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Intelligent Network

Introduction to Intelligent Network Capability Set 4

ITU-T Recommendation Q.1241

(Formerly CCITT Recommendation)

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ITU-T Recommendation Q.1241

Introduction to Intelligent Network Capability Set 4

Summary

This Recommendation is the first of the ITU-T Q.124x series of Recommendations devoted to IN CS-4, which builds on the architectural principles of IN as described in the preceding IN CS-1 (ITU-T Q.121x), IN CS-2 (ITU-T Q.122x) and the IN CS-3 (ITU-T Q.123x) series of Recommendations. Intelligent Network Capability Set 4 (IN CS-4) is the fourth standardized stage of the Intelligent Network (IN) as an architectural concept for the creation and provision of services, including telecommunication services, service creation and management. This Recommendation gives an introduction to IN CS-4 and describes the main characteristics and overall capabilities of IN CS-4. It includes the CS-4 functional architecture relationships plus service and network aspects that form the basis of the IN CS-4 capabilities. CS-4 Service Features are listed and possible inter-networking scenarios between IN and non-IN structured networks are also described.

The IN CS-4 Recommendations form a detailed and stable basis for implementing IN CS-4 telecommunication services. They also provide high level guidelines for supporting:

- service management;
- service creation, and
- some partially supported telecommunication services.

The IN CS-4 Recommendations are intended to give the same degree of technical information as the IN CS-3 Recommendations.

Source

ITU-T Recommendation Q.1241 was prepared by ITU-T Study Group 11 (2001-2004) and approved under the WTSA Resolution 1 procedure on 13 July 2001.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

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.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

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

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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ITU-T Recommendation Q.1241

Introduction to Intelligent Network Capability Set 4

1 Introduction

This Recommendation contains an introduction to Intelligent Network Capability Set 4 (IN CS-4). It describes the main characteristics and overall capabilities of IN CS-4 and defines the service and network aspects with functional relationships that form the basis for IN CS-4 capabilities. IN CS-4, as successor to IN CS-3, becomes the fourth standardized stage of the Intelligent Network (IN) for the creation and provision of network services. Along with advances in call modelling, security, feature interaction and mobility management, IN CS-4 offers enhanced Number Portability, Mobility, Broadband, Broadband and inter-working with the services in the Internet Protocol (IP) Networks.

2 Phased Standardization

The phased approach of IN Capability Sets is described in ITU-T Q.1201. IN CS-4 extends the service aspects, network aspects and management aspects of IN CS-3 as specified in the ITU-T Q.123x series of Recommendations. Definition of IN CS-3 service features may be found in ITU-T Q.1231.

3 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

[1] ITU-T Q.1210 (1995), *Q.1210-series intelligent network Recommendation structure*.

[2] ITU-T Q.1211 (1993), *Introduction to intelligent network capability set 1*.

[3] ITU-T Q.1213 (1995), *Global functional plane for intelligent network CS-1*.

[4] ITU-T Q.1214 (1995), *Distributed functional plane for intelligent network CS-1*.

[5] ITU-T Q.1215 (1995), *Physical plane for intelligent network CS-1*.

[6] ITU-T Q.1218 (1995), *Interface Recommendation for intelligent network CS-1*.

[7] ITU-T Q.1220 (1997), *Q.1220-series Intelligent Network Capability Set 2 Recommendation structure*.

[8] ITU-T Q.1221 (1997), *Introduction to Intelligent Network Capability Set 2*.

[9] ITU-T Q.1222 (1997), *Service plane for Intelligent Network Capability Set 2*.

[10] ITU-T Q.1223 (1997), *Global functional plane for Intelligent Network Capability Set 2*.

[11] ITU-T Q.1224 (1997), *Distributed functional plane for Intelligent Network Capability Set 2*.

[12] ITU-T Q.1225 (1997), *Physical plane for Intelligent Network Capability Set 2*.

[13] ITU-T Q.1228 (1997), *Interface Recommendation for Intelligent Network Capability Set 2*.

[14] ITU-T Q.1231 (1999), *Introduction to Intelligent Network Capability Set 3*.

[15] ITU-T Q.1236 (1999), *Intelligent Network Capability Set 3 – Management Information Model Requirements and Methodology*.

[16] ITU-T Q.1237 (2000), *Extensions to Intelligent Network Capability Set 3 in support of B-ISDN*.

[17] ITU-T Q.1238.x (2000), *Interface Recommendation for Intelligent Network Capability Set 3*.

[18] ITU-T Q.1290 (1998), *Glossary of terms used in the definition of Intelligent Networks*.

