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SERIES Q: SWITCHING AND SIGNALLING
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Interface Recommendation for Intelligent Network capability set 4: SCF-CUSF Interface

ITU-T Recommendation Q.1248.7

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Interface Recommendation for Intelligent Network capability set 4: SCF-CUSF Interface

Summary

The Q.1248.x family of Recommendations defines the Intelligent Network (IN) Application Protocol (INAP) for IN capability set 4 (IN CS-4). This family of Recommendation defines the INAP for IN CS-4 based upon IN CS-3 ITU-T Q.1238 (2000), and the general rules for INAP provided in ITU-T Q.1208, and is consistent with the scope of IN CS-4 as defined in ITU-T Q.1241.

Within the Q.124x series of Recommendations, the ITU-T Q.1248.x family describes the protocol realizing the Q.1244 Distributed Functional Plane in a service and vendor implementation independent manner, as constrained by the capabilities of the embedded base of network technology. This provides the flexibility to allocate distributed functionality into multiple physical network configurations and to evolve IN from IN CS-4 to some future IN CS-N.

This Recommendation belongs to ITU-T Q.1248.x family of Recommendation for IN capability set 4. It covers the CUSF-SCF interface including the description of the aspects of the CUSF and SCF Functional Entities which are relevant to this interface.

This Recommendation includes an electronic attachment containing Annex A, ASN.1 definitions.

Source

ITU-T Recommendation Q.1248.7 was prepared by ITU-T Study Group 11 (2001-2004) and approved under the WTSA Resolution 1 procedure on 13 July 2001.

Keywords

Intelligent Network (IN), Intelligent Network Application Protocol (INAP), IN Capability Set 4 (IN CS-4), Service Control Function (SCF), Call Unrelated Service Function (CUSF).

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

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In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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ITU-T Recommendation Q.1248.7

Interface Recommendation for Intelligent Network capability set 4: SCF-CUSF Interface¹

1 Scope

This Recommendation belongs to the Q.1248.x family of Recommendations for IN capability set 4. It specifies the protocol on the CUSF-SCF interface and provides a description of the aspects of the CUSF and SCF Functional Entities which are involved in the realization of this interface.

2 References

All ITU-T Recommendations and other references are identified in ITU-T Q.1248.1.

3 Abbreviations and acronyms

All abbreviations and acronyms used in this text are defined in ITU-T Q.1248.1.

4 Relationships

4.1 SCF-CCF/CUSF relationship

The SCF-CUSF relationship is used for messages between an SCF and a CUSF in the public network. This relationship provides a service, or service features, which need call-unrelated user interaction. This provides, for example, user location registration, user authentication, supplementary service activation or de-activation. Details of service drivers can be found in ITU-T Q.1241.

This relationship is used for three cases, and respective cases are exclusive for the others.

Case 1) for sending/receiving ROSE APDUs to/from a user.

Case 2) for sending/receiving USI informations to/from a user.

Case 3) for relaying some informations for call unrelated association establishment from a supplementary service (e.g. CCBS) in CCF (BCUSM).

4.2 CUSF-SSF relationship

It is considered that the CUSF and the SSF may have a relationship, but the relationship is not defined in IN CS-4, and is not mandatory. This relationship may be used to influence the basic call processing in the SSF/CCF (e.g. activation or de-activation of Call Forwarding) via call-unrelated interaction.

5 CCF/CUSF model

5.1 General

The CCF/CUSF model shown in Figure 1 is for a single-ended service logic instance related to a user. The purpose of this model is to provide a framework for the understanding of call unrelated modelling with respect to the CCF/CUSF.

¹ This Recommendation includes an electronic attachment containing Annex A, ASN.1 definitions.

5.2 CCF/CUSF components

The CCF/CUSF model consists of several entities. Each of the entities is briefly described below. It is noted that this shows a conceptual model of CCF/CUSF and is not intended to imply an actual implementation of the CCF/CUSF.

