_Waiting_Notification | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |
| Clear_Request | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |
| Handover_Complete_Indication | | |
| Argument | INVOKE (LAST) | UNIDIRECTIONAL |
| Success | N.A. | N.A. |
| Failure | N.A. | N.A. |
| Rejection | N.A. | N.A. |
| Handover_Performed_Indication | | |
| Argument | INVOKE (LAST) | UNIDIRECTIONAL |
| Success | N. A. | N. A. |
| Failure | N. A. | N. A. |
| Rejection | N. A. | N. A. |
| Network_Challenge_Request | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |
| Qualification_Directive | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |

*(continued)*

**Table 1** *(concluded)*

| | | |
|---|---|---|
| Qualification_Request | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION or CONVERSATION WITH PERMISSION[5)] |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |
| RACF_Authentication_Request | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |
| Registration_Cancellation_Indication | | |
| Argument | INVOKE (LAST) | UNIDIRECTIONAL |
| Success | N.A. | N.A. |
| Failure | N.A. | N.A. |
| Rejection | N.A. | N.A. |
| Registration_Request | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |
| Routing_Request | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |
| Status_Request | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |
| TMSI_Assignment_Request | | |
| Argument | INVOKE (LAST) | QUERY WITH PERMISSION |
| Success | RETURN RESULT (LAST) | RESPONSE |
| Failure | RETURN ERROR | RESPONSE |
| Rejection | REJECT | RESPONSE |

NOTES

[1)] In PS terminated call this corresponds to the case where the operations Provide_Roaming_Number and Complete_Call are within separate transactions.

[2)] In PS terminated call this corresponds to the case where the operations Provide_Roaming_Number and Complete_Call are within the same transaction.

[3)] Applies for a PS terminated call.

[4)] Applies for a PS originated call.

[5)] The Qualification_Request may be sent as a conversation package when sent as a result to a Routing_Request.

# 6 Operations descriptions

## 6.1 PACS operations descriptions

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

#### 6.1.1.1 Common operations

PACS uses the following common operations, as defined in 6.6:

Authentication_Directive
Authentication_Failure_Indication
Call_Waiting_Notification
Clear_Request
Handover_Complete_Indication
Handover_Performed_Indication
Network_Challenge_Request
Qualification_Directive
Qualification_Request
RACF_Authentication_Request
Registration_Cancellation_Indication
Registration_Request
Routing_Request

#### 6.1.1.2 PACS specific operations

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

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

#### 6.1.2.1 Common operations

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

#### 6.1.2.2 PACS specific operations

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

## 6.2 CDMA operations descriptions

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

#### 6.2.1.1 Common operations

CDMA uses the following common operations, as defined in 6.6:

Authentication_Directive
Authentication_Failure_Indication
Call_Waiting_Notification

Clear_Request
Handover_Complete_Indication
Network_Challenge_Request
Qualification_Directive
Qualification_Request
Registration_Cancellation_Indication
Registration_Request
Routing_Request
Status_Request
TMSI_Assignment_Request

#### 6.2.1.2 CDMA specific operations

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

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

#### 6.2.2.1 Common operations

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

#### 6.2.2.2 CDMA specific operations

##### 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 |
| | service_Option | Service_Option | O |
| | terminal_Location | Coordinates | 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 |
| | search_Window | Search_Window | O |
| | actual_Confidentiality | Confidentiality_Modes | O |
| | handoff_Power_Level | Handoff_Power_Level | O |
| | neighbor_List | Neighbor_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 – TIA IS-41 billing identification for billing record correlation

subscriber – identifies the subscriber:
MIN: Mobile Identification Number
IMSI: International Mobile Station Identity
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
service_Option – type of service requested by the RTF (e.g., voice, data, etc.)
terminal_Location – estimated RTF longitude and latitude
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
search_Window – search window size used by mobile to search for traffic channel(s)
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
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 TIA IS-651 Part IIIb
Faulty_Parameter – see TIA IS-41C

### 6.3 PCS 1900 operations descriptions

The operations defined in this clause assume the distribution of functionality as identified below. The operations are defined as peer-to-peer operations between functional entities. When functional entities are physically connected through intermediate nodes, the assumption is that a logical association exists between the entities for the exchange of information via the operations.

Visited SCF functionality

1. Registration procedure

Performs location updating.

2. Service request procedure

Processes the service request of the personal terminal.

RACF functionality

1. Authentication procedure

Obtains authentication information from the Home SCF and personal terminal and compares the results to determine if the subscriber is valid.

2. Identity procedure

Obtains information about the subscriber or personal terminal from the personal terminal.

3. Subscriber temporary identity

Performs the assignment of the subscriber's temporary identifier.

4. Locate personal terminal

Locates the personal terminal.

5. Detached subscribers

Maintains the status of the subscriber in relation to the personal terminal.

6. Ciphering process

Initiates the encryption process and maintains information about the encryption algorithms and encryption keys.

7. Handover

Performs the handover process and maintains information about the cells. Notifies the visited SCF when handover occurs in order to update location area.

### 6.3.1 RACF <----> SCF operations

#### 6.3.1.1 Common operations

PCS 1900 does not utilize any RACF-to-SCF common operations.

#### 6.3.1.2 PCS 1900 specific operations

##### 6.3.1.2.1 PCS 1900 authentication information request

Name: Authentication_Information_Request

Direction: RACF ----> SCF

Description:

This operation is used to obtain authentication information from the SCF for use in the authentication process in the RACF.

Operational Rules:

When the RACF determines that it needs to update its authentication information regarding a specific subscriber, it initiates an authentication information request to the SCF. The authentication parameters given by the SCF consist of a list of triplets. A set of one to five authentication triplets are transferred from the SCF to the RACF, if the outcome of the operation was successful. If the SCF cannot provide the RACF with triplets, an empty response is returned. The RACF may then re-use the old authentication triplets.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | IMSI | M |
| Response: | | | |
| Success: | | | |
| | authentication_Info | Authentication_Set_List | O |
| Errors: | | | |
| | authentication_Info_Error | see definitions below | M |

Parameter Definitions:

| | |
|---|---|
| subscriber | – identifies the subscriber to be authenticated |
| authentication_Info | – a list of RAND, SRES, and Kc triplets for use in the authentication process |

Error Definitions:

| | |
|---|---|
| unknown_Subscriber | – subscription does not exist. |
| system_Failure | – 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 | – data type is formally correct but its value or presence is unexpected in the current context. |

#### 6.3.1.2.2 PCS 1900 update location request

Name: Update_Location_Request

Direction: RACF ---> SCF

Description:

This operation is used by the RACF to register and update the location information of a subscriber stored in the SCF.

Operational Rules:

Update_Location is an operation needed to keep track of where personal terminals are located. A personal terminal includes the terminal equipment, and the User Identity Module (UIM) which contains the subscriber identity (IMSI). The location information of each personal terminal is defined by a Location Area (LA) identity. The address of the RACF controlling an LA is stored in the SCF. A Location Area covers one or more cells. An RACF can control one or several LAs. The maximum size of an LA is limited to the area controlled by one RACF. Personal terminals may move within an LA without updating their location information in the RACF, and within all LAs of one single RACF without updating location information in the SCF.

A location updating procedure is initiated by a personal terminal when it has moved to a new Location Area. If the new LA is controlled by an RACF other than the previous one, then the new RACF initiates an Update_Location operation toward the SCF. It sends the identity of the subscriber (IMSI) and the address of the RACF to the SCF.

The RACF can optionally allocate a local subscriber identity for the personal subscriber. It is significant only to the particular RACF. It is used in signaling with the SCF to optimize access to the subscriber data record in the RACF.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | IMSI | M |
| | short_Message_Address | ISDN_Address_String | M |
| | racf | ISDN_Address_String | M |
| | local_Subscriber | LMSI | O |
| Response: | | | |
| Success: | | | |
| | home_SCF | ISDN_Address_String | M |
| Errors: | | | |
| | update_Location_Error | see definitions below | M |

Parameter Definitions:

| | |
|---|---|
| subscriber | – unique identity of a PCS subscriber. |
| short_Message_Address | – address of the RACF for submitting short messages to the RACF for delivery to a personal terminal. |
| racf | – address of the RACF for addressing messages related to a personal terminal to the RACF. |
| local_Subscriber | – local identity of a subscriber within the RACF for internal management of subscriber data. |
| home_SCF | – address of the home SCF of the subscriber. |

Error Definitions:

| | |
|---|---|
| unknown_Subscriber | – subscription does not exist. |
| roaming_Not_Allowed | – location updating attempt is made in an area not covered by the subscription. |
| system_Failure | – 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 | – data type is formally correct but its value or presence is unexpected in the current context. |

#### 6.3.1.2.3 PCS 1900 cancel location request

Name: Cancel_Location_Request

Direction: RACF <--- SCF

Description:

This operation is used by the SCF to delete all information of a subscriber from an RACF in association with a location update to another RACF.

Operational Rules:

This location cancellation procedure is used by the SCF to remove all data concerning a personal terminal from an RACF. A personal terminal includes the terminal equipment and the User Identity Module (UIM) which contains the subscriber identity (IMSI). The procedure is normally used when a personal terminal has moved from an area of an RACF to an area controlled by a different RACF. It can also be initiated after an OAM&P action.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | IMSI | M |
| | local_Subscriber | LMSI | O |
| Response: | | | |
| Success: | no parameters | | |
| Errors: | | | |
| | cancel_Location_Error | see definitions below | M |

Parameter Definitions:

| | |
|---|---|
| subscriber | – unique identity of a PCS subscriber. |
| local_Subscriber | – local identity of a subscriber within the RACF for internal management of subscriber data. Provision optional to the operator of the RACF. |

Error Definitions:

| | |
|---|---|
| data_Missing | – an optional parameter required by the context in which the operation is applied is missing. |
| unexpected_Data_Value | – data type is formally correct but its value or presence is unexpected in the context in which the operation is applied. |

#### 6.3.1.2.4 PCS 1900 purge user

Name: Purge_User

Direction: RACF ---> SCF

Description:

This operation is used between the RACF and the SCF to cause the SCF to mark a personal terminal as not reachable. Any request for routing information for a terminating call or a terminating short message will be treated as if the personal terminal is not reachable.

Operational Rules:

This operation is invoked when the user record for a personal terminal is to be deleted in the RACF, either as a result of an OAM&P action or automatically (e.g., the personal terminal has been inactive for a very long time). As a result of a purge, the RACF requests the SCF to mark the personal terminal as not reachable. All calls and short messages addressed to the personal terminal will be treated as if the personal terminal is not reachable.

ROSE Operation Class: Class 4

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | IMSI | M |
| | racf | ISDN_Address_String | M |

Response:

Success: no parameters

Errors: not applicable

Parameter Definitions:

| | |
|---|---|
| subscriber | – unique identity of a PCS subscriber. |
| racf | – address of the RACF for addressing messages related to a personal terminal to the RACF. |

#### 6.3.1.2.5 PCS 1900 validate outgoing call

Name: Validate_Outgoing_Call

Direction: RACF ---> SCF

Description:

This operation is used to validate the service parameters requested by the subscriber for an outgoing call.

Operational Rules:

Before any network resources are to be reserved for an outgoing call setup, the requested service parameters are to be analyzed and validated. This operation is used by the RACF to transfer appropriate service parameters to the SCF for analysis and validation in the case of a call originated by a personal terminal.

Upon receiving this message, the SCF extracts service related parameters and verifies that they are aligned with the subscriber service profile. It is also verified that the requested services can be supported.

In a successful case the service request is accepted and the message is acknowledged to the RACF by the SCF with a list of preferred carriers (to be sent further by the RACF to the RCF for use in call setup request between the RCF and the SSF). Also the allocation of network resources is initiated according to requested service parameters and the call setup will proceed normally.

In a validation failure case the outgoing call is terminated and the release of already reserved radio resources is initiated through return of an appropriate error code to the RACF.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | user_Id | User_Id_Type | M |
| | digits_Dialed | Address_String | O |
| | pcs_Bearer_Service | Bearer_Service_List | O |
| | teleservice | Teleservice_List | O |
| Response: | | | |
| Success: | | | |
| | pref_Carrier | Pref_Carrier_Id_List | M |
| Errors: | | | |
| | validate_Outgoing_Call_Error | | see definitions below |
| | M | | |

Parameter Definitions:

user_Id – identity of the party requesting PCS service. In normal call setup it shall always be IMSI. However, in an emergency call with no UIM card inserted in the terminal, it may be IMEI.

digits_Dialed – directory number of the called party.

pcs_Bearer_Service – indicates the PCS bearer capability (as specified in TIA IS-653) requested to be used in a service. One or two bearer capabilities may be given.

teleservice – indicates the requested teleservices (as specified in TIA IS-653). One or two teleservices may be given.
pref_Carrier – list of the long distance carriers to be used in the call.

Error Definitions:

unknown_Subscriber – subscriber data cannot be located or subscription does not exist.
bearer_Serv_Not_Provisioned – requested bearer service is either not supported or subscribed to.
tele_Service_Not_Provisioned – requested teleservice is either not supported or subscribed to.
data_Missing – an optional parameter required by the context is missing.
unexpected_Data_Value – data type is formally correct but its value or presence is unexpected in the current context.
system_Failure – task cannot be performed because of a problem in another entity.
call_Barred – call to requested destination is barred.

#### 6.3.1.2.6 PCS 1900 provide roaming number

Name: Provide_Roaming_Number

Direction: RACF <--- SCF

Description:

This operation is used between the SCF and the RACF to request a roaming number for an incoming call. The operation is invoked by the SCF to request the RACF to send back a roaming number to enable the SCF to instruct the network to route an incoming call to the called personal terminal.