4 General Description and Scope of IN CS-4

4.1 Criteria for IN CS-4

IN CS-4 defines a set of IN capabilities that meet the following general criteria:

- IN CS-4 is a subset of the target Intelligent Networks architecture.
- IN CS-4 is a superset of IN CS-3, as defined in the IN CS-3 Recommendations (1999).
- IN CS-4 is a set of definitions of capabilities that is help to both manufacturers and network service providers/operators.
- IN CS-4 provides network capabilities defined to support the set of IN CS-4 benchmark services and service features. These capabilities can also be used to support other services that may, or may not, be standardized by ITU-T.

The following clauses outline the work items defined for IN CS-4.

4.2 Basic features

1) Evolution of IN CS-3

   Enhancement of the existing CS-3 features

2) Multiple point of control

   More than one-service logic's in one or more SCFs are allowed to act on the same (half) call, which implies retriggering in the same SSP. The involved service logic's act independently from each other (same behaviour as if the service logic's are triggered in different SSPs), i.e. each service logic has its own abstract view of its half call segment.

   The interaction between the CCF and the several sub-SSFs is handled by an enhanced functional entity located between the CCF and the sub SSFs (Feature Interaction Manager).

4.3 IN Support for Voice over IP

4.3.1 Basic Services

INAP CS-4 to support Voice over IP customers, including some new INAP CS-4 network capabilities, such as "high quality audio" should support the following network voice services. Services that should be supported (as H.323 and SIP will support these services in the future) that may require INAP control are:

- *Speech*;
- Low bit rate data;
- Medium bit rate data;
- High bit rate data;
- High quality audio;
- Low bandwidth video;
- High bandwidth video.

In addition, end-to-end negotiation of parameters at the call set-up time and the ability to modify these parameters during the active phase of the call should be supported.

4.3.2 Supplementary Services

Example supplementary services that require INAP CS-4 control in a network:

- *Operator determined barring*;
- *User defined barring*;
- *Call screening*;
- *Call deflection*;
- *Call forwarding unconditional*;
- *Call forwarding on busy, no reply and not reachable*;
- *Call waiting*;
- *Call hold*;
- *Call transfer*;
- *Multiple Subscriber Profile*;
- *Multi-party*;
- *Closed user group*;
- *Advise of charge*;
- *Calling name identification presentation.*

Example supplementary services that require IN interaction in a network:

- *Calling number identification presentation/restriction;*
- *Connected line identification presentation/restriction;*
- *Call Completion Services (e.g. CCBS)*.

4.3.3 Operator Specific Services

Example operator specific services that require INAP CS-4 control in a network:

- *Short number dialling*;
- *Prepaid*;
- *VPN*;
- *Free-phone service*;
- *Number portability*.

4.4 IN and IP networks

Many aspects of inter-working between IP network services/applications and Intelligent Network services/features are addressed in IN CS-4:

1) *IN support for IP connectivity*
   - Minimal support for accessing IN from H.323 Gatekeepers/SIP Proxy Server for implementing services that do not require explicit handling of the call configuration (i.e. no support for CPH in case of VoIP, but support of free-phone, prepaid, etc.).
   - Full support for accessing IN from a SIP Proxy for implementing services that do not require explicit handling of the call configuration (i.e. no support for CPH in case of VoIP, but support of free-phone, prepaid, etc.).
   - Full support for inter-working IN with Call Servers, based on the H.248 architecture for all types of services.

4.5 General aspects

1) *Network technology transparency*

The target IN is considered an overlay "service network" common to all transport and signalling technologies. Where possible and appropriate, network (transport and signalling) technology transparency is a goal.

2) *Security*

Independent of benchmark services and/or service features, security aspects between users and the network, and between physical entities within the network, are taken into account where appropriate.

5 Overview of IN CS-4 Recommendations

Table 1 contains an overview of the Recommendations that are specifically related to IN CS-4. It was decided not to update the Recommendation of the Service Plane, Global Functional Plane and Physical Plane for IN CS-4. Where appropriate, the existing CS-2/CS-3 Recommendations ITU-T Q.1222, Q.1223 Q.1224, Q.1225, Q.1231, Q.1236, Q.1237 and Q.1238 can be taken as a reference.