5.2.1 Basic Non-Call Manager (BNCM)

This entity provides an abstraction of an association and proceedings for call unrelated interactions between a user and a network. It detects basic call unrelated events that can lead to the invocation of IN service logic instances or those that should be reported to active IN service logic instances. It also manages resources required to support basic call unrelated control. The BNCM interacts with the FIM/NCM as described in the FIM/NCM description below. The BNCM also manages the BCUSM and the DP processing logic.

5.2.2 IN – Non-Switching Manager (IN-NSM)

This entity interacts with the SCF via SCF Access Manager in the course of providing IN services/features to users. It provides the SCF with an observable view of a CUSF call unrelated processing activities, and provides the SCF with access to CUSF capabilities, such as managing of an association and invoked operations. It also detects non-call processing events that should be reported to active IN service logic instances or can lead to the invocation of IN service logic instances. It manages CUSF resources required to support IN service logic instances, if any.

5.2.3 Feature Interaction Manager/Non-Call Manager (FIM/NCM)

This entity provides mechanisms to prevent invocation of multiple instances of IN and non-IN service logic instances on a single association. The ability of the FIM/NCM to arbitrate IN/non-IN call associated/call unrelated associated services/features and IN call unrelated associated services/features is outside the scope of this capability set. These two types of arbitration need an implicit relationship. The FIM/NCM integrates these interactions mechanisms with the BNCM and IN-NSM to provide the CUSF with a unified view of call unrelated processing internal to the CUSF for an association.

5.3 Relationship of CCF/CUSF model components

5.3.1 BNCM relationship to IN-NSM

This is the relationship that encompasses the interaction between the BNCM and the IN-NSM, through the FIM/NCM. The message related to this interaction is not externally visible and is not for standardization. However, an understanding of this subject is required to identify how basic call unrelated processing and IN call unrelated processing interact.

5.3.2 BNCM and IN-NSM relationship to FIM/NCM

This is the relationship that encompasses the interaction between the BNCM and the FIM/NCM, and the interaction between the IN-NSM and the FIM/NCM. The messages related to these interactions are not externally visible and are not for standardization. However, an understanding of this subject is required in order to unify the BNCM, IN-NSM and FIM/NCM.

5.4 Basic Call Unrelated State Model (BCUSM)

This model relates to the call unrelated associated connection-oriented interaction between the user and the IN service logic using existing ISDN user-to-network signalling procedures.

The main concept of the BCUSM is similar to the BCSM. The BCUSM is a high-level description of the CCF activities required to establish and maintain an association between users and service processing, to manage invoked operations. For this, it identifies a set of basic call unrelated

associated activities in the CCF and shows how these activities are joined together to process a basic call unrelated associated services/features (e.g. establish and maintain an association between a user and a network, manage this and all operation invocations).

Many aspects of the BCUSM are not externally visible to IN service logic instances. However, aspects of the BCUSM that are reflected upward to the IN-NSM and FIM/NCM are visible to IN service logic instance. Only these aspects of the BCUSM will be the subjects of standardization. Therefore, the BCUSM is primarily an explanatory tool for providing a representation of CCF activities that can be analysed to determine which aspects of the BCUSM will be visible to IN service logic instances, if any, and what level of abstraction and granularity is appropriate for this visibility.

The BCUSM identifies points when IN service logic instances are permitted to interact with basic call unrelated interaction processing (for the time being it is reasonable to assume ROSE procedures). In particular, it provides a framework for describing basic call unrelated events that can lead to the invocation of IN service logic instances or reporting of the events to the active logic, for describing those points in association and operation processing when the transfer of control can occur.

Figure 2 shows the components that have been identified to describe a BCUSM. Points in association (PIA), detection points (DPs). Transitions and events are not depicted in the figure, but they are self-explanatory. Figure 2 also shows the BCUSM. PIAs represent the states of an association for the call unrelated interaction. The concepts of DPs are same as the BCSM, however an IN service logic instance can influence a call unrelated interaction processing with specifying a ROSE APDU (invoke, return result, return error, reject) which should be delivered via appropriate signalling messages between the user and the network (e.g. REGISTER, FACILITY, REL, and REL COMP on DSS1).