Operational Rules:

Establishment of a call to a PCS user requires the actual location of the called user to be indicated to the network by a roaming number. A roaming number is allocated and used to route the call in the network. The SCF can request the RACF to allocate a roaming number for an incoming call. The SCF can indicate the bearer capabilities required for the call. The RACF returns a roaming number to the SCF which then instructs the network to establish the call using the roaming number as the address.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | IMSI | M |
| | personal_Number | ISDN_Address_String | O |
| | local_Subscriber | LMSI | O |
| | pcs_Bearer_Service | Bearer_Service_List | O |
| | network_Capability | Network_Signal_Info | O |
| Response: | | | |
| Success: | | | |
| | roaming_Number | ISDN_Address_String | M |
| Errors: | | | |
| | provide_Roaming_Number _Error | see definitions below | M |

Parameter Definitions:

| | |
|---|---|
| subscriber | – unique identity of a PCS subscriber. |
| personal_Number | – personal subscriber ISDN number identifying a PCS subscriber, the number dialed to reach a PCS subscriber. |
| local_Subscriber | – local identity of a subscriber within the RACF for internal management of subscriber data. Provision optional to the operator of radio system. It is to be included if it has been previously (in location update) provided to the SCF by the RACF. |
| pcs_Bearer_Service | – indicates the PCS bearer capability (as specified in TIA IS-653) requested to be used in a service. One or two bearer capabilities may be given. |
| network_Capability | – imported as external signal information from protocol as described in ANSI T1.113. It may include information about ISDN bearer capability, high layer compatibility and low layer compatibility. |
| roaming_Number | – ISDN number for routing and establishing calls to the location of the called PCS subscriber. On request from the network via the SCF it is temporarily allocated by the radio system which is serving the personal terminal. |

Error Definitions:

| | |
|---|---|
| absent_Subscriber | – subscriber is inactive (e.g., powered down, detached, or not reachable). |
| no_Roaming_Number_Available | – all available roaming numbers are already in use. |
| facility_Not_Supported | – requested facility is not supported. |
| system_Failure | – 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 | – data type is formally correct but its value or presence is unexpected in the current context. |

#### 6.3.1.2.7 PCS 1900 complete call

Name: Complete_Call

Direction: RACF <--- SCF

Description:

This operation is used by the SCF to provide the RACF with necessary information to allocate appropriate radio system resources as required to complete an incoming or an outgoing call.

Operational Rules:

The message Complete_Call is sent by the SCF to the RACF in order to initiate completion of an incoming or an outgoing call. Before a call can be completed on the radio system side, the personal terminal has to be paged (in terminating call) and dedicated radio resources have to be made available for the call.

Upon receiving this message, the RACF extracts service related parameters and verifies that the personal terminal is reachable and that appropriate radio resources are available. If this is the case, then the message is acknowledged to the SCF with an interface DN used to setup a B-channel between the SSF and the RCF. In the case of a problem the call establishment is terminated, radio resources are released and the release of network resources is initiated by the RACF through sending of an appropriate error indication to the SCF.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | user_Id | User_Id_Type | M |
| | local_Subscriber | LMSI | O |
| | personal_Number | ISDN_Address_String | O |
| | pcs_Bearer_Service | Bearer_Service_List | O |
| | network_Capability | Network_Signal_Info | O |
| | ss_Data | SS_Data_List | O |
| Response: | | | |
| Success: | | | |
| | interface_DN | ISDN_Address_String | M |
| Errors: | | | |
| | complete_Call_Error | see definitions below | M |

Parameter Definitions:

user_Id – identity of the party for which the PCS call is to be completed. Identity type may be either IMSI or IMEI. In normal call setup it shall always be IMSI. However, in an emergency call when the calling subscriber cannot be identified, it may be IMEI.

local_Subscriber – local identity of a subscriber within the RACF for internal management of subscriber data. It is to be included if it has been previously (in location update) provided to the SCF by the RACF.

personal_Number – personal subscriber ISDN number identifying a PCS subscriber, the number dialed to reach a PCS subscriber.

pcs_Bearer_Service – indicates the PCS bearer capability (as specified in TIA IS-653) to be used in a service. One or two bearer capabilities may be given.

network_Capability – imported as external signal information from protocol as described in ANSI T1.113. It may include information about ISDN bearer capability, high layer compatibility and low layer compatibility.

ss_Data – a list of SS data that will only be passed if the information is available (for example for supplementary service such as calling number identification presentation).

interface_DN – ISDN directory number uniquely identifying the interface to be employed between the radio system and the SSF in a call.

Error Definitions:

no_Subscriber_Reply – subscriber does not reply to the paging.

radio_Congestion – no radio resources available.

busy_Subscriber – the subscribers resources (terminal or person using them) are busy.

data_Missing – an optional parameter required by the context is missing.

unexpected_Data_Value – 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

PCS 1900 does not utilize any RACF-to-RACF common operations.

#### 6.3.2.2 PCS 1900 specific operations

##### 6.3.2.2.1 PCS 1900 prepare handover

Name: Prepare_Handover

Direction: Anchor RACF ---> Target RACF

Description:

This operation is used by the anchor RACF to request allocation of radio resources for handover from an RCF which is under the control of another (target) RACF.

Operational Rules:

This operation can be triggered by two distinct events:

1) by a handover request from the RCF which is serving the personal terminal. In this case the RCF is controlled by the anchor RACF, or

2) by a handover request from a distinct (serving) RACF (see 6.3.2.2.2). In this case the personal terminal is served by an RCF which is controlled by the serving RACF.

In both of these situations the request will carry the HANDOVER_REQUEST message specified in TIA IS-651 in the rs-Apdu parameter, containing all the information required by the target RACF to allocate the necessary radio resources. If no circuit connection between the serving and the target RCFs is needed (i.e., there is only a signaling connection between the personal terminal and the network), the parameter handover_Number_NR is contained in the request.

Upon receiving the request, the target RACF reserves the appropriate radio resources and allocates the handover number, if needed.

Depending on the result of the allocation of the radio resources, the rs_Apdu in the Prepare_Handover response contains one of the following messages defined in TIA IS-651:

HANDOVER_REQUEST_ACKNOWLEDGE,
HANDOVER_FAILURE,
QUEUING_INDICATION

The Prepare_Handover operation can also be used to request a handover number, when a circuit connection between the anchor RCF and the serving RCF has to be set up after an inter-RACF handover without circuit connection. In this case the request contains the ASSIGNMENT_REQUEST message defined in TIA IS-651 in rs_Apdu parameter. The response can contain one of the following messages defined in TIA IS-651 in rs_Apdu parameter:

ASSIGNMENT_COMPLETE,
ASSIGNMENT_FAILURE
QUEUING_INDICATION.

In this case the parameter target_Cell is not included in the request.

ROSE operation class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | target_Cell | Target_Cell_ID | O |
| | handover_Number_NR | Handover_Number_NR | O |
| | rs_Apdu | RS_Apdu | O |
| Response: | | | |
| Success: | | | |
| | handover_Number | ISDN_ Address_String | O |
| | rs_Apdu | RS_Apdu | O |
| Errors: | | | |
| | prepare_Handover_Error | see definitions below | M |

Parameter Definitions:

target_Cell – identity of the cell to which a call has to be handed over.
handover_Number_NR – this parameter indicates that no handover number allocation is necessary.
rs-Apdu – this parameter is used to carry the radio system specific information between RACFs.
handover_Number – the ISDN number used for routing a call between RCFs during handover

Error Definitions:

no_Handover_Number_Available – all available handover numbers are already in use
system_Failure – task cannot be performed because of a problem in another entity
unexpected_Data_Value – data type is formally correct but its value or presence is unexpected in the context in which the operation is applied.
data_Missing – an optional parameter required by the context in which the operation is applied is missing

#### 6.3.2.2.2 PCS 1900 prepare subsequent handover

Name: Prepare_Subsequent_Handover

Direction: Serving RACF ---> Anchor RACF

Description:

This operation is used in a situation where a handover from the anchor RACF to a second RACF (the serving RACF, distinct from the anchor RACF) has already happened and is completed. By this operation the serving RACF notifies the anchor RACF that a handover either back to the anchor RACF or to a third RACF (target RACF) is required.

Operational Rules:

When the serving RACF has decided that a further handover between RACFs is needed it sends the Prepare Subsequent Handover request to anchor RACF. This message indicates the target RS address and the target cell identity. It also includes a complete HANDOVER_REQUEST message defined in TIA IS-651 in the rs_Apdu parameter. After receiving the request, the anchor RACF starts the handover procedure.

The rs_Apdu parameter in the Prepare_Subsequent_Handover response contains one of the following messages defined in TIA IS-651:

HANDOVER_REQUEST_ACKNOWLEDGE,
HANDOVER_FAILURE
QUEUING_INDICATION.

ROSE operation class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| target_Cell | Target_Cell_ID | M | |
| | target_RS_Address | ISDN__Address_String | M |
| | rs-Apdu | RS-Apdu | M |
| Response: | | | |
| Success: | | | |
| | rs-Apdu | RS-Apdu | M |
| Errors: | | | |
| | prepare_Subsequent_ Handover_Error | see definitions below | M |

Parameter Definitions:

target_Cell – identity of the cell to which a call has to be handed over.
target_RS_Address – this parameter refers to the ISDN number of an RACF to which a call has to be handed over.
rs-Apdu – this parameter is used to carry the radio system specific information between RACFs.

Error Definitions:

unknown_RACF – identity of target RACF is not recognized.
subsequent_Handover_Failure – handover to target radio system failed.
unexpected_Data_Value – data type is formally correct but its value or presence is unexpected in the context in which the operation is applied.
data_Missing – an optional parameter required by the context in which the operation is applied is missing

#### 6.3.2.2.3 PCS 1900 process access signaling

Name: Process_Access_Signaling

Direction: Serving RACF ---> Anchor RACF

Description:

This operation is used by the serving RACF (which is distinct from the anchor RACF) to pass the information received from the serving RCF to the anchor RACF for processing.

Operational Rules:

When the serving RACF receives information from the serving RCF that needs to be processed by the anchor RACF, it embeds this information in the rs-Apdu parameter and passes the information to the anchor RACF. No response is expected.

The rs-Apdu parameter is defined in TIA IS-651 and ANSI J-STD-007.

ROSE operation class: Class 5

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | rs-Apdu | RS-Apdu | M |
| Response: | not applicable | | |
| Success: | | | |
| Errors: | | | |

Parameter Definitions:

rs-Apdu – this parameter is used to carry the radio system specific information between RACFs.

#### 6.3.2.2.4 PCS 1900 forward access signaling

Name: Forward_Access_Signaling

Direction: Anchor RACF ---> Serving RACF

Description:

This operation is used by the anchor RACF to pass information to the serving RACF (which is distinct from the anchor RACF) to be further passed to the serving RCF for processing.

Operational Rules:

When the anchor RACF needs to pass radio system specific information to the serving RCF controlled by another (serving) RACF, it embeds this information in the rs-Apdu parameter and passes this information to the serving RACF, which will pass it further to the serving RCF. No response is expected.

The rs-Apdu parameter is defined in TIA IS-651 and ANSI J-STD-007.

ROSE operation class: Class 5

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request | | | |
| | rs-Apdu | RS-Apdu | M |

Response: not applicable

Success:

Errors:

Parameter Definitions:

rs-Apdu – this parameter is used to carry the the radio system specific information between RACFs .

#### 6.3.2.2.5 PCS 1900 send end signal

Name: Send_End_Signal

Direction: Target RACF ---> Anchor RACF

Description:

This operation is used by the target RACF (now becoming the new serving RACF) to indicate to the anchor RACF that the radio path has been established between an RCF under its control and the personal terminal.

The response is used by the anchor RACF to inform the old serving RACF that all resources for the call can be released in the old serving RACF.

Operational Rules:

When the radio link between the personal terminal and the new serving RCF has been successfully established, the RACF controlling the target RCF sends the request to the anchor RACF. This request includes the HANDOVER_COMPLETE message defined in TIA IS-651 in the rs_Apdu parameter.

Upon receiving the request, the anchor RACF initiates the release of the circuit between the anchor RCF and the old serving RCF, provided that the old serving RCF was not the anchor RCF.

The response is sent by the anchor RACF to initiate the release of the radio resources, either when the call is released or the call is successfully handed over to another RACF.

Upon receiving the response, the RACF releases the radio resources.

ROSE operation class: Class 4

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | rs-Apdu | RS-Apdu | M |
| Response: | | | |
| Success: | no parameters | | |
| Errors: | not applicable | | |

Parameter Definitions:

rs-Apdu – this parameter is used to carry the radio system specific information transparently between RACFs.

#### 6.3.2.2.6 PCS 1900 send identification

Name: Send_Identification

Direction: RACF ----> RACF

Description:

This operation is used by a radio system to request the identity (IMSI) and the authentication information of a subscriber from the previous radio system in association with a location update to a new radio system.

Operational Rules:

When a personal terminal performs a location update to a new radio system identifying itself by a Temporary Mobile Subscriber Identity (TMSI), the new radio system has to request the IMSI and the authentication data of the subscriber from the previous radio system using the TMSI as the identity. The previous radio system returns the IMSI and the remaining authentication information. If the request cannot be directed to the previous radio system, or the previous radio system does not recognize the TMSI, then the new radio system has to request the IMSI of the subscriber from the personal terminal.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | TMSI | M |
| Response: | | | |
| Success: | | | |
| | subscriber | IMSI | O |
| | authentication_Info | Authentication_Set_List | O |
| Errors: | | | |
| | send_Identification_Error | see definitions below | |

Parameter Definitions:

| | |
|---|---|
| subscriber | – unique identity of a PCS subscriber |
| authentication_Info | – a list of RAND, SRES, and Kc triplets for use in the authentication process |

Error Definitions:

| | |
|---|---|
| unidentified_Subscriber | – subscriber cannot be identified by TMSI. |
| system_Failure | – 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 | – data type is formally correct but its value or presence is unexpected in the current context. |

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

#### 6.4.1 RACF <---> SCF operations

##### 6.4.1.1 Common operations

CCT uses the following common operations, as defined in 6.6:

Authentication_Directive
Authentication_Failure_Indication
Call_Waiting_Notification
Clear_Request
Handover_Complete_Indication
Handover_Performed_Indication
Network_Challenge_Request
Qualification_Directive
Qualification_Request
RACF_Authentication_Request
Registration_Cancellation_Indication
Registration_Request
Routing_Request

##### 6.4.1.2 CCT specific operations

There are no CCT specific RACF-to-SCF operations

#### 6.4.2 RACF <----> RACF operations

##### 6.4.2.1 Common operations

CCT does not utilize any RACF-to-RACF common operations

##### 6.4.2.2 CCT specific operations

###### 6.4.2.2.1 CCT handover request

Name: CCT_Handover_Request

Direction: source RACF ----> target RACF

Description:

This operation is used to request a handover of an RTF from a source RACF to a target RACF.