Table 1/Q.1241 – IN CS-4 Recommendations

ITU-T Rec.	Title
Q.1240	Intelligent Network Capability Set 4 Recommendation Structure
Q.1241	Introduction to Intelligent Network Capability Set 4
Q.1244	Distributed Functional Plane for Capability Set 4.
Q.1248	Intelligent Network Interface Specifications for Capability Set 4
Q.1231	Introduction to Intelligent Network Capability Set 3
Q.1236	Intelligent Network Management requirements for Capability Set 3
Q.1237	Extensions to Intelligent Network Capability Set 3 in support of B-ISDN
Q.1238	Intelligent Network Interface Specifications for Capability Set 3
Q.1222	Service Plane for Intelligent Network Capability Set 2
Q.1223	Global Functional Plane for Intelligent Network Capability Set 2
Q.1224	Intelligent Network Distributed functional plane for Capability Set 2
Q.1225	Physical Plane for Intelligent Network Capability Set 2
Q.1290	Glossary of Terms Used in the Definition of Intelligent Networks

6 Service Features and Network Capabilities

This clause contains lists of the IN CS-4 service features and network capabilities, which, in addition to IN CS-2 related service features, can be used to identify and verify the service-independent capabilities of IN CS-4. These lists were used to develop the current ITU-T Q.124x series of Recommendations and were intended for this purpose only. They, however, provide an overview of the capabilities offered by IN CS-4 and can, in combination with information provided on how network capabilities can be realised with the developed protocol, offer guidance for platform and service designers.

6.1 Definitions

Below, the definitions for Service Feature and Network Capability as used throughout ITU-T Q.124x series of Recommendations are given. The definition of Service Feature deviates slightly from definitions used in earlier Capability Sets, and as stated in ITU-T Q.1290. The difference is that it is acknowledged that for requirement capture not only the capabilities from the perspective of service end-users are relevant, but capabilities from all users of the Intelligent Network, including for example network operators or network service providers.

6.1.1 service feature: A short textual description, describing a capability from the user perspective (e.g. end users should be able to leave a message for the called party, if the called party does not answer the phone). Although the level of detail may vary a lot, still the user perspective should be considered. Note that the user can be an end-user, the service subscriber, and the network operator.

6.1.2 network capability: A short textual description, describing a capability from the network perspective (e.g. the ability of the network to connect an announcement machine to a call and a running service session). Although the level of detail may vary a lot, still the network perspective should be considered.

Service features and network capabilities are listed in tables in the following clauses. The correlation's between them, that is, Network Capabilities required to realise a Service Feature, and Service Features that make use of a Network Capability, are presented in the tables as well.

6.2 Service Features IN CS-4

In this clause the Service Features for IN CS-4 are listed. The column 'Uses NC' indicates the Network Capabilities identified to realise the Service Feature in question. The 'Tag' is used elsewhere in the Recommendation text to refer to a particular Service Feature.

Service Features IN CS-4		
Tag	**Name & Description**	**Uses NC**
	BASIC FEATURES	
SCUGC	Service Logic Programs are able to influence the execution of CUG services. One of the fundamental features of the Virtual Private Network is a Private Numbering Plan.	CUGC
RTTM	Real-time Traffic Management at the SSP by dynamically arming DP4 (Route Select Failure) through a non-call related operation. The proposed method requires the SCP to send a non-call-related operation MonitorRouteRequest (new) in which the SCP specifies the route/route list to be monitored. This operation will have parameters which can request the SSP (Service Switching Point) to either inform the SCP of the number failed calls over the specified route(s), within a specified interval during a particular time of day, or to inform the SCP when a high watermark of failures has been reached at the SSP. This is done by the SCP requesting the SSP to dynamically arm DP4 (routeSelectFailure) for a particular set of route/routeList and incrementing a counter whenever calls over the specified route hits this particular DP. The filtering criteria can now be based on the number of failed calls in the specified duration. The SCP can have service logic to calculate the number of calls that should go through and the number of calls, which need to be gapped/filtered.	
	PERSONAL AND TERMINAL MOBILITY SUPPORT	
SLAMS	Support for Local Advertising towards IMT-2000 Mobile SubscribersWhen the mobile subscriber registers, some advertising may be displayed in order to give him some local information, e.g. weather forecast. It depends on the service elements the user has subscribed to.	INNUM INNAD
	INTERWORKING BETWEEN IN AND IP NETWORKS	
EUSDC	End User Service Data Customization via an IP network. A service end-user can customise his/her service data, service via an IP network. NOTE – This feature may be supported in PINT over a Secure Socket Layer.	
RTCBI	Request-to-Call-Back IP A user is able to initiate a telephone call by clicking a button during a Web session. The call can be first set up in the direction of the requester of the call, or first be set up in the direction of the party the requester wants to be connected to. E.164 addressing for both A-party and B-party is assumed, and one or both parties have a VoiceOverIP service. A VoiceOverIP user might be a mobile user as well. Possible reasons for failures are A-party busy, A-party no answer, B-party busy, B-party no answer. No detailed notifications are reported back to the requester. An example of an application of this feature would be on-line shopping: A user is browsing through an on-line catalogue, and clicks a button thus inviting a call from a sales representative. In IN the request could be handled depending on availability of agent, time of day, etc.	