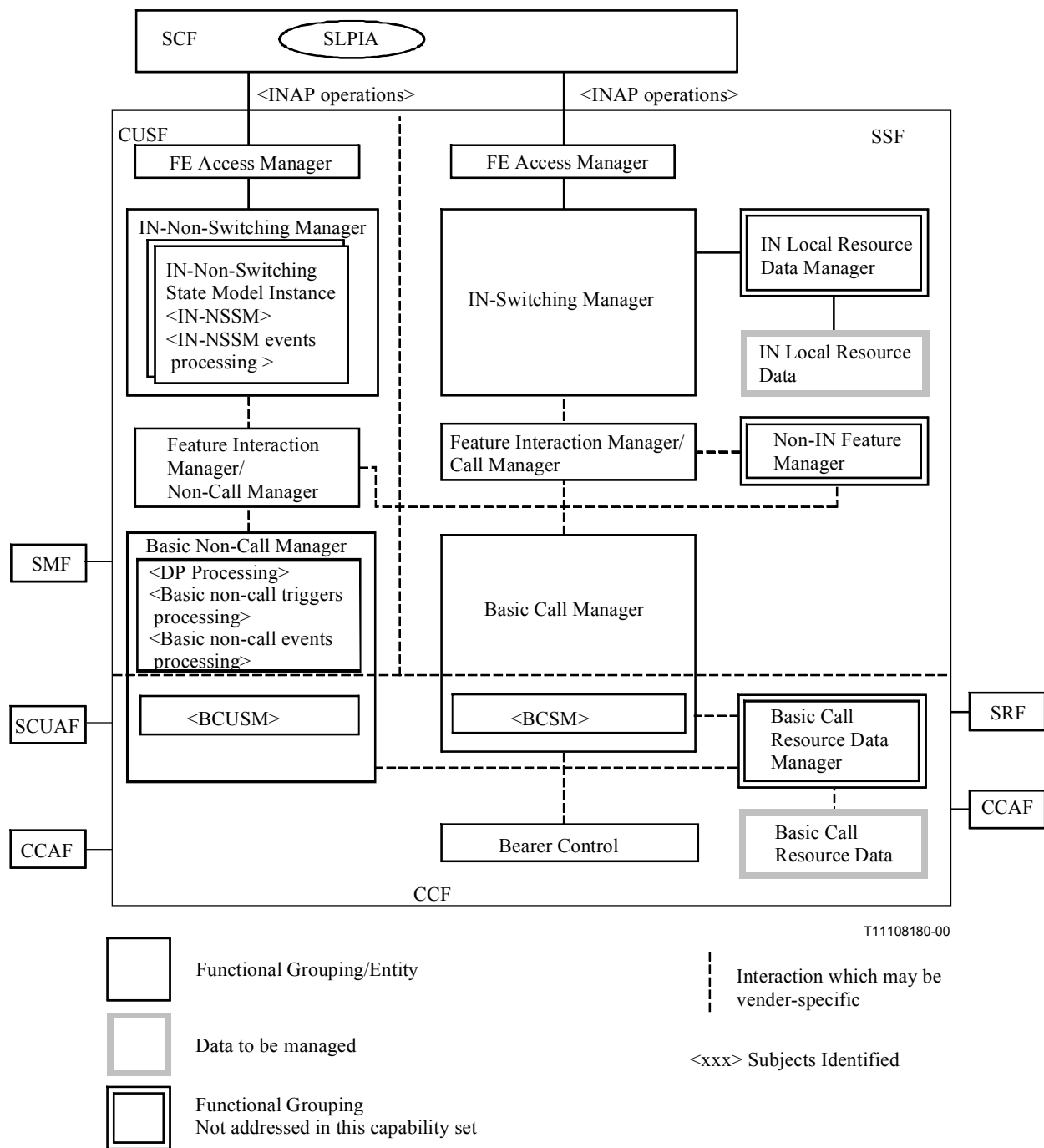


Figure 1/Q.1248.7 – Internal CUSF structure and the relationship between FEs

5.4.1 BCUSM description

In the following descriptions, the PIAs are related at a high level to the procedure taking place in an entity that supports ROSE. To aid understanding, Q.931 and Q.932 messages with information elements are attached to the description: however, this should not be understood as limiting the scope of BCUSM only to DSS1.