Operational Rules:

The request identifies the target RACF and provides information about the RTF. If the handover can be supported by the target RACF/RCF, a success response is returned with a handover number. If the handover cannot be supported, an error is returned.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | Subscriber_ID | M |
| | target_Cell | Node_ID | M |
| | source_Cell | Node_ID | M |
| | billing | Billing_ID | M |
| | mobile_Bearer_Capabilities | Mobile_Bearer_Characteristics | M |
| | terminal | Terminal_ID | O |
| Response: | | | |
| Success: | | | |
| | subscriber | Subscriber_ID | M |
| | handover_Number | Handover_Number | M |
| | terminal | Terminal_ID | O |
| Errors: | | | |
| | cCT_Handover_Request_ Error | Error_Code | M |
| | cause | Cause | O |
| | parameter_In_Error | Faulty_Parameter | O |

Parameter Definitions:

| | |
|---|---|
| subscriber | – identifies the subscriber (either permanent or temporary identifier) |
| target_Cell | – identifies the target cell for handover |
| source_Cell | – identifies the source cell for handover |
| billing | – billing identifier |
| mobile_Bearer_Capabilities | – identifies the mobile bearer capabilities to be supported |
| terminal | – identifies the terminal (ESN or IMEI) |
| handover_Number | – the handover reference number |
| cCT_Handover_Request_Error | – identifies a handover 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 TIA IS-651 Part IIIb

Faulty_Parameter – see TIA IS-41C

## 6.5 TDMA operations descriptions

### 6.5.1 RACF <---> SCF operations

#### 6.5.1.1 Common operations

TDMA uses the following common operations, as defined in 6.6:

- Authentication_Directive
- Authentication_Failure_Indication
- Call_Waiting_Notification
- Clear_Request
- Handover_Complete_Indication
- Network_Challenge_Request
- Qualification_Directive
- Qualification_Request
- Registration_Cancellation_Indication
- Registration_Request
- Routing_Request
- Status_Request
- TMSI_Assignment_Request

#### 6.5.1.2 TDMA specific operations

There are no TDMA specific RACF-to-SCF operations.

### 6.5.2 RACF <----> RACF operations

#### 6.5.2.1 Common operations

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

#### 6.5.2.2 TDMA specific operations

There are no TDMA specific RACF-to-RACF operations.

## 6.6 Common operations descriptions

### 6.6.1 RACF <---> SCF operations

#### 6.6.1.1 Authentication directive

Name: Authentication_Directive

Direction: RACF <-- SCF

Description:

This operation is used to update the shared secret data, call history count, or request number at the personal terminal. It can also be used for a unique challenge from the SCF to the RACF.

Operational Rules:

This operation includes rand_SSD if the SCF is requesting the updating of the Shared Secret Data (SSD) at the personal terminal. In order to request a count update at the personal terminal, the SCF includes the init_Count_Update parameter and the current call history count. In order to request a request number update at the personal terminal, the SCF includes the request_Number parameter. For a unique challenge, the SCF includes the rand_U, the random number used as input to the authentication algorithm, in this operation.

The subscriber identifier is required where no association exists between the SCF and RACF which identifies the subscriber at a terminal.

If the Authentication_Directive operation was used by the SCF for a unique challenge, the success response includes auth_U, which is the output of the authentication algorithm used at the SCF and the personal terminal. The SCF compares the received response to its calculated response.

If the Authentication_Directive operation fails, an error response is sent from the RACF to the SCF.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | Subscriber_ID | C |
| | terminal | Terminal_ID | O |
| | rand_SSD | Random_Variable_SSD | O |
| | init_Count_Update | Update_Count | O |
| | count | Call_History_Count | O |
| | rand_U | Random_Variable_Unique_ Challenge | O |
| | request_Number | Request_Number | O |
| Response: | | | |
| Success: | | | |
| | auth_U | Authentication_Response_ Unique_Challenge | O |
| | request_Number | Request_Number | O |

Error:

| | | |
|---|---|---|
| authentication_Directive_ Error | Error_Code | M |
| cause | Cause | O |
| parameter_In_Error | Faulty_Parameter | O |

Parameter Definitions:

| | |
|---|---|
| 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 or IMEI) |
| rand_SSD | – random variable used as input for SSD generation |
| init_Count_Update | – parameter used to indicate that count update is requested |
| count | – call history parameter |
| rand_U | – random variable used as input to authentication during unique challenge |
| request_Number | – request number of the update |
| auth_U | – the output of the authentication process during unique challenge |
| authentication_Directive_Error | – includes 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:<br>Unrecognized_MIN<br>Unrecognized_ESN<br>MIN_HLR_Mismatch<br>Operation_Sequence_Problem<br>Resource_Shortage<br>Operation_Not_Supported<br>Trunk_Unavailable<br>Parameter_Error<br>System_Failure<br>Unrecognized_Parameter_Value<br>Feature_Inactive<br>Missing_Parameter<br>Requested_Information_Unavailable |
| Cause | – see TIA IS-651 Part IIIb |
| Faulty_Parameter | – see TIA IS-41C |

#### 6.6.1.2 Authentication failure indication

Name: Authentication_Failure_Indication

Direction: SCF ----> RACF

Description:

This operation is used to inform the RACF that the authentication procedure was unsuccessful. Alternatively, the SCF may initiate other forms of service denial (e.g., call clearing).

Operational Rules:

The authentication process occurs in both the personal terminal and the SCF. The result of the authentication procedure in the RTF is sent to the SCF where a comparison of the results occurs. The authentication failure operation notifies the RACF that the comparison failed.

The subscriber identifier is required where no association exists between the SCF and RACF which identifies the subscriber at a terminal.

ROSE Operation Class: Class 5

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | Subscriber_ID | C |
| | terminal | Terminal_ID | 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)

#### 6.6.1.3 Call waiting notification

Name: Call_Waiting_Notification

Direction: RACF <--- SCF

Description:

This operation may be sent from the SCF to the RACF to inform the RACF that an additional call is to be delivered on an existing connection.

Operational Rules:

When an SCF receives a routing request from a subscriber's home SCF, and the SCF determines that the indicated RTF is active on a call and has a call waiting feature active, authorized, and allowed, it sends the Call_Waiting_Notification to the RACF currently serving the RTF. Thus, in the case where the existing call is cleared before the new call arrives, the RACF can allow the call to be cleared while keeping the radio channel available for the subsequent call when it arrives. This allows the call to be delivered without reinitiating the alerting process.

When the RACF receives the Call_Waiting_Notification, it records that a call is enroute for the indicated RTF and therefore the radio channel on which the RTF is currently active should not be released. The RACF also starts a timer waiting for the incoming call. When the switch delivers the call to the radio system, the timer is stopped. If the timer expires, call clearing procedures are invoked for the call so that the SCF can update the activity status of the indicated RTF.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | Subscriber_ID | M |
| | terminal | Terminal_ID | O |
| Response: | | | |
| Success: | no parameters | | |
| Errors: | | | |
| | call_Waiting_Notification_ Error | Error_Code | M |
| | cause | Cause | O |
| | parameter_In_Error | Faulty_Parameter | O |

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_Waiting_Notification_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 TIA IS-651 Part IIIb

Faulty_Parameter – see TIA IS-41C

#### 6.6.1.4 Clear request

Name: Clear_Request

Direction: RACF <---> SCF

Description:

This operation is sent from the RACF to the SCF to indicate that the RTF is no longer active on a call or that the call has failed. This includes the case where two calls are active and one is cleared. It may also be sent from the SCF to the RACF to request clearing of a call connection and all associated resources.

Operational Rules:

When the RACF (or SCF) detects that an RTF is no longer active on a call (this may happen when the RTF disconnects or any other abnormal occurrence), it clears the data associated with the call and sends the Clear_Request operation to the SCF (or RACF).

The registration type may be used to indicate that the RTF release included power-down notification.

When an SCF (or RACF) receives the Clear_Request, it also clears the data associated with the call and updates the status of the indicated RTF (e.g., the RTF is no longer active on a call or that the RTF is active on only one call).

If the Clear_Request operation fails, the SCF (or RACF) returns the cause of the failure to the originating entity.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | Subscriber_ID | M |
| | terminal | Terminal_ID | O |
| | setup_Time | Time_Stamp | O |
| | connect_Time | Time_Stamp | O |
| | disconnect_Time | Time_Stamp | O |
| | registration_Type | Registration_Type | O |
| | call_Reference | Call_Reference | O |
| | clear_Cause | Cause | O |
| Response: | | | |
| Success: | no parameters | | |
| Errors: | | | |
| | clear_Request_Error | Error_Code | M |
| | cause | Cause | O |
| | parameter_In_Error | Faulty_Parameter | O |

Parameter Definitions:

| | |
|---|---|
| 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 or IMEI) |
| setup_Time | – time of setup |
| connect_Time | – time of connect |
| disconnect_Time | – time of disconnect |
| registration_Type | – type of registration, set to “power down/deregistration” |
| call_Reference | – identifies the party released, for multiparty call cases |
| clear_Cause | – contains the reason for call clearing |
| clear_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:<br>Unrecognized_MIN<br>Unrecognized_ESN<br>MIN_HLR_Mismatch<br>Operation_Sequence_Problem<br>Resource_Shortage<br>Operation_Not_Supported<br>Trunk_Unavailable<br>Parameter_Error<br>System_Failure<br>Unrecognized_Parameter_Value<br>Feature_Inactive<br>Missing_Parameter<br>Requested_Information_Unavailable |
| Cause | – see TIA IS-651 Part IIIb |
| Faulty_Parameter | – see TIA IS-41C |

#### 6.6.1.5 Handover complete indication

Name: Handover_Complete_Indication

Direction: RACF ---> SCF

Description:

This operation is sent from the RACF to the SCF to indicate that the RTF is now served at the designated interface DN (IDN). In a distributed implementation, the SCF informs the formerly serving RACF with a Handover_Performed_Indication operation that the RTF has completed a handover.

Operational Rules:

When an RACF determines that a handover is complete, it may update the IDN in the RACF's record of the RTF and send the Handover_Complete_Indication to the SCF. This operation may be used for billing or trace purposes as well.

When an SCF receives the Handover_Complete_Indication, it shall update the RACF's identity, if necessary, and the IDN in the SCF's record of the RTF. In a distributed implementation of an RACF, if the SCF determines that the RACF is a new RACF, it shall send the Handover_Performed_Indication to the old RACF.

At least one of the conditional parameters must be provided if no association exists between the RACF and SCF.

ROSE Operation Class: Class 5

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| subscriber | Subscriber_ID | C | |
| | terminal | Terminal_ID | C |
| | channel_ID_List | Channel_ID_List | C |
| | channel_Number_List | Channel_Number_List | C |
| | target_Cell_ID_List | Cell_ID_List | C |
| | interface_DN | Digits | O |
| | racf | Node_ID | O |
| | alert_Identifier | Alert_Value | O |
| | cause | Cause | O |

Response: not applicable

Success:

Errors:

Parameter Definitions:

| | |
|---|---|
| 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 or IMEI) |
| channel_ID_List | – current CDMA channel identity information for one or more channels |
| channel_Number_List | – logical number(s) assigned to the equipment providing the traffic channel; useful for statistics, billing, and call trace operations |
| target_Cell_ID_List | – current CDMA channel identity information for one or more channels |
| interface_DN | – the directory number of the radio system interface |
| racf | – identifies the racf originating the request |
| alert_Identifier | – identifies the current temporary RTF alias for alerting |
| cause | – why a handover is required |

#### 6.6.1.6 Handover performed indication

Name: Handover_Performed_Indication

Direction: RACF <---- SCF

Description:

This operation is sent from the SCF to the source RACF to indicate that the RTF is now served by the target RACF.

Operational Rules:

When the source RACF receives the Handover_Performed_Indication, it shall initiate the clearing of appropriate resources associated with the call prior to the handover.

ROSE Operation Class: Class 5

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | Subscriber_ID | M |
| | terminal | Terminal_ID | O |
| | alert_Identifier | Alert_Value | O |

Response: not applicable

Success:

Errors:

Parameter Definitions:

| | |
|---|---|
| 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 or IMEI) |
| alert_Identifier | – provides a temporary RTF alias for alerting |

#### 6.6.1.7 Network challenge request

Name: Network_Challenge_Request

Direction: RACF --> SCF

Description:

This operation is used to authenticate the network to the personal terminal or subscriber.

Operational Rules:

This operation is sent from the RACF to the SCF to authenticate the network. It contains rand_BS, which is a random number used as an input parameter to the authentication algorithm at the personal terminal and the SCF. auth_BS is the output of the authentication algorithm, and is expected in a success response to this message from the SCF. The personal terminal compares its calculated response to the response received from the SCF.

The subscriber identifier is required where no association exists between the SCF and RACF which identifies the subscriber at a terminal.

If the Network_Challenge_Request operation fails, an error response is sent from the SCF to the RACF.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | rand_BS | Random_Variable_Base_Station | M |
| | subscriber Subscriber_ID | C | |
| | terminal | Terminal_ID | O |
| Response: | | | |
| Success: | | | |
| | auth_BS | Authentication_Response_Base_Station | M |
| Errors: | | | |
| | network_Challenge_Request_Error | Error_Code | M |
| | cause | Cause | O |
| | parameter_In_Error | Faulty_Parameter | O |

Parameter Definitions:

rand_BS – random variable used as input to authentication during base station challenge

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)

auth_BS – the output of the authentication process during base station challenge

network_Challenge_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:<br>Unrecognized_MIN<br>Unrecognized_ESN<br>MIN_HLR_Mismatch<br>Operation_Sequence_Problem<br>Resource_Shortage<br>Operation_Not_Supported<br>Trunk_Unavailable<br>Parameter_Error<br>System_Failure<br>Unrecognized_Parameter_Value<br>Feature_Inactive<br>Missing_Parameter<br>Requested_Information_Unavailable |
| Cause | – see TIA IS-651 Part IIIb |
| Faulty_Parameter | – see TIA IS-41C |

#### 6.6.1.8 Qualification directive

Name: Qualification_Directive

Direction: RACF <--- SCF

Description:

This operation is sent from the SCF to the RACF if local circumstances result in a change in the roamer's validation or service profile from that which was previously sent to the RACF.

Operational Rules:

When an SCF detects that a subscriber's profile information or validation status has changed and the subscriber is registered, it sends Qualification_Directive operation to the RACF where subscriber is currently registered. Note that profile information is sent only if the RACF stores profile information.

When RACF receives the Qualification_Directive, it updates the data stored at the RACF for the indicated RTF. If the Qualification_Directive indicates that the subscriber is no longer valid, the registration at the RACF is canceled. If the indicated RTF is involved in a call or service operation and the changes in the RTF's qualification requirements indicate that the serving system may optionally disconnect the call or service operation in progress, then the RACF takes appropriate action.