The following is the BCUSM description for this capability set.

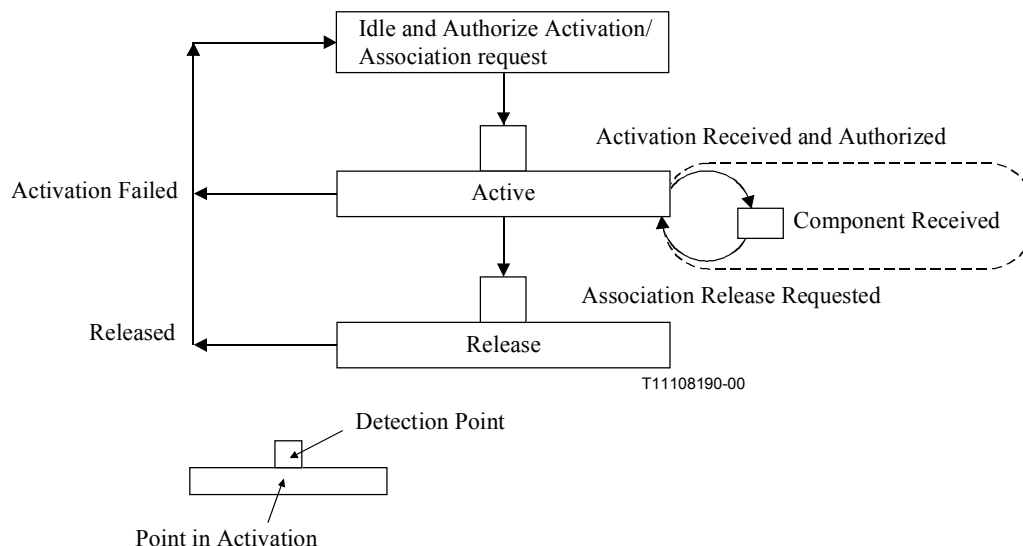


Figure 2/Q.1248.7 – BCUSM

5.4.1.1 BCUSM model for ROSE APDU

5.4.1.1.1 Idle and Authorize Activation/Association request

Entry Event:

- All previously invoked operations between a user and a network are completed (event: Released), or the (last) invocation of an operation was rejected by the user or the network (event: Activation Failed). There is no relationship between the user and the network; e.g. no call reference exists between the user and the network.

Functions:

Logical association is idled (e.g. no call reference, no data link connection).

When the indication to establish an association and optionally invoke an operation is received (e.g. Q.932 REGISTER with FACILITY IE), the authority/ability of the user invoking the particular operation is verified. For example, some restrictions may be checked that are assigned to the used access, such as invoking User Registration is prohibited, if any.

Exit Event:

- An indication to establish an association and optionally invoke an operation is received (e.g. Q.932 REGISTER with FACILITY IE), the authority/ability of the user invoking the particular operation was verified (DP Activation Received and Authorized).

5.4.1.1.2 Active

Entry Event:

- An indication to establish an association and optionally invoke an operation is received (e.g. Q.932 REGISTER with FACILITY IE), the authority/ability of the user invoking particular operation was verified (DP Activation Received and Authorized), or a response/invocation from the user is received (DP Component Received).

Functions:

- Logical association is established (i.e. a call reference is assigned).
- The received operation is processed and an appropriate response is sent to the user, or the response/invocation from the user is monitored.

Exit Event:

- A response/invoke from the user is received (DP Component Received).
- Activation is failed (Activation Failed).
- An association release request is received from the user or the network (e.g. Q.931 REL). (DP Association Release Requested).

5.4.1.1.3 Release

Entry Event:

- An association release request is received from the user or the network (e.g. Q.931 REL). This request optionally contains response/invoke to the user or from the network (DP Association Release Requested).

Functions:

- The association is being released with appropriate procedures (a pending response may be delivered with an association release message, e.g. Q.931 RELComp). This procedure may deliver final invoke/response to the user or to the network.

Exit Event:

- The association is completely released (Released).

5.4.1.1.4 Transition for BCUSM

Table 1/Q.1248.7 – Transition for BCUSM

From	To
Activation Received and Authorized	Idle and Authorize Activation/Association request
Activation Received and Authorized	Active
Component Received	Idle and Authorize Activation/Association request
Component Received	Active
Association Release Requested	Idle and Authorize Activation/Association request
NOTE – These transitions are depicted here as they are beyond the normal BCUSM transitions.	

5.4.1.1.5 Modelling for ROSE APDU handling

The current BCUSM models only the association handling parts and detection of the ROSE APDU as it is received. While it may be possible to model the analysis of the received ROSE APDU and invoke ID, it is not done since all ROSE ADPU are specific to a service. This would mean having to model every service. Therefore, only the general parts (component handling and association handling) are modelled.

The modelling is similar to the BCSM in the sense of how far the interaction portion of the state model depicts the details of the activities in the physical entity, however the interaction is different from the circuit mode switched bearer services (represented by the BCSM) with the following:

- a) the variation of the service triggering points (corresponding to TDP) is limited to the association establishment/release phases or the reception of the ROSE APDU;
- b) the ROSE APDU is received during the association establishment/release phase or within the established association;
- c) the modelling of the analysis of a received ROSE APDU may be not necessary, because it can be well modelled as the TDP criteria check;

- d) the procedures with the interaction vary from service to service and have many variations, so each supplementary service has different states to handle the ROSE APDUs (but it may be possible to model reject or failure of the invocation).

The DP indicates the place of:

- a) the event of the association establishment request or release;
b) the detection of the ROSE APDU reception (Figure 3 shows what part is service dependent and what part is general for this type of interaction).

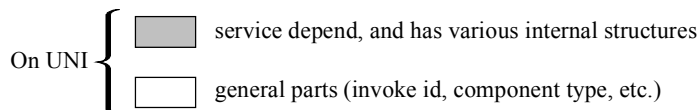
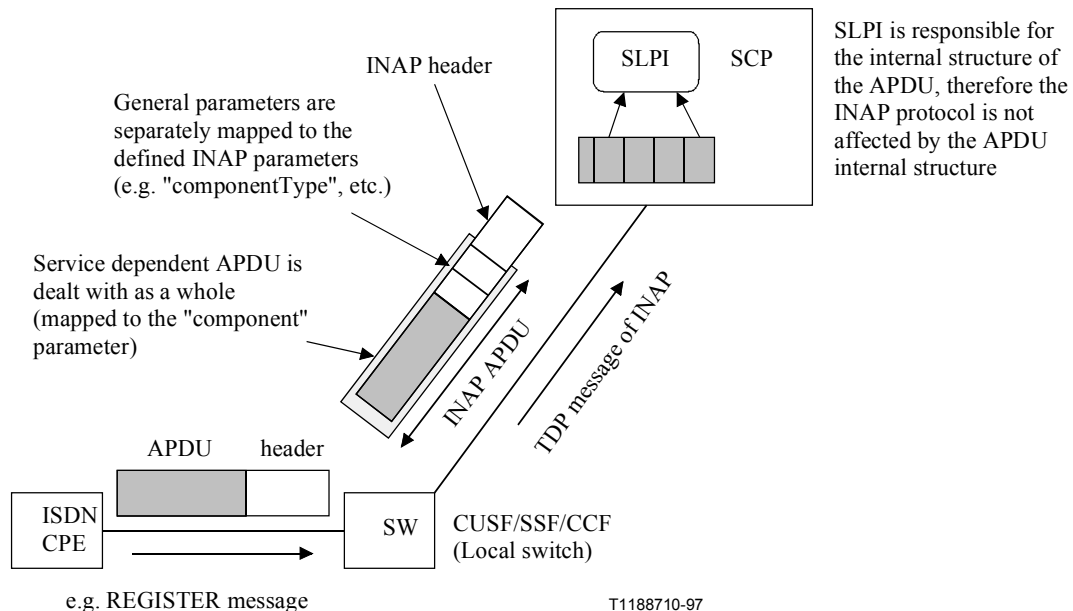