If the Qualification_Directive operation fails, the RACF returns the cause of the failure to the SCF.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | Subscriber_ID | M |
| | qualification | Qualification_Information_Code | O |
| | terminal | Terminal_ID | O |
| | authorization | Authorization_Denied | O |
| | authorization_Period | Authorization_Period | O |
| | originations_Allowed | Origination_Indicator | O |
| | denied_Destinations | Digits | O |
| | terminations_Allowed | Termination_Restriction_Code | O |
| | features_Allowed | Calling_Features_Indicator | O |
| | carrier | Digits | O |
| | sme_Key | Signaling_Message_ Encryption_Key | O |
| | private_Long_Code | Private_Long_Code_Mask | O |
| | service_Option | Service_Option | O |
| | data_Services | Data_Services | O |
| Response: | | | |
| Success: | no parameters | | |
| Errors: | | | |
| | qualification_Directive_Error | Error_Code | M |
| | cause | Cause | O |
| | parameter_In_Error | Faulty_Parameter | O |

Parameter Definitions:

subscriber – identifies the subscriber:
MIN: Mobile Identification Number
IMSI: International Mobile Station Identity
TMSI: Temporary Mobile Station Identity

qualification – provides qualification information

terminal – identifies the terminal (ESN or IMEI)

authorization – indicates access is denied

authorization_Period – indicates access is allowed and the access period

originations_Allowed – indicates the type of calls the RTF is allowed to originate

denied_Destinations – identifies the denied destinations for the calls

terminations_Allowed – indicates the type of calls the RTF is allowed to terminate

features_Allowed – identifies the features allowed at the RTF

carrier – identifies the preferred inter-exchange carrier

sme_Key – contains the key used for message encryption

private_Long_Code – contains the mask for voice privacy

service_Option – contains the type of service requested by the RTF

data_Services – list of data services allowed

qualification_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:<br>Unrecognized_MIN<br>Unrecognized_ESN<br>MIN_HLR_Mismatch<br>Operation_Sequence_Problem<br>Resource_Shortage<br>Operation_Not_Supported<br>Trunk_Unavailable<br>Parameter_Error<br>System_Failure<br>Unrecognized_Parameter_Value<br>Feature_Inactive<br>Missing_Parameter<br>Requested_Information_Unavailable |
| Cause | – see TIA IS-651 Part IIIb |
| Faulty_Parameter | – see TIA IS-41C |

#### 6.6.1.9 Qualification request

Name: Qualification_Request

Direction: RACF ---> SCF

Description:

This operation may be sent from the RACF to the SCF to verify credit-worthiness, to obtain a subscriber's profile information, to inform the SCF of a call request or alert response, and to optionally authenticate a subscriber.

Operational Rules:

When an RACF determines that it needs to (1) retrieve profile information, (2) inform the SCF of a call origination or page response, or (3) validate call setup actions, it initiates a qualification request to its associated SCF. This operation may contain authentication parameters (authentication_Info) if the RACF needs to invoke the authentication procedure.

When an SCF receives the Qualification_Request, it may invoke the authentication procedure (if the authentication parameters are included). On successful completion of the authentication procedure, if necessary the SCF retrieves the indicated RTF's profile information and returns it to the RACF in a response message. If the RTF is found to be invalid, the SCF does not return the profile but returns the cause of the failure to the RACF (authorization parameter). In the event that the authentication fails, a profile request is denied and the cause is returned to the RACF in the deny_Access_Cause parameter.

The subscriber and terminal identification parameters may be included in the response to provide additional identity types to the RACF.

If the Qualification_Request operation fails, the SCF returns the cause of the failure to the RACF.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | Subscriber_ID | M |
| | qualification | Qualification_Information_Code | M |
| | terminal | Terminal_ID | O |
| | uim | Uim_Esn | O |
| | interface_DN | Digits | O |
| | system_Access_Type | System_Access_Type | O |
| | authentication_Info | Authentication_Info | O |
| | system_Capabilities | System_Capabilities | O |
| | digits_Dialed | Digits | 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 |
| | paging_Frame_Class | Paging_Frame_Class | O |
| Response: | | | |
| Success: | | | |
| | authorization | Authorization_Denied | O |
| | authorization_Period | Authorization_Period | O |
| | originations_Allowed | Origination_Indicator | O |
| | denied_Destinations | Digits | O |
| | terminations_Allowed | Termination_Restriction_Code | O |
| | features_Allowed | Calling_Features_Indicator | O |
| | carrier | Digits | O |
| | voice_Privacy_Info | VP_Info | O |
| | deny_Access_Cause | Deny_Access | O |
| | sme_Key | Signaling_Message_ Encryption_Key | O |
| | private_Long_Code | Private_Long_Code_Mask | O |
| | subscriber | Subscriber_ID | O |
| | terminal | Terminal_ID | O |
| | service_Option | Service_Option | O |
| | data_Services | Data_Services | O |
| Error: | | | |
| | qualification_Request_Error | Error_code | M |
| | cause | Cause | O |
| | parameter_In_Error | Faulty_Parameter | O |

Parameter Definitions:

| | |
|---|---|
| subscriber | – identifies the subscriber:<br>MIN: Mobile Identification Number<br>IMSI: International Mobile Station Identity<br>TMSI: Temporary Mobile Station Identity |
| qualification | – indicates the type of qualification required |
| terminal | – identifies the terminal (ESN or IMEI) |
| uim | – identifies the ESN associated with the UIM |
| interface_DN | – the directory number of the radio system interface |
| system_Access_Type | – identifies the context (registration or call origination or call delivery) in which authentication is being invoked |
| authentication_Info | – contains the parameters necessary for authentication (count, rand, authR) |
| system_Capabilities | – describes the authentication capabilities supported |
| digits_Dialed | – contains the number dialed by the RTF (mobile originations only) |
| location_Area | – identifies the present location area of the RTF |
| alert_Identifier | – provides a 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 |
| paging_Frame_Class | – defines the length of the sleep mode |
| authorization | – indicates access is denied |
| authorization_Period | – indicates access is allowed and the access period |
| originations_Allowed | – indicates the type of calls the RTF is allowed to originate |
| denied_Destinations | – identifies the denied destinations for the calls |
| terminations_Allowed | – indicates the type of calls the RTF is allowed to terminate |
| features_Allowed | – indicates the features allowed at the RTF |
| carrier | – identifies the preferred inter-exchange carrier |
| voice_Privacy_Info | – contains the keys and cipher information necessary for PACS (SKey, Pkey, Cipher Counter or Net_Auth) |
| deny_Access_Cause | – contains the cause for failure of authentication |
| sme_Key | – contains the key used for message encryption |
| private_Long_Code | – contains the mask for voice privacy |
| data_Services | – list of data services allowed |
| qualification_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:<br>Unrecognized_MIN<br>Unrecognized_ESN<br>MIN_HLR_Mismatch<br>Operation_Sequence_Problem<br>Resource_Shortage<br>Operation_Not_Supported<br>Trunk_Unavailable<br>Parameter_Error<br>System_Failure<br>Unrecognized_Parameter_Value<br>Feature_Inactive |

| | |
|---|---|
| | Missing_Parameter |
| | Requested_Information_Unavailable |
| Cause | – see TIA IS-651 Part IIIb |
| Faulty_Parameter | – see TIA IS-41C |

#### 6.6.1.10 RACF Authentication request

Name: RACF_Authentication_Request

Direction: RACF --> SCF

Description:

This operation is used by the RACF service provider to authenticate a personal terminal or subscriber.

Operational Rules:

When the subscriber registers, or originates a call, or receives a call, the RACF may send the RACF_Authentication_Request to the SCF to authenticate the subscriber.

The parameters of the request message include a random number used as input to the authentication algorithm by the personal terminal, the computed result, the system capabilities, which identifies the authentication capabilities of the personal terminal (e.g., support of encipherment, sharing of SSD, etc.), and the system access type, which identifies if this message is being invoked in the context of registration or call origination or page response. Note that the parameters used as input to the authentication algorithm vary depending on the system access type. For example, digits dialed may be used as input to the authentication algorithm if the system access type is call origination.

A success authentication response is sent from the SCF to the RACF with the results of the authentication process upon successful completion. This response optionally includes the voice privacy information, which may be necessary for encryption of the voice channel and for decipherment of signaling message. The deny_Access_Cause parameter includes the cause for denial of service to the personal terminal or subscriber.

If the RACF_Authentication_Request operation fails, an error response is sent from the SCF to the RACF.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | Subscriber_ID | M |
| | authentication_Info | Authentication_Info | M |
| | location_Area | Location_Area_ID | M |
| | system_Access_Type | System_Access_Type | M |
| | racf | Node_ID | O |
| | terminal | Terminal_ID | O |
| | uim | Uim_Esn | O |
| | system_Capabilities | System_Capabilities | O |
| | digits_Dialed | Digits | O |

Response:

Success:

| | | |
|---|---|---|
| voice_Privacy_Info | VP_Info | O |
| deny_Access_Cause | Deny_Access | O |

Error:

| | | |
|---|---|---|
| rACF_Authentication_ Request_Error | Error_Code | M |
| cause | Cause | O |
| parameter_In_Error | Faulty_Parameter | O |

Parameter Definitions:

| | |
|---|---|
| subscriber | – identifies the subscriber:<br>MIN: Mobile Identification Number<br>IMSI: International Mobile Station Identity<br>TMSI: Temporary Mobile Station Identity |
| authentication_Info | – contains the parameters necessary for authentication (count, RAND, authR) |
| location_Area | – identifies the present location area of the RTF |
| system_Access_Type | – identifies the context (registration or call origination or call delivery) in which authentication is being invoked |
| racf | – identifies the RACF |
| terminal | – identifies the terminal (ESN or IMEI) |
| uim | – identifies the ESN associated with the UIM |
| system_Capabilities | – describes the authentication capabilities supported |
| digits_Dialed | – contains the number dialed by the RTF (mobile originations only) |
| voice_Privacy_Info | – contains the keys and cipher information necessary for PACS (SKey, Pkey, Cipher Counter or Net_Auth) |
| deny_Access_Cause | – contains the cause for failure of authentication |
| rACF_Authentication_Request_ Error | – identifies an error |
| cause | – provides additional information regarding the failure |
| parameter_In_Error | – a parameter in error |

Error Definition:

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

#### 6.6.1.11 Registration cancellation indication

Name: Registration_Cancellation_Indication

Direction: RACF <--- SCF

Description:

This operation is sent from the SCF to the RACF to indicate that an RTF is no longer in the RACF's service area.

Operational Rules:

The SCF effects registration cancellation procedure when it receives a registration cancellation indication from the home SCF (because the RTF is now registered in a different visited SCF's serving area) or as a result of receiving a registration notification request from an RACF. The SCF sends the Registration_Cancellation_Indication operation to the RACF where the RTF was registered. The RACF, on receiving this operation, clears the data stored for the indicated RTF.

No response is returned to the SCF by the RACF.

ROSE Operation Class: Class 5

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | Subscriber_ID | M |
| | terminal | Terminal_ID | O |
| | alert_Identifier | Alert_Value | O |
| Response: | not applicable | | |
| Success: | | | |
| Errors: | | | |

Parameter Definitions:

| | |
|---|---|
| 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 or IMEI) |
| alert_Identifier | – provides a temporary RTF alias for alerting |

#### 6.6.1.12 Registration request

Name: Registration_Request

Direction: RACF ---> SCF

Description:

This operation is sent from the RACF to the SCF to register (re-register) or de-register and update the location of an RTF, and optionally, authenticate the subscriber.

Operational Rules:

Events leading to an RACF's registration request may include the detection of the RTF's presence through autonomous registration, call origination, call termination, or other mechanisms. If the RACF determines that the RTF is currently registered with it, the registration process need not involve the SCF.

An RACF starts the registration procedure when it receives a registration request from the RTF. This registration request may contain authentication parameters (authentication_Info) if registration is requested at the same time as authentication. To invoke the registration procedure, the RACF sends a Registration_Request operation to the SCF. This operation contains qualification information requesting either profile information or validation information (or both) from the SCF.

For initial registration, both the subscriber and terminal identifiers shall be provided._

When an SCF receives the Registration_Request, it may invoke authentication procedure (if the authentication parameters are included). On successful completion of the authentication procedure, the SCF records the identity of the indicated RTF, and the registration area identity (based on the location area identifier received in the registration request). If the indicated RTF is not currently registered with the SCF, the SCF retrieves the subscriber's profile information from the home SCF. Depending on the qualification requested in the Registration_Request message received from the RACF, the SCF may return a subset of the user's profile to the RACF. The SCF may also assign a temporary subscriber identifier and return it to the RACF in the response message. If the RTF is found to be invalid, the registration fails, and the SCF returns the cause of the registration failure to the RACF in the authorization parameter. In the event that the authentication fails, a registration request is denied and the cause is returned to the RACF in the deny_Access_Cause parameter.

If the Registration_Request operation fails, the SCF returns the cause of the failure to the RACF.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | subscriber | Subscriber_ID | M |
| | registration_Type | Registration_Type | M |
| | terminal | Terminal_ID | C |
| | qualification | Qualification_Information_Code | O |
| | racf | Node_ID | O |
| | uim | Uim_Esn | O |
| | location_Area | Location_Area_ID | O |
| | alert_Identifier | Alert_Value | O |
| | authentication_Info | Authentication_Info | O |
| | system_Capabilities | System_Capabilities | O |

| | | |
|---|---|---|
| station_Class_Mark | Class_Mark | O |
| slot_Cycle_Index | Slot_Cycle_Index | O |
| mobile_Protocol_Revision | Mobile_Protocol_Revision | O |
| mobile_Bearer_Capabilities | Mobile_Bearer_Characteristics | O |
| paging_Frame_Class | Paging_Frame_Class | O |

Response:

Success:

| | | |
|---|---|---|
| temporary_Subscriber | Subscriber_ID | O |
| authorization | Authorization_Denied | O |
| authorization_Period | Authorization_Period | O |
| originations_Allowed | Origination_Indicator | O |
| denied_Destinations | Digits | O |
| terminations_Allowed | Termination_Restriction_Code | O |
| features_Allowed | Calling_Features_Indicator | O |
| carrier | Digits | O |
| voice_Privacy_Info | VP_Info | O |
| deny_Access_Cause | Deny_Access | O |
| data_Services | Data_Services | O |

Errors:

| | | |
|---|---|---|
| registration_Request_Error | Error_Code | M |
| cause | Cause | O |
| parameter_In_Error | Faulty_Parameter | O |

Parameter Definitions:

subscriber – identifies the subscriber:
MIN: Mobile Identification Number
IMSI: International Mobile Station Identity
TMSI: Temporary Mobile Station Identity

registration_Type – type of registration
terminal – identifies the terminal (ESN or IMEI)
qualification – indicates the type of qualification required
racf – identifies the RACF
uim – identifies the ESN associated with the UIM
location_Area – identifies the present location area of the RTF
alert_Identifier – provides a temporary RTF alias for alerting
authentication_Info – contains the parameters necessary for authentication (count, RAND, authR)
system_Capabilities – describes the authentication capabilities supported
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
mobile_Bearer_Capabilities – identifies the voice and data RTF bearer capabilities
paging_Frame_Class – defines the length of the sleep mode
temporary_Subscriber – a temporary subscriber identifier assigned by the SCF
authorization – indicates access is denied
authorization_Period – indicates access is allowed and the access period
originations_Allowed – indicates the type of calls the RTF is allowed to originate
denied_Destinations – identifies the denied destinations for the calls
terminations_Allowed – indicates the type of calls the RTF is allowed to terminate
features_Allowed – indicates the features allowed at the RTF
carrier – identifies the preferred inter-exchange carrier

voice_Privacy_Info – contains the keys and cipher information necessary for PACS (SKey, Pkey, Cipher Counter or Net_Auth)
deny_Access_Cause – contains the cause for failure of authentication
data_Services – list of data services allowed
registration_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 TIA IS-651 Part IIIb
Faulty_Parameter – see TIA IS-41C

#### 6.6.1.13 Routing request

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 “NoPage 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 |
| 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 |

Parameter Definitions:

subscriber – identifies 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

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 TIA IS-651 Part IIIb

Faulty_Parameter – see TIA IS-41C

#### 6.6.1.14 Status request

Name: Status_Request

Direction: RACF <---- SCF

Description:

This operation is used by the SCF to request the identity or other information regarding the personal terminal or subscriber.