Figure 3/Q.1248.7 – ROSE APDU treatment scheme

5.4.1.2 BCUSM model for association establishment from a service ASE in CUSF

5.4.1.2.1 Idle and Authorize Activation/Association request

Entry Event:

- A previously invoked call unrelated association establishment is completed (event: Released), or the (last) association establishment was failed (event: Activation Failed). There is no association for a service ASE in CUSF.

Functions:

- Logical association is idled.
- When the request to establish a call unrelated association from a service ASE in CUSF is received, the authority/ability of the invocation of the association establishment is verified.

Exit Event:

- The authority/ability of invoking the association establishment was verified (DP Activation Received and Authorized).

5.4.1.2.2 Active

Entry Event:

- The authority/ability of invoking the association establishment was verified (DP Activation Received and Authorized); or
- a response for the call unrelated association is received (DP Component Received).

Functions:

- Logical association is established.
- The response is processed and a further response is monitored.

Exit Event:

- A response for the call unrelated association establishment is received (DP: Component Received).
- The association establishment is failed (Activation Failed).
- The association is released (DP: Association Release Requested).

5.4.1.2.3 Release

Entry Event:

- The association is released (DP: Association Release Requested).

Functions:

- The association is being released with appropriate procedures.

Exit Event:

- The association is completely released (Released).

5.4.1.2.4 Transition for BCUSM

Table 2/Q.1248.7 – Transition for BCUSM

From	To
Activation Received and Authorized	Idle and Authorize Activation/Association request
Activation Received and Authorized	Active
Component Received	Idle and Authorize Activation/Association request
Component Received	Active
Association Release Requested	Idle and Authorize Activation/Association request
Association Release Requested	Active
NOTE – These transitions are depicted here as they are beyond the normal BCUSM transitions.	

5.4.2 BCUSM DP criteria

As for CS-4 BCUSM, the DP criteria means to check the specific out-channel interaction activation at the Activation Received and Authorized, or Component Received DP against the specified pattern, for example an operation code for ROSE like interaction. The formal description is not defined for IN CS-4.

Table 3 denotes the applicability of DP criteria to DPs of BCUSM. The entries in the table can be (these are the same as the BCSM):

- Line-Based (Subscriber line or Trunk line);
- Group-Based (including Private Facility Group);

- Office-Based.

Table 3/Q.1248.7 – BCUSM DP criteria

DP criteria	DPs	
	ActivationReceivedAndAuthorized	ComponentReceived
Trigger Assigned	X	X
ITU-T ISDN supplementary services' operation codes	X	O
Regional/Network operator specific ISDN supplementary services' operation codes (Note)	X	O
USIServiceIndicator	X	O
X Applicable O Optional (The meaning of "X" and "O" is the same as for the BCSM.) NOTE – The total number of the codes is regional or network operator specific.		

6 SCF model

Refer to ITU-T Q.1248.1.

7 FSM for CUSF

7.1 Relations between CUSF FSM and the SSF/CCF and maintenance functions

The primitive interface between the CUSF FSM and the CCF/SSF/maintenance functions is an internal interface and is not subject to standardization in IN CS-4. Nevertheless, this interface should be in line with the BCUSM defined in 5.4.

The relationship between the BCUSM and the CUSF FSM may be described as follows for the case of a call unrelated association/operation attempt from an end user or IN service logic:

- When a call unrelated associated association/operation attempt is initiated by an end user and processed at an exchange, an instance of a BCUSM is created. As the BCUSM proceeds, it encounters detection points (DPs, see 5.4). If a DP is armed as a Trigger DP (TDP), an instance of a CUSF FSM is created.
- If an InitiateAssociation is received from the SCF, an instance of a BCUSM is created, as well as an instance of a CUSF FSM.