Operational Rules:

The status request includes an indication of the type of status information to be provided by the RTF. The SCF may request more than one status type in a single operation. The status response received from the RTF is returned to the SCF by the RACF.

The subscriber identifier is required where no association exists between the SCF and RACF which identifies the subscriber at a terminal.

If an error occurs in the status request process, an error response is sent from the RACF to the SCF.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | status_Type_List | Status_Info_Type_List | M |
| | subscriber | Subscriber_ID | C |
| | terminal | Terminal_ID | O |
| | status_Qualification | Status_Qualification | O |

Response:

Success:

| | | |
|---|---|---|
| status_Response_List | Status_Info | M |

Errors:

| | | |
|---|---|---|
| status_Request_Error | Error_Code | M |
| cause | Cause | O |
| parameter_In_Error | Faulty_Parameter | O |

Parameter Definitions:

status_Type_List – specifies the type(s) of status requested
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)
status_Qualification – qualifies the information requested
status_Response_List – contains the returned status from the RTF
status_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 TIA IS-651 Part IIIb
Faulty_Parameter – see TIA IS-41C

**6.6.1.15 TMSI assignment request**

Name: TMSI_Assignment_Request

Direction: RACF <---- SCF

Description:

This operation may be sent from the SCF to the RACF to initially assign or to reassign a TMSI to an RTF.

Operational Rules:

When an SCF determines that it needs to assign or reassign a TMSI for an RTF, it initiates a TMSI Assignment request to its associated RACF.

The RACF responds with a success indication if the procedure is completed successfully.

The RACF sends an error indication to the SCF if the procedure fails.

The subscriber identifier is required where no association exists between the SCF and RACF which identifies the subscriber at a terminal.

ROSE Operation Class: Class 2

| Parameters: | Name | Type | Usage |
|---|---|---|---|
| Request: | | | |
| | temporary_Subscriber | Subscriber_ID | M |
| | subscriber | Subscriber_ID | C |
| | terminal | Terminal_ID | O |
| | expiration_Time | TMSI_Expiration | O |
| Response: | | | |
| Success: | | | |
| | authentication_Info | Authentication_Info | O |
| Errors: | | | |
| | tMSI_Assignment_Error | Error_Code | M |
| | cause | Cause | O |
| | parameter_In_Error | Faulty_Parameter | O |

Parameter Definitions:

temporary_Subscriber – provides a temporary identifier for the subscriber (TMSI)
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)
expiration_Time – expiration time for the TMSI
authentication_Info – contains the parameters necessary for authentication (count, rand, authR)
tMSI_Assignment_Error – includes an error value.
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 TIA IS-651 Part IIIb |
| Faulty_Parameter | – see TIA IS-41C |

## 7 ASN

Object identifiers are assigned to each module and each ASE. The MMAP object identifiers are assigned according to the tree structure in figure 3.

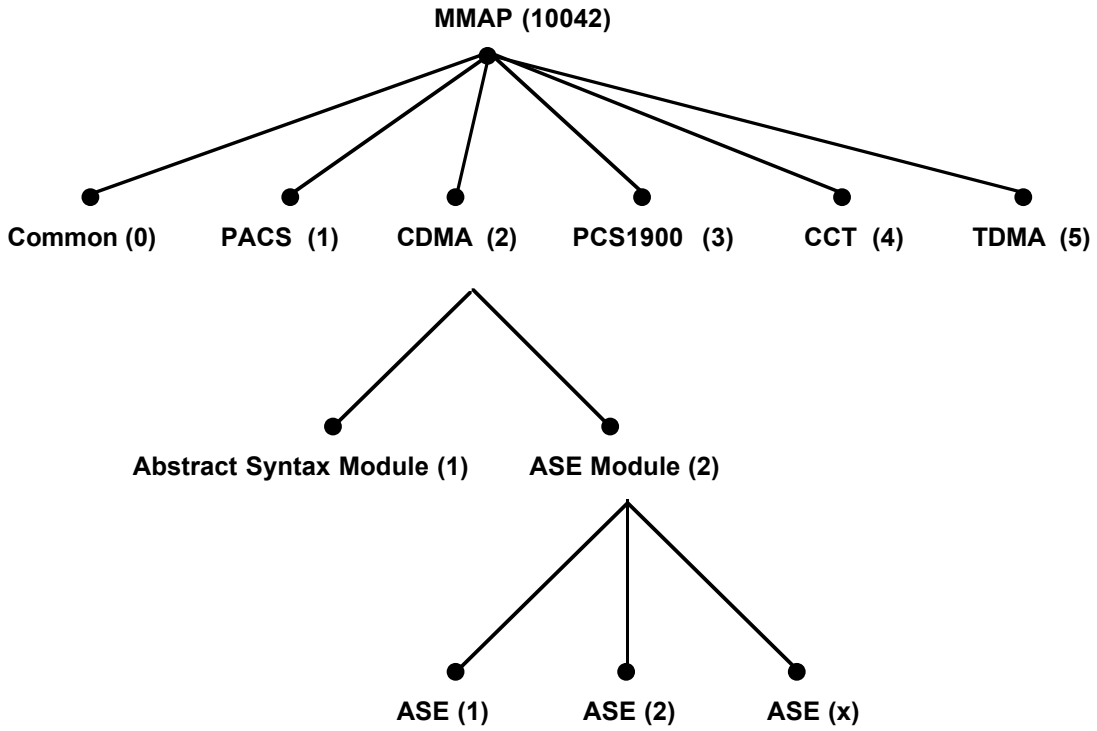


**Figure 3 – MMAP Object identifier tree**

The following object identifiers are defined:

Common:

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

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

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(1) racf-scf-ase (1) v(1)}

PACS:

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

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

CDMA:

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

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

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(1) racf-racf-ase (1) v(1)}

PCS1900:

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

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

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

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

CCT:

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

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

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(1) racf-racf-ase (1) v(1)}

TDMA:

MMAP-TDMA-abstract-syntax-module
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) tdma (5) abstract-syntax-module (1) v(1)}

MMAP-TDMA--abstract-service-elements-module
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) tdma (5) ase-module (2) 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. The following Object ID is reserved for any future PACS specific operations:

**MMAP-PACS-abstract-syntax-module**
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) pacs (1) abstract-syntax-module (1) v(1)}

#### 7.1.2 PACS ASEs

There are no specific ASEs for PACS. PACS is supported by the Common ASEs. The following Object ID is reserved for any future PACS specific ASEs:

**MMAP-PACS-abstract-service-elements-module**
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) pacs (1) ase-module (2) v(1)}

### 7.2 CDMA ASN

#### 7.2.1 CDMA Abstract Syntax

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

**DEFINITIONS ::=**

**BEGIN**

**EXPORTS**

**-- data types**

CellID,

**-- operation values**

cdmaFacilitiesDirective3;

**IMPORTS**

OPERATION,
ERROR

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

```
BillingID,
Digits,
ErrorCode,
ErrorParameter,
MobileProtocolRevision,
PrivateLongCodeMask,
RacfNodeID,
SignalingMessageEncryptionKey,
ServiceOption,
StationClassMark,
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)};

-- External References
–
–   [1] TIA IS-41 Cellular Intersystem Operations Revision C
–   [2] ANSI J-STD-008 Personal Station-Base Station Compatibility Requirements for 1.8 to 2.0
GHz            Code Division Multiple Access (CDMA) Personal Communication Systems

-- 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  StationClassMark             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  SignalingMesageEncryptionKey OPTIONAL,
    mask                [11] IMPLICIT  PrivateLongCodeMask          OPTIONAL,
    handoffReason       [12] IMPLICIT  HandoffReason                OPTIONAL,
    handoffMode         [13] IMPLICIT  HandoffMode                  OPTIONAL,
    priority            [14] IMPLICIT  Priority                     OPTIONAL,
    serviceOption       [15] IMPLICIT  ServiceOption                OPTIONAL,
    terminalLocation    [16] IMPLICIT  Coordinates                  OPTIONAL,
    privateParameters   [17] IMPLICIT  PrivateParameters            OPTIONAL}
```

```
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,
    searchWindow            [5]   IMPLICIT   SearchWindow              OPTIONAL,
    actualConfidentiality   [6]   IMPLICIT   ConfidentialityModes      OPTIONAL,
    handoffPowerLevel       [7]   IMPLICIT   HandoverPowerLevel        OPTIONAL,
    neighborList            [8]   IMPLICIT   NeighborList              OPTIONAL,
    privateParameters       [9]   IMPLICIT   PrivateParameters         OPTIONAL}

CDMAFacilitiesDirective3Error ::=
                                ErrorCode
                                PARAMETER   ErrorParameter
```

**-- CDMA Data Types**

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

ChannelNumberList ::=    OCTET STRING   --  ChannelNumber as defined in TIA IS-651 Part IIIb

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

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

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

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

HandoffPowerLevel ::=    OCTET STRING   --  HPL as defined in TIA IS-651 Part IIIb

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

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

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

NeighborInformation ::=  SEQUENCE
  {
    neighborPN              [0]   IMPLICIT   NeighborPN                OPTIONAL,
    neighborConfig          [1]   IMPLICIT   NeighborConfig            OPTIONAL,
    neighborMaxAge          [2]   IMPLICIT   NeighborMaxAge            OPTIONAL,
    pilotInc                [3]   IMPLICIT   PilotInc                  OPTIONAL,
```

```
    sID             [4]  IMPLICIT  SID             OPTIONAL,
    nID             [5]  IMPLICIT  NID             OPTIONAL,
    racfAddress     [6]  IMPLICIT  RacfNodeID      OPTIONAL,
    srchWinA        [7]  IMPLICIT  SrchWinA        OPTIONAL,
    srchWinN        [8]  IMPLICIT  SrchWinN        OPTIONAL,
    srchWinR        [9]  IMPLICIT  SrchWinR        OPTIONAL,
    tAdd            [10] IMPLICIT  TAdd            OPTIONAL,
    tDrop           [11] IMPLICIT  TDrop           OPTIONAL,
    tComp           [12] IMPLICIT  TComp           OPTIONAL,
    tTDrop          [13] IMPLICIT  TTDrop          OPTIONAL}

NeighborList ::=          SEQUENCE OF NeighborInformation

NeighborMaxAge ::=        OCTET STRING  --  NGHBR_MAX_AGE as defined in ANSI J-STD-008

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 TIA IS-41C

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

Priority ::=              OCTET STRING  --  Priority as defined in TIA IS-651 Part IIIb

PrivateParameters ::=     OCTET STRING  --  PrivateParameters as defined in TIA IS-651 Part IIIb

SearchWindow ::=          OCTET STRING  --  CDMASearchWIndow as defined in TIA IS-41C

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

SrchWinA ::=              OCTET STRING  --  SRCH_WIN_A as defined in ANSI J-STD-008

SrchWinN ::=              OCTET STRING  --  SRCH_WIN_N as defined in ANSI J-STD-008

SrchWinR ::=              OCTET STRING  --  SRCH_WIN_R as defined in ANSI J-STD-008

SubrateChannelIDList ::=  OCTET STRING  --  Circuit Identity Code extension as defined in ANSI J-STD-008

TAdd ::=                  OCTET STRING  --  T_ADD as defined in ANSI J-STD-008

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

TComp ::=                 OCTET STRING  --  T_COMP as defined in ANSI J-STD-008

TDrop ::=                 OCTET STRING  --  T_DROP as defined in ANSI J-STD-008

TTDrop ::=                OCTET STRING  --  T_TDROP as defined in ANSI J-STD-008

-- CDMA Error Definitions

-- see common definitions
```

**-- CDMA Operation Values**

cdmaFacilitiesDirective3 CDMAFacilitiesDirective3 ::= localValue 20

**END**

### 7.2.2 CDMA ASEs

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

**DEFINITIONS ::=**

**BEGIN**

**EXPORTS mMAP-CDMA-RACF-RACF-ASE;**

**IMPORTS**

cdmaFacilitiesDirective3

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

APPLICATION-SERVICE-ELEMENT

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

**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(1) racf-racf-ase (1) v(1)}

**END**

## 7.3 PCS1900 ASN

### 7.3.1 PCS1900 Abstract Syntax

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

**DEFINITIONS ::=**

**BEGIN**

**EXPORTS**

**-- operation values**

-- RACF-to-SCF operations

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

-- 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)};

UpdateLocationRes,
PrepareHO-Arg,
PrepareHO-Res,
SendAuthenticationInfoArg,
SendAuthenticationInfoRes,
SendIdentificationRes

FROM MAP-MS-DataTypes
{ --ansiPCS1900 0 4 0 mobileDomain (0) pcs-Network (1) modules(3) map-MS-DataTypes (11)
version2 (2)};

AbsentSubscriber,
BearerServiceNotProvisioned,
DataMissing,
FacilityNotSupported,
NoRoamingNumberAvailable,
NoHandoverNumberAvailable,
RoamingNotAllowed,
SubsequentHandoverFailure,
SystemFailure,
TeleserviceNotProvisioned,
UnexpectedDataValue,

```
UnidentifiedSubscriber,
UnknownSubscriber

FROM MAP-Errors
{ --ansiPCS1900 0 4 0 mobileDomain (0) pcs-Network (1) modules(3) map-Errors (10) version2 (2)};

AddressString,
BasicServiceGroupList,
BearerServiceList,
ExternalSignalInfo,
GlobalCellId,
IMEI,
IMSI,
ISDN-AddressString,
LMSI,
PrefCarrierIdList,
TeleserviceList,
TMSI

FROM MAP-CommonDataTypes
{ --ansiPCS1900 0 4 0 mobileDomain (0) pcs-Network (1) modules(3) map-CommonDataTypes (18)
   version2 (2)};

SS-Status,
SS-SubscriptionOption

FROM MAP-SS-DataTypes
{ --ansiPCS1900 0 4 0 mobileDomain (0) pcs-Network (1) modules(3) map-SS-DataTypes (14)
   version2 (2)};

SS-Code

FROM MAP-SS-Code
{ --ansiPCS1900 0 4 0 mobileDomain (0) pcs-Network (1) modules(3) map-SS-Code (15) version2
   (2)};
```

**-- External References**

– [1] ANSI J-STD-007 Air Interface Specification for 1.8 to 2.0 GHz Frequency Hopping Time Division -- Multiple Access (TDMA) for Personal Communication Services
– [2] TIA IS-652 PCN to PCN Intersystem Operations based on PCS-1900

**-- PCS1900 RACF to SCF operations**

```
AuthenticationInformationRequest ::=
                        OPERATION
                        ARGUMENT    SendAuthenticationInfoArg
                        RESULT      SendAuthenticationInfoRes
                        ERRORS      {
                                      DataMissing,
                                      SystemFailure,
                                      UnexpectedDataValue,
                                      UnknownSubscriber}
```

```
CancelLocationRequest ::=
                              OPERATION
                              ARGUMENT    CancelLocationArg
                              RESULT
                              ERRORS      {
                                            DataMissing,
                                            UnexpectedDataValue}
CancelLocationArg ::= CHOICE
  {
    subscriber                            IMSI,
    imsi-WithLMSI                         IMSI-WithLMSI}


CompleteCall ::=
                              OPERATION
                              ARGUMENT    CompleteCallArg
                              RESULT      ISDN-AddressString
                              ERRORS      {
                                            BusySubscriber,
                                            DataMissing,
                                            NoSubscriberReply,
                                            RadioCongestion,
                                            UnexpectedDataValue}

CompleteCallArg ::= SEQUENCE
  {
    userID                                UserIDType,
    localSubscriber         [0]  IMPLICIT LMSI                    OPTIONAL,
    personalNumber                        ISDN-AddressString      OPTIONAL,
    pcsBearerService        [1]  IMPLICIT BearerServiceList       OPTIONAL,
    networkCapability       [2]  IMPLICIT ExternalSignalInfo      OPTIONAL,
    ssData                                SS-DataList             OPTIONAL}

ProvideRoamingNumber ::=
                              OPERATION
                              ARGUMENT    ProvideRoamingNumberArg
                              RESULT      ISDN-AddressString
                              ERRORS      {
                                            AbsentSubscriber,
                                            DataMissing,
                                            FacilityNotSupported,
                                            NoRoamingNumberAvailable,
                                            UnexpectedDataValue,
                                            SystemFailure}

ProvideRoamingNumberArg ::= SEQUENCE
  {
    subscriber                            IMSI,
    personalNumber          [0]  IMPLICIT ISDN-AddressString      OPTIONAL,
    localSubscriber         [1]  IMPLICIT LMSI                    OPTIONAL,
    pcsBearerService        [2]  IMPLICIT BearerServiceList       OPTIONAL,
    networkCapability       [3]  IMPLICIT ExternalSignalInfo      OPTIONAL}
```

```
PurgeUser ::=
                        OPERATION
                        ARGUMENT    PurgePS-Arg
                        RESULT

PurgePS-Arg ::= SEQUENCE
  {
    subscriber                      IMSI,
    servingRSAddress                ISDN-AddressString}

UpdateLocationRequest ::=
                        OPERATION
                        ARGUMENT    UpdateLocationArg
                        RESULT      UpdateLocationRes
                        ERRORS      {
                                      DataMissing,
                                      RoamingNotAllowed,
                                      SystemFailure,
                                      UnexpectedDataValue,
                                      UnknownSubscriber}

UpdateLocationArg ::= SEQUENCE
  {
    subscriber                      IMSI,
    shortMessageAddress             ISDN-AddressString,
    servingRSAddress                ISDN-AddressString,
    localSubscriber                 LMSI                        OPTIONAL}

ValidateOutgoingCall ::=
                        OPERATION
                        ARGUMENT    ValidateOutgoingCallArg
                        RESULT      PrefCarrierIdList
                        ERRORS      {
                                      BearerServiceNotProvisioned
                                      CallBarred,
                                      DataMissing,
                                      SystemFailure,
                                      TeleserviceNotProvisioned
                                      UnexpectedDataValue,
                                      UnknownSubscriber}

ValidateOutgoingCallArg ::= SEQUENCE
  {
    userID                          UserIDType,
    calledNumber                    AddressString               OPTIONAL,
    pcsBearerService    [0] IMPLICIT BearerServiceList          OPTIONAL,
    teleService         [1] IMPLICIT TeleserviceList            OPTIONAL}

-- PCS1900 RACF to RACF operations
```

```
ForwardAccessSignaling ::=
                        OPERATION
                        ARGUMENT    ExternalSignalInfo

PrepareHandover ::=
                        OPERATION
                        ARGUMENT    PrepareHO-Arg
                        RESULT      PrepareHO-Res
                        ERRORS      {
                                      DataMissing,
                                      NoHandoverNumberAvailable,
                                      SystemFailure,
                                      UnexpectedDataValue}

PrepareSubsequentHandover ::=
                        OPERATION
                        ARGUMENT    PrepareSubsequentHO-Arg
                        RESULT      ExternalSignalInfo
                        ERRORS      {
                                      DataMissing,
                                      SubsequentHandoverFailure,
                                      UnexpectedDataValue,
                                      UnknownRACF}

PrepareSubsequentHO-Arg ::= SEQUENCE
  {
    targetCellID                    GlobalCellId,
    racf                            ISDN-AddressString,
    rs-APDU                         ExternalSignalInfo}


ProcessAccessSignaling ::=
                        OPERATION
                        ARGUMENT    ExternalSignalInfo


SendIdentification ::=
                        OPERATION
                        ARGUMENT    TMSI
                        RESULT      SendIdentificationRes
                        ERRORS      {
                                      DataMissing,
                                      SystemFailure,
                                      UnexpectedDataValue,
                                      UnidentifiedSubscriber}

SendEndSignal ::=
                        OPERATION
                        ARGUMENT    ExternalSignalInfo
                        RESULT

-- PCS1900 Data Types
```

```
IMSI-WithLMSI ::= SEQUENCE
  {
    imsi                                IMSI,
    lmsi                                LMSI}

maxNumberOfSupplService      INTEGER ::= 30

SS-Data ::= SEQUENCE
  {
    ss-Code              [0]  IMPLICIT  SS-Code                 OPTIONAL,
    ss-Status            [1]  IMPLICIT  SS-Status               OPTIONAL,
    ss-SubscriptionOption               SS-SubscriptionOption   OPTIONAL,
    basicServiceGroupList               BasicServiceGroupList   OPTIONAL}

    -- ss-Code                  must be present for version 1 of PCS 1900 MAP
    -- ss-SubscriptionOption    must be absent for version 1 of PCS 1900 MAP
    -- basicServiceGroupList    must be absent for version 1 of PCS 1900 MAP


SS-DataList ::= SEQUENCE SIZE (1 .. maxNumberOfSupplService) OF SS-Data

UserIDType ::= CHOICE
  {
    subscriber           [0]  IMPLICIT  IMSI,
    terminal             [1]  IMPLICIT  IMEI}
```

**-- PCS1900 Error Definitions**

```
BusySubscriber          ::= ERROR
CallBarred              ::= ERROR
NoSubscriberReply       ::= ERROR
RadioCongestion         ::= ERROR
UnknownRACF             ::= ERROR

absentSubscriber                AbsentSubscriber                ::= localValue 27
bearerServiceNotProvisioned     BearerServiceNotProvisioned     ::= localValue 10
busySubscriber                  BusySubscriber                  ::= localValue 31
callBarred                      CallBarred                      ::= localValue 13
dataMissing                     DataMissing                     ::= localValue 35
facilityNotSupported            FacilityNotSupported            ::= localValue 21
noHandoverNumberAvailable       NoHandoverNumberAvailable       ::= localValue 25
noRoamingNumberAvailable        NoRoamingNumberAvailable        ::= localValue 39
noSubscriberReply               NoSubscriberReply               ::= localValue 27
radioCongestion                 RadioCongestion                 ::= localValue 24
roamingNotAllowed               RoamingNotAllowed               ::= localValue 8
subsequentHandoverFailure       SubsequentHandoverFailure       ::= localValue 26
systemFailure                   SystemFailure                   ::= localValue 34
teleserviceNotProvisioned       TeleserviceNotProvisioned       ::= localValue 11
unexpectedDataValue             UnexpectedDataValue             ::= localValue 36
unidentifiedSubscriber          UnidentifiedSubscriber          ::= localValue 16
unknownRACF                     UnknownRACF                     ::= localValue 3
unknownSubscriber               UnknownSubscriber               ::= localValue 1
```

**-- PCS1900 Operation Values**

```
authenticationInformationRequest    AuthenticationInformationRequest   ::= localValue 56
cancelLocationRequest               CancelLocationRequest              ::= localValue 3
completeCall                        CompleteCall                       ::= localValue 28
provideRoamingNumber                ProvideRoamingNumber               ::= localValue 4
purgeUser                           PurgeUser                          ::= localValue 56
updateLocationRequest               UpdateLocationRequest              ::= localValue 2
validateOutgoingCall                ValidateOutgoingCall               ::= localValue 30
```

**-- RACF-to-RACF operations**

```
forwardAccessSignaling              ForwardAccessSignaling             ::= localValue 34
prepareHandover                     PrepareHandover                    ::= localValue 68
prepareSubsequentHandover           PrepareSubsequentHandover          ::= localValue 69
processAccessSignaling              ProcessAccessSignaling             ::= localValue 33
sendEndSignal                       SendEndSignal                      ::= localValue 29
sendIdentification                  SendIdentification                 ::= localValue 55
```

**END**

### 7.3.2 PCS1900 ASEs

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

**DEFINITIONS ::=**

**BEGIN**

**EXPORTS mMAP-PCS1900-RACF-SCF-ASE;**

**IMPORTS**

routingResponse

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

APPLICATION-SERVICE-ELEMENT

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

**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) ansi (1) mmap (10042) pcs1900 (3) ase-module (2) v(1) racf-scf-ase (1) 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) ansi (1) mmap (10042) pcs1900 (3) ase-module (2) v(1) racf-racf-ase (2) v(1)}

**END**

### 7.4 CCT ASN

#### 7.4.1 CCT Abstract Syntax

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

**DEFINITIONS ::=**

**BEGIN**

**EXPORTS**

**-- operation values**

cctHandoverRequest;

**IMPORTS**

```
OPERATION,
ERROR

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

```
BillingID,
Digits,
ErrorCode,
ErrorParameter,
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)};
```

**-- External References**

– [1] TIA IS-41 Cellular Intersystem Operations Revision C
– [2] ANSI J-STD-018 CCT Air Interface Compatibility Standard for PCS

**-- 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**

```
-- see common definitions
```

**-- CCT Operation Values**

cctHandoverRequest CCTHandoverRequest ::= localValue 30

**END**

### 7.4.2 CCT ASEs

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

**DEFINITIONS ::=**

**BEGIN**

**EXPORTS mMAP-CCT-RACF-RACF-ASE;**

**IMPORTS**

cctHandoverRequest

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

APPLICATION-SERVICE-ELEMENT

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

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

OPERATIONS -- RACF invokes
{
cctHandoverRequest}

**mMAP-CCT-RACF-RACF-ASE ::= MMAP-PCS2000-RACF-RACF-ASE**
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) cct (4) ase-module (2) v(1) 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. The following Object ID is reserved for any future TDMA specific operations:

**MMAP-TDMA-abstract-syntax-module**
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) tdma (5) abstract-syntax-module (1) v(1)}

### 7.5.2 TDMA ASEs

There are no specific ASEs for TDMA. TDMA is supported by the Common ASEs. The following Object ID is reserved for any future TDMA specific ASEs:

**MMAP-TDMA--abstract-service-elements-module**
{iso (1) member-body (2) uSA (840) ansi (1) mmap (10042) tdma (5) ase-module (2) v(1)}

### 7.6 Common ASN

### 7.6.1 Common Abstract Syntax

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

**DEFINITIONS ::=**

**BEGIN**

**EXPORTS**

**-- data types**

AccessDeniedReason,
AlertValue,
AuthorizationDenied,
AuthenticationInfo,
AuthorizationPeriod,
AuthenticationResponseBaseStation,
AuthenticationResponse,
AuthenticationResponseUniqueChallenge,
BillingID,
CallHistoryCount,
CallReference,
CallingFeaturesIndicator,
Cause,
CellIDList,
CellNodeID,
ChannelIDList,
ChannelNumberList,
CipherCounter,
ClassMark,
DataServices,
DenyAccess,
Digits,
Imsi,
LocationAreaID,
MobileBearerCharacteristics,
MobileProtocolRevision,
NetAuth,
NodeID,
OriginationIndicator,
PagingFrameClass,
PrivacyInfo,

Pkey,
PrivateLongCodeMask,
QualificationInformationCode,
RacfNodeID,
RandomVariable,
RandomVariableBaseStation,
RandomVariableSSD,
RandomVariableUniqueChallenge,
RcfNodeID,
RegistrationType,
RequestNumber,
ScfNodeID,
ServiceOption,
SignalingMessageEncryptionKey,
Skey,
SlotCycleIndex,
StatusInfo,
StatusInfoTypeList,
SubscriberID,
SystemAccessType,
SystemCapabilities,
TerminalID,
TerminalESN,
TerminationRestrictionCode,
TimeStamp,
UpdateCount,
UimEsn,
VPInfo