The CUSF logic should:

- perform the DP processing actions, including if DP criteria are met;
- check for SCF accessibility; and
- handle service feature interactions in conjunction with the SSF.

NOTE – This processing is optional and network specific, and there are no more descriptions for these interactions.

The CUSF hands control back to the CCF at least in the following cases:

- if a trigger (TDP) criteria match is not found (e.g. insufficient information to proceed): the CUSF logic returns supplementary service control processing to the CCF;



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ITU-T Rec. Q.1248.7 (07/2001)

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- if the association is abandoned: the CUSF logic returns supplementary service control processing to the CCF;
- if the destination SCF is not accessible: the CUSF logic will apply final treatment to the end user for the TDP-R case, or return supplementary service control processing to the CCF for the TDP-N case.

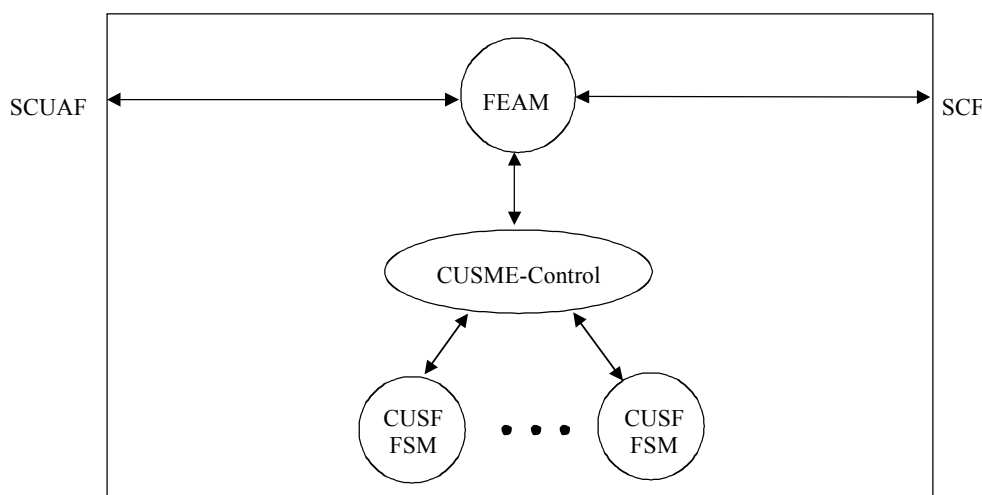
The management functions related to the execution of operations received from the SCF are executed by the CUSF Management Entity (CUSME)-control. The CUSME-control interfaces the different CUSF FSMs and the Functional Entity Access Manager (FEAM). Figure 4 shows the CUSF Interfaces.

The function of FEAM is defined in ITU-T Q.1248.1.

The CUSME-control maintains the dialogues with the SCF on behalf of all instances of the CUSF Finite State Model (FSM). These instances of the CUSF FSM occur concurrently and asynchronously as associations occur, which explains the need for a single entity that performs the task of creation, invocation, and maintenance of the CUSF FSMs. In particular, the CUSME-control performs the following tasks:

- 1) interprets the input messages from other FEs and translates them into corresponding CUSF FSM events;
- 2) translates the CUSF FSM outputs into corresponding messages to other FEs;
- 3) captures asynchronous (with processing association and/or operation request from the end user) activities related to management or supervisory functions in the CUSF;
- 4) checks the existence of a CUSF-SCF relationship by receiving an ActivityTest operation from the SCF and returns the result to the SCF.

The CUSF FSM passes component handling instructions to the related instances of the BCUSM as needed. DPs may be dynamically armed as EDPs, requiring the CUSF FSM to remain active. At some point, further interaction with the SCF is not needed, and the CUSF FSM may be terminated while the BCUSM continues to handle the association as needed.



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Figure 4/Q.1248.7 – CUSF interfaces