**-- operation values**

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

```
IMPORTS

OPERATION,
ERROR

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

CellID

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

-- External References

–  [1] TIA IS-41 Cellular Intersystem Operations Revision C
–  [2] CCITT Fascile II.2 – Recommendation E.212  88
–  [3] ANSI J-STD-014
–  [4] TIA IS-651 Part IIIb
–  [5]  ANSI J-STD-008
–  [6] ANSI T1.607

-- RACF to SCF operations

AuthenticationDirective ::=
                          OPERATION
                          ARGUMENT    AuthenticationDirectiveArgument
                          RESULT      AuthenticationDirectiveResult
                          ERRORS      AuthenticationDirectiveError

AuthenticationDirectiveArgument ::= SEQUENCE
  {
    subscriber          [0]           SubscriberID                  OPTIONAL,
    terminal            [1]           TerminalID                    OPTIONAL,
    randSSD             [2]  IMPLICIT RandomVariableSSD             OPTIONAL,
    initCountUpdate     [3]  IMPLICIT UpdateCount                   OPTIONAL,
    count               [4]  IMPLICIT CallHistoryCount              OPTIONAL,
    randU               [5]  IMPLICIT RandomVariableUniqueChallenge OPTIONAL,
    requestNumber       [6]  IMPLICIT RequestNumber                 OPTIONAL}

AuthenticationDirectiveResult ::= SEQUENCE
  {
    authU               [0]  IMPLICIT AuthenticationResponseUniqueChallenge OPTIONAL,
    requestNumber       [1]  IMPLICIT RequestNumber                         OPTIONAL}

AuthenticationDirectiveError ::= ErrorCode
                          PARAMETER   ErrorParameter
```

```
AuthenticationFailureIndication ::=
                              OPERATION
                              ARGUMENT    AuthenticationFailureIndicationArgument

AuthenticationFailureIndicationArgument ::= SEQUENCE
  {
    subscriber          [0]               SubscriberID                  OPTIONAL,
    terminal            [1]               TerminalID                    OPTIONAL}


CallWaitingNotification ::=
                              OPERATION
                              ARGUMENT    CallWaitingNotificationArgument
                              RESULT      CallWaitingNotificationResult
                              ERRORS      CallWaitingNotificationError

CallWaitingNotificationArgument ::= SEQUENCE
  {
    subscriber                            SubscriberID,
    terminal                              TerminalID                    OPTIONAL}

CallWaitingNotificationResult ::=  NULL

CallWaitingNotificationError ::= ErrorCode
                              PARAMETER   ErrorParameter


ClearRequest ::=
                              OPERATION
                              ARGUMENT    ClearRequestArgument
                              RESULT      ClearRequestResult
                              ERRORS      ClearRequestError

ClearRequestArgument ::=        SEQUENCE
  {
    subscriber                            SubscriberID,
    terminal            [0]               TerminalID                    OPTIONAL,
    setupTime           [1]   IMPLICIT    TimeStamp                     OPTIONAL,
    connectTime         [2]   IMPLICIT    TimeStamp                     OPTIONAL,
    disconnectTime      [3]   IMPLICIT    TimeStamp                     OPTIONAL,
    registrationType    [4]   IMPLICIT    RegistrationType              OPTIONAL,
    callReference       [5]   IMPLICIT    CallReference                 OPTIONAL,
    clearCause          [6]   IMPLICIT    Cause                         OPTIONAL}

ClearRequestResult ::=          NULL

ClearRequestError ::=           ErrorCode
                              PARAMETER   ErrorParameter
```

```
HandoverCompleteIndication ::=
                              OPERATION
                              ARGUMENT    HandoverCompleteIndicationArgument

HandoverCompleteIndicationArgument ::= SEQUENCE
  {
    subscriber              [0]           SubscriberID                OPTIONAL,
    terminal                [1]           TerminalID                  OPTIONAL,
    channelIDList           [2]  IMPLICIT ChannelIDList               OPTIONAL,
    channelNumberList       [3]  IMPLICIT ChannelNumberList           OPTIONAL,
    targetCellIDList        [4]  IMPLICIT CellIDList                  OPTIONAL,
    interfaceDN             [5]  IMPLICIT Digits                      OPTIONAL,
    racf                    [6]           NodeID                      OPTIONAL,
    alertIdentifier         [7]  IMPLICIT AlertValue                  OPTIONAL,
    cause                   [8]  IMPLICIT Cause                       OPTIONAL}


HandoverPerformedIndication ::=
                              OPERATION
                              ARGUMENT    HandoverPerformedIndicationArgument

HandoverPerformedIndicationArgument ::= SEQUENCE
  {
    subscriber                            SubscriberID,
    terminal                [0]           TerminalID                  OPTIONAL,
    alertIdentifier         [1]  IMPLICIT AlertValue                  OPTIONAL}


NetworkChallengeRequest ::=
                              OPERATION
                              ARGUMENT    NetworkChallengeRequestArgument
                              RESULT      NetworkChallengeRequestResult
                              ERRORS      NetworkChallengeRequestError

NetworkChallengeRequestArgument ::= SEQUENCE
  {
    randBS                                RandomVariableBaseStation,
    subscriber              [0]           SubscriberID                OPTIONAL,
    terminal                [1]           TerminalID                  OPTIONAL}

NetworkChallengeRequestResult ::= SEQUENCE
  {
    authBS                                AuthenticationResponseBaseStation}

NetworkChallengeRequestError ::=
                              ErrorCode
                              PARAMETER   ErrorParameter
```

**QualificationDirective** ::=

```
                        OPERATION
                        ARGUMENT    QualificationDirectiveArgument
                        RESULT      QualificationDirectiveResult
                        ERRORS      QualificationDirectiveError
```

```
QualificationDirectiveArgument ::= SEQUENCE
  {
    subscriber                          SubscriberID,
    qualification       [0]  IMPLICIT   QualificationInformationCode    OPTIONAL,
    terminal            [1]             TerminalID                      OPTIONAL,
    authorization       [2]  IMPLICIT   AuthorizationDenied             OPTIONAL,
    authorizationPeriod [3]  IMPLICIT   AuthorizationPeriod             OPTIONAL,
    originationsAllowed [4]  IMPLICIT   OriginationIndicator            OPTIONAL,
    deniedDestinations  [5]  IMPLICIT   Digits                          OPTIONAL,
    terminationsAllowed [6]  IMPLICIT   TerminationRestrictionCode      OPTIONAL,
    featuresAllowed     [7]  IMPLICIT   CallingFeaturesIndicator        OPTIONAL,
    carrier             [8]  IMPLICIT   Digits                          OPTIONAL,
    smeKey              [9]  IMPLICIT   SignalingMessageEncryptionKey   OPTIONAL,
    privateLongCode     [10] IMPLICIT   PrivateLongCodeMask             OPTIONAL,
    serviceOption       [11] IMPLICIT   ServiceOption                   OPTIONAL,
    dataServices        [12] IMPLICIT   DataServices                    OPTIONAL}
```

```
QualificationDirectiveResult ::= NULL
```

```
QualificationDirectiveError ::=   ErrorCode
                                  PARAMETER   ErrorParameter
```

**QualificationRequest** ::=

```
                        OPERATION
                        ARGUMENT    QualificationRequestArgument
                        RESULT      QualificationRequestResult
                        ERRORS      QualificationRequestError
```

```
QualificationRequestArgument ::= SEQUENCE
  {
    subscriber                          SubscriberID,
    qualification                       QualificationInformationCode,
    terminal            [0]             TerminalID                      OPTIONAL,
    uim                 [1]  IMPLICIT   UimEsn                          OPTIONAL,
    interfaceDN         [2]  IMPLICIT   Digits                          OPTIONAL,
    systemAccessType    [3]  IMPLICIT   SystemAccessType                OPTIONAL,
    authenticationInfo  [4]  IMPLICIT   AuthenticationInfo              OPTIONAL,
    systemCapabilities  [5]  IMPLICIT   SystemCapabilities              OPTIONAL,
    digitsDialed        [6]  IMPLICIT   Digits                          OPTIONAL,
    locationArea        [7]  IMPLICIT   LocationAreaID                  OPTIONAL,
    alertIdentifier     [8]  IMPLICIT   AlertValue                      OPTIONAL,
    stationClassMark    [9]  IMPLICIT   ClassMark                       OPTIONAL,
    slotCycleIndex      [10] IMPLICIT   SlotCycleIndex                  OPTIONAL,
    mobileProtocolRevision   [11]       IMPLICIT                        MobileProtocolRevision
  OPTIONAL,
    serviceOption       [12] IMPLICIT   ServiceOption                   OPTIONAL,
    pagingFrameClass    [13] IMPLICIT   PagingFrameClass                OPTIONAL}
```

```
QualificationRequestResult ::= SEQUENCE
  {
    authorization          [0]  IMPLICIT  AuthorizationDenied                OPTIONAL,
    authorizationPeriod    [1]  IMPLICIT  AuthorizationPeriod                OPTIONAL,
    originationsAllowed    [2]  IMPLICIT  OriginationIndicator               OPTIONAL,
    deniedDestinations     [3]  IMPLICIT  Digits                             OPTIONAL,
    terminationsAllowed    [4]  IMPLICIT  TerminationRestrictionCode         OPTIONAL,
    featuresAllowed        [5]  IMPLICIT  CallingFeaturesIndicator           OPTIONAL,
    carrier                [6]  IMPLICIT  Digits                             OPTIONAL,
    voicePrivacyInfo       [7]            VPinfo                             OPTIONAL,
    denyAccessCause        [8]  IMPLICIT  DenyAccess                         OPTIONAL,
    smeKey                 [9]  IMPLICIT  SignalingMessageEncryptionKey      OPTIONAL,
    privateLongCode        [10] IMPLICIT  PrivateLongCodeMask                OPTIONAL,
    subscriber             [11]           SubscriberID                       OPTIONAL,
    terminal               [12]           TerminalID                         OPTIONAL,
    serviceOption          [13] IMPLICIT  ServiceOption                      OPTIONAL,
    dataServices           [14] IMPLICIT  DataServices                       OPTIONAL}

QualificationRequestError ::=  ErrorCode
                               PARAMETER  ErrorParameter


RacfAuthenticationRequest ::=
                               OPERATION
                               ARGUMENT   RacfAuthenticationRequestArgument
                               RESULT     RacfAuthenticationRequestResult
                               ERRORS     RacfAuthenticationRequestError

RacfAuthenticationRequestArgument ::= SEQUENCE
  {
    subscriber                            SubscriberID,
    authenticationInfo                    AuthenticationInfo,
    locationArea                          LocationAreaID,
    systemAccessType                      SystemAccessType,
    racf                   [0]            NodeID,                            OPTIONAL,
    terminal               [1]            TerminalID                         OPTIONAL,
    uim                    [2]  IMPLICIT  UimEsn                             OPTIONAL,
    systemCapabilities     [3]  IMPLICIT  SystemCapabilities                 OPTIONAL,
    digitsDialed           [4]  IMPLICIT  Digits                             OPTIONAL}

RacfAuthenticationRequestResult ::= SEQUENCE
  {
    voicePrivacyInfo       [0]            VPInfo                             OPTIONAL,
    denyAccessCause        [1]  IMPLICIT  DenyAccess                         OPTIONAL}

RacfAuthenticationRequestError ::=
                               ErrorCode
                               PARAMETER  ErrorParameter
```

```
RegistrationCancellationIndication ::=
                                OPERATION
                                ARGUMENT    RegistrationCancellationIndicationArgument

RegistrationCancellationIndicationArgument ::= SEQUENCE
  {
    subscriber                              SubscriberID,
    terminal                [0]             TerminalID                  OPTIONAL,
    alertIdentifier         [1]  IMPLICIT   AlertValue                  OPTIONAL}


RegistrationRequest ::=
                                OPERATION
                                ARGUMENT    RegistrationRequestArgument
                                RESULT      RegistrationRequestResult
                                ERRORS      RegistrationRequestError

RegistrationRequestArgument ::= SEQUENCE
  {
    subscriber                              SubscriberID,
    registrationType                        RegistrationType,
    terminal                [0]             TerminalID                  OPTIONAL,
    qualification           [1]  IMPLICIT   QualificationInformationCode OPTIONAL,
    racf                    [2]             NodeID                      OPTIONAL,
    uim                     [3]  IMPLICIT   UimEsn                      OPTIONAL,
    locationArea            [4]  IMPLICIT   LocationAreaID              OPTIONAL,
    alertIdentifier         [5]  IMPLICIT   AlertValue                  OPTIONAL,
    authenticationInfo      [6]  IMPLICIT   AuthenticationInfo          OPTIONAL,
    systemCapabilities      [7]  IMPLICIT   SystemCapabilities          OPTIONAL,
    stationClassMark        [8]  IMPLICIT   ClassMark                   OPTIONAL,
    slotCycleIndex          [9]  IMPLICIT   SlotCycleIndex              OPTIONAL,
    mobileProtocolRevision      [10]        IMPLICIT                    MobileProtocolRevision
  OPTIONAL,
    mobileBearerCapabilities [11]           IMPLICIT
  MobileBearerCharacteristics   OPTIONAL,
    pagingFrameClass        [12] IMPLICIT   PagingFrameClass            OPTIONAL}

RegistrationRequestResult ::= SEQUENCE
  {
    temporarySubscriber     [0]             SubscriberID                OPTIONAL,
    authorization           [1]  IMPLICIT   AuthorizationDenied         OPTIONAL,
    authorizationPeriod     [2]  IMPLICIT   AuthorizationPeriod         OPTIONAL,
    originationsAllowed     [3]  IMPLICIT   OriginationIndicator        OPTIONAL,
    deniedDestinations      [4]  IMPLICIT   Digits                      OPTIONAL,
    terminationsAllowed     [5]  IMPLICIT   TerminationRestrictionCode  OPTIONAL,
    featuresAllowed         [6]  IMPLICIT   CallingFeaturesIndicator    OPTIONAL,
    carrier                 [7]  IMPLICIT   Digits                      OPTIONAL,
    voicePrivacyInfo        [8]             VPInfo                      OPTIONAL,
    denyAccessCause         [9]  IMPLICIT   DenyAccess                  OPTIONAL,
    dataServices            [10] IMPLICIT   DataServices                OPTIONAL}

RegistrationRequestError ::=    ErrorCode
                                PARAMETER   ErrorParameter
```

```
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}

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

RoutingRequestError ::=       ErrorCode
                              PARAMETER   ErrorParameter


StatusRequest ::=
                              OPERATION
                              ARGUMENT    StatusRequestArgument
                              RESULT      StatusRequestResult
                              ERRORS      StatusRequestError

StatusRequestArgument ::= SEQUENCE
  {
    statusTypeList                        StatusInfoTypeList,
    subscriber          [0]               SubscriberID              OPTIONAL,
    terminal            [1]               TerminalID                OPTIONAL,
    statusQualification [2]   IMPLICIT    StatusQualification       OPTIONAL}

StatusRequestResult ::= SEQUENCE
  {
    statusResponseList                    StatusInfo}

StatusRequestError ::=        ErrorCode
                              PARAMETER   ErrorParameter
```

```
TmsiAssignmentRequest ::=
                        OPERATION
                        ARGUMENT    TmsiAssignmentRequestArgument
                        RESULT      TmsiAssignmentRequestResult
                        ERRORS      TmsiAssignmentRequestError

TmsiAssignmentRequestArgument ::= SEQUENCE
  {
    temporarySubscriber             SubscriberID,
    subscriber          [0]         SubscriberID                OPTIONAL,
    terminal            [1]         TerminalID                  OPTIONAL,
    expirationTime      [2]  IMPLICIT TMSIExpiration            OPTIONAL}

TmsiAssignmentRequestResult ::= SEQUENCE
  {
    authenticationInfo              AuthenticationInfo          OPTIONAL}

TmsiAssignmentRequestError ::=
                        ErrorCode
                        PARAMETER   ErrorParameter
```

**-- Data Types**

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

AlertValue ::=          OCTET STRING    -- AlertIdentifier as defined in ANSI J-STD-014

AuthorizationDenied ::= OCTET STRING    -- AuthorizationDenied as defined in TIA IS-41C

AuthenticationInfo ::=  SEQUENCE
  {
    rand                                RandomVariable,
    count                               CallHistoryCount,
    authR                               AuthenticationResponse}

AuthorizationPeriod ::= OCTET STRING    -- AuthorizationPeriod as defined in TIA IS-41C

AuthenticationResponseBaseStation ::=
                        OCTET STRING    -- AuthenticationResponseBaseStation as defined in TIA IS-
41C

AuthenticationResponse ::=
                        OCTET STRING    -- AuthenticationResponse as defined in TIA IS-41C

AuthenticationResponseUniqueChallenge ::=
                        OCTET STRING    --- AuthenticationResponseUniqueChallenge as defined in TIA
IS-41C

BillingID ::=           OCTET STRING    -- BillingID as defined in TIA IS-41C

CallHistoryCount ::=    OCTET STRING    -- CallHistoryCount as defined in TIA IS-41C

CallReference ::=       OCTET STRING    -- CallReference as defined in ANSI T1.607
```

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

Cause ::=               OCTET STRING    --  Cause as defined in TIA IS-651 PartIIb

CellIDList ::=          SEQUENCE OF CellNodeID

CellNodeID ::=          OCTET STRING

ChannelIDList ::=       OCTET STRING    --  CDMAChannelIdentity as defined in TIA IS-651 Part IIIb

ChannelNumberList ::=   OCTET STRING    --  ChannelNumber as defined in TIA IS-651 Part IIIb

CipherCounter ::=       OCTET STRING    --  OTPCNTR as defined in ANSI J-STD-014

ClassMark ::=           OCTET STRING    --  As specified by air interface standards

DataServices ::=        SEQUENCE
  {
    bearerRate          OCTET STRING (SIZE (1)),
    interworkingFunctions OCTET STRING (SIZE(8))}

DenyAccess ::=          OCTET STRING    --  DenyAccess as defined in TIA IS-41C

Digits ::=              OCTET STRING    --  Digits as defined in TIA IS-41C

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

Imei ::=                OCTET STRING    --  IMEI as defined in TIA IS-652

Imsi ::=                OCTET STRING    --  IMSI as defined in ITU-T Recommendation E.212

LocationAreaID ::=      OCTET STRING    --  LocationAreaId as defined in TIA IS-41C

MobileBearerCharacteristics ::=
                        SEQUENCE
  {
    revision            OCTET STRING (SIZE (1),
    speechCoding        OCTET STRING (SIZE (1),
    encryption          OCTET STRING (SIZE (1),
    power               OCTET STRING (SIZE (1),
    supplemServices     OCTET STRING (SIZE (1),
    shortMsgServices    OCTET STRING (SIZE (1),
    dataServices        OCTET STRING (SIZE (8)}

MobileIdNumber ::=      OCTET STRING    --  MobileIdentificationNumber as defined in TIA IS-41C

MobileProtocolRevision ::=
                        OCTET STRING    --  Mob_P_REV as defined in ANSI J-STD-008

NetAuth ::=             OCTET STRING    --  NetAuth as defined in ANSI J-STD-014
```

```
NodeID ::=                CHOICE
  {
    scf                   [0]                 ScfNodeID,
    racf                  [1]                 RacfNodeID,
    rcf                   [2]                 RcfNodeID,
    cell                  [3]                 CellNodeID,
    unknownType           [4]                 OCTET STRING}

OriginationIndicator ::=  OCTET STRING   -- OriginationIndicator as defined in TIA IS-41C

PagingFrameClass ::=      OCTET STRING   -- PagingFrameClass as defined in ANSI J-STD-011

PrivacyInfo ::=           SEQUENCE
  {
    counter                                 CipherCounter,
    sKey                                    Skey,
    pKey                                    Pkey}

Pkey ::= OCTET STRING                    -- Pkey as defined in ANSI J-STD-014

PrivateLongCodeMask ::=
                          OCTET STRING   -- PrivateLongCodeMask as defined in TIA IS-41C

QualificationInformationCode ::=
                          OCTET STRING   -- QualificationInformationCode as defined in TIA IS-41C

RacfNodeID ::=            OCTET STRING

RandomVariable ::=        OCTET STRING   -- RandomVariable as defined in TIA IS-41C

RandomVariableBaseStation ::=
                          OCTET STRING   -- RandomVariableBaseStation as defined in TIA IS-41C

RandomVariableSSD ::=     OCTET STRING   -- RandomVariableSSD as defined in TIA IS-41C

RandomVariableUnique ::= OCTET STRING    -- RandomVariableUniqueChallenge as defined in TIA IS-41C

RcfNodeID ::=             OCTET STRING

RegistrationType ::=      OCTET STRING   -- RegType as defined in ANSI J-STD-008

RequestNumber ::=         OCTET STRING   -- RequestNumber as defined in ANSI J-STD-008

ScfNodeID ::=             OCTET STRING

ServiceOption ::=         OCTET STRING   -- ServiceOption as defined in TIA IS-651 Part IIIb

SignalingMessageEncryptionKey ::=
                          OCTET STRING   -- SignalingMessageEncryptionKey as defined in TIA IS-41C

Skey ::=                  OCTET STRING   -- Skey as defined in ANSI J-STD-014

SlotCycleIndex ::=        OCTET STRING   -- SlotCycleIndex as defined in ANSI J-STD-008
```

```
StatusInfo ::=              OCTET STRING    -- Record as defined in ANSI J-STD-008

StatusInfoTypeList ::=      OCTET STRING    -- RecordType as defined in ANSI J-STD-008

StatusQualification ::=     OCTET STRING    -- QUAL_INFO_TYPE as defined in ANSI J-STD-008

SubscriberID ::=            CHOICE
  {
    mobileIdNumber          [0]             MobileIdNumber,
    imsi                    [1]             Imsi,
    tmsi                    [2]             Tmsi,
    tSubId                  [3]             TsubID}

SystemAccessType ::=        OCTET STRING    -- SystemAccessType as defined in TIA IS-41C

SystemCapabilities ::=      OCTET STRING    -- SystemCapabilities as defined in TIA IS-41C

TerminalID ::=              CHOICE
  {
    imei                    [0]             Imei,
    terminalESN             [1]             TerminalESN}

TerminalESN ::=             OCTET STRING    -- ElectronicSerialNumber as defined in TIA IS-41C

TerminationRestrictionCode ::=
                            OCTET STRING    -- TerminationRestrictionCode as defined in TIA IS-41C

TSubID ::=                  OCTET STRING    -- TSubID as defined in ANSI J-STD-014

TimeStamp ::=               UTCTime

Tmsi ::=                    OCTET STRING    -- As specified by air interface standards

TMSIExpiration ::=          OCTET STRING    -- TMSI_EXP_TIME as defined in ANSI J-STD-008

UpdateCount ::=             OCTET STRING    -- UpdateCount as defined in TIA IS-41C

UimEsn ::=                  OCTET STRING    -- UIMESN as defined in ANSI J-STD-014

VPInfo ::=                  CHOICE
  {
    networkAuthentication                   NetAuth,
    privacyInformation                      PrivacyInfo}
```

**-- 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}


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              AuthenticationDirective              ::= localValue   1
authenticationFailureIndication      AuthenticationFailureIndication      ::= localValue   2
callWaitingINotification             CallWaitingNotification              ::= localValue   3
clearRequest                         ClearRequest                         ::= localValue   4
handoverCompleteIndication           HandoverCompleteIndication           ::= localValue   5
handoverPerformedIndication          HandoverPerformedIndication          ::= localValue   6
networkChallengeRequest              NetworkChallengeRequest              ::= localValue   7
qualificationDirective               QualificationRequest                 ::= localValue   8
qualificationRequest                 QualificationRequest                 ::= localValue   9
racfAuthenticationRequest            RacfAuthenticationRequest            ::= localValue   10
registrationCancellationIndication   RegistrationCancellationIndication   ::= localValue   11
registrationRequest                  RegistrationRequest                  ::= localValue   12
routingIRequest                      RoutingRequest                       ::= localValue   13
statusIRequest                       StatusRequest                        ::= localValue   14
tmsiAssignmentIRequest               TmsiAssignmentRequest                ::= localValue   15
```

**END**

### 7.6.2 Common ASEs

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

**DEFINITIONS ::=**

**BEGIN**

**EXPORTS mMAP-COMMON-RACF-SCF-ASE;**

**IMPORTS**

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

**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)};

APPLICATION-SERVICE-ELEMENT

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

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

CONSUMER INVOKES          -- RACF invokes
  {
    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(1) racf-scf-
   ase (1) v(1)}

END
```

## Annex A
(informative)

## Physical scenarios

The MMAP operations support the following example physical scenarios:

Physical scenario 1 is characterized by:

signaling and bearer services interface(s) between:

– the Personal Station (PS) and the Radio System (RS)
– the RS and the Switching Platform

a signaling interface between:

– the RSs
– the Switching Platform and the Mobility Management Platform

MMAP operations are sent and received over the signaling interfaces between the RACF and SCF via the switching platform using methods such as NCAS. MMAP operations are sent and received between RACFs over signaling interfaces or routes between the RSs such as SS7 or X.25.

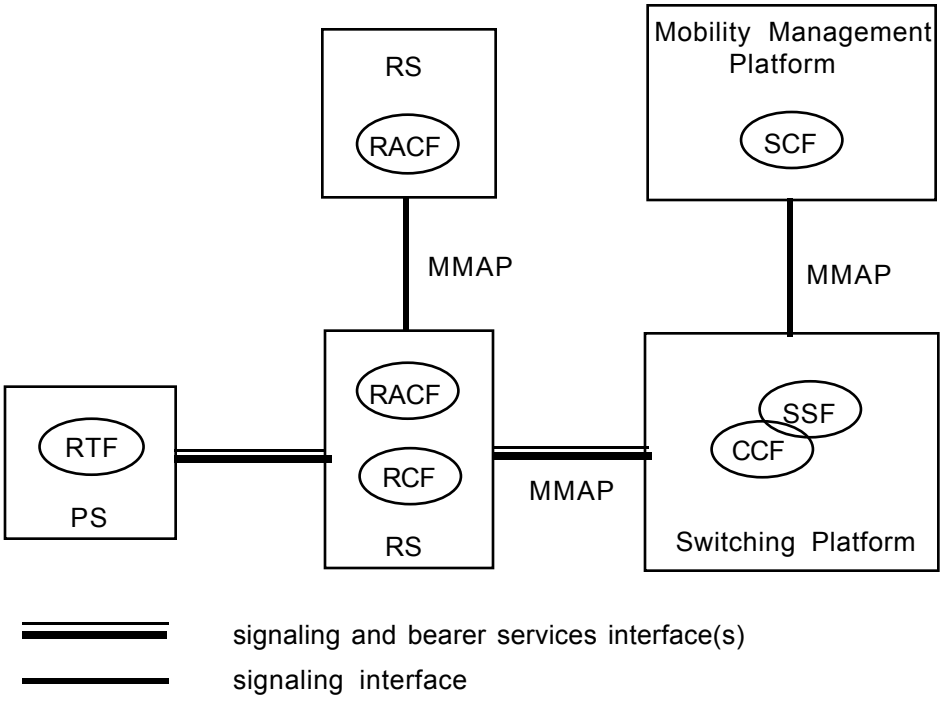


**Figure A.1 – Physical scenario 1: RACF-to-SCF via switching platform**

Physical scenario 2 is characterized by:

signaling and bearer services interface(s) between:

– the Personal Station (PS) and the Radio System (RS)
– the RS and the Switching Platform

a signaling interface between:

– the RSs
– the Switching Platform and the Mobility Management Platform
– the RS and the Mobility Management Platform

MMAP operations are sent and received over the signaling Interfaces or routes between the RACF and SCF via methodologies such as SS7 or X.25. MMAP operations are sent and received between RACFs over signaling interfaces or routes between the RSs such as SS7 or X.25.

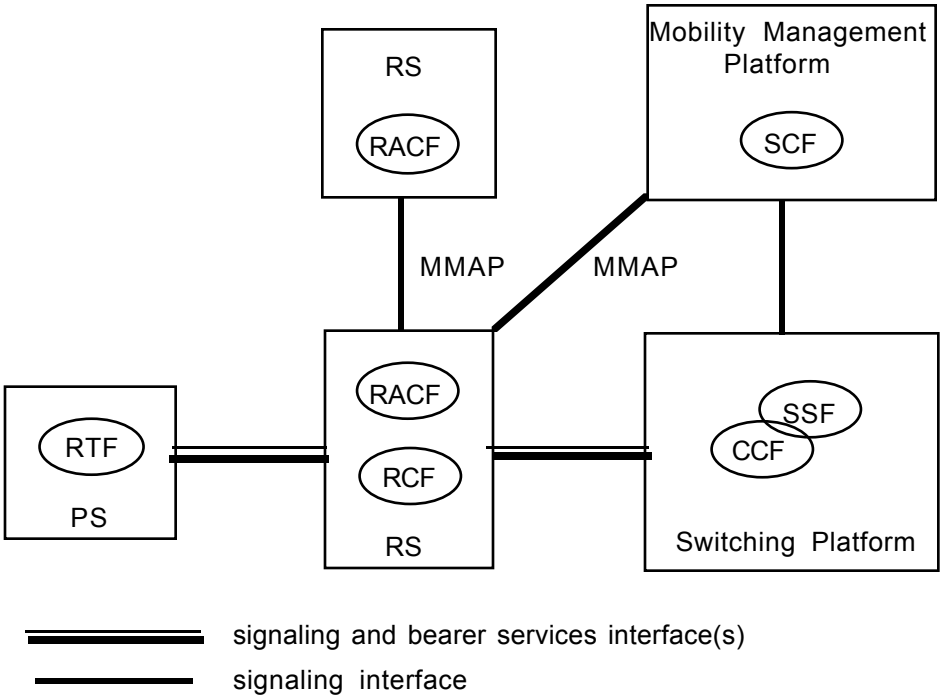


**Figure A.2 – Physical scenario 2: RACF-to-SCF via direct route**

## Annex B
(informative)

## Bibliography

ANSI T1.113-1995, *Telecommunications – Signalling System No. 7 (SS7) – Integrated Services Digital Network (ISDN) user part*

ANSI T1.607-1990, *Telecommunications – Integrated Services Digital Network (ISDN) – Layer 3 Signaling Specification for Circuit-Switched Bearer Service for Digital Subscriber Signaling System Number 1 (DSS1)*

CCITT Recommendation E.212, *Telephone Network and ISDN Operations, Numbering, Routing, and Mobile Services*[1)]