Service Features IN CS-4		
Tag	**Name & Description**	**Uses NC**
RQTCI	Request-to-Call IP A user is able to initiate a telephone call by clicking a button during a Web session. The requested call is to be set up between two parties identified by E.164 addresses, where one or both parties have a VoiceOverIP service. A VoiceOverIP user might be a mobile user as well. The requester him/herself may or may not take part in the call to be set up. Possible reasons for failures are A-party busy, A-party no answer, B-party busy, B-party no answer. No detailed notifications are reported back to the requester.	
ICWTG	Internet Call Waiting A user is notified of incoming calls during a Web session and, by clicking a button is able to instruct the network on how this call shall be further processed. For example the call may be rejected, forwarded to a voice mail system, accepted with or without interruption of the Web session (in case of acceptance without Web session interruption VoiceOverIP is assumed). A sub-set of this feature would be just to keep a log of the times a user receives calls during an Internet session.	
WCPCS	Web Controlled PSTN/IP Conferencing Service Basic Web controlled PSTN/IP conference call, initiation of conference call, adding parties, etc.	
IPGWS	IP Gateway Selection A service involving a CSN connection to a gateway to an IP network is provided, making use of a network setup with several gateways towards the IPdomain. An IN service is used to decide on which physical gateway to use, based among other things on the availability of the gateway, or on its load. This scenario is applicable for so-called Internet Access Servers as well as Voice over IP gateways.	
ADDTRANS	The following are service features and requirements related to address translation: • Registration of previously registered IP addresses of the communicating end systems within IN infrastructure. • Registration of mnemonic addresses (e.g. Names) of the communicating end systems infrastructure. • Optionally, it should be possible to disseminate the registered information to where it is needed, and collect registered information from other service providers vital for address translation on a global basis. • It should be possible for the network to support the following as part of address translation: – Time-of-day translation; – 1-to-N address translation; – N-to-1 address translation; • It shall be possible for the network to allow terminals to register the following: – Terminal characteristics (e.g. Video/Audio Coder characteristics); – QoS related parameters; – Different levels of security, and – Authentication.	

Service Features IN CS-4		
Tag	**Name & Description**	**Uses NC**
MDATARATES	The following data rates should be supported under INAP control: • Low bit rate data; • Medium bit rate data; • High bit rate data; • High quality audio; • Low bandwidth video; • High bandwidth video.	
	INTERWOKING WITH PRIVATE NETWORKS	
HCRPN	Holding a Call on Request of a Private Network An SCP inquires of a PN how to handle the IN-access-call (e.g. free-phone call). The PN decides that the call should be temporally held according to the situation specific to that PN (e.g. operators are all busy). The PN requests the SCP to route that call to be held in a specified announcement device. Afterward, the PN requests the SCP to quit holding and resume processing according to the situation (e.g. an operator has become available).	
CIRPN	Call Initiation on Request of a Private Network Based on the instruction of an entity residing in a PN, the PN requests the SCP to initiate a call from the public switched network. The SCP let the PN subscriber line be connected to the requested destination.	

6.3 Network Capabilities IN CS-4

In this clause the Network Capabilities for IN CS-4 are listed. The column "Used by SF/BS" indicates for the realisation of which Service Features and Benchmark Services the Network Capability in question is needed. The 'tag' is used elsewhere in the recommendation text to refer to a particular Network Capability.

Tag	Name & Description	Used by SF/BS
	BASIC FEATURES	
SIMOP	Service Interaction Management over platforms Subscriber features and services may be provided off several physical platforms (for example in Mobile Networks HLR and SCP). The Service Interaction Managers (SIM's) in the service platforms should be able to manage features within their own platform, and coordinate interactions with features on other platforms.	
ISNCN	Inter SCP Network Capability Negotiation Distributed Service Control Function. An SCP in Network A shall be capable to interrogate another SCP, possibly in Network B, on a given network capability. This capability shall be bi-directional.	
CPHSR	Service Logic Programs are able to control the impact of CPH operations on the signalling relationship. This reflects the potential extension of the INAP operations in a light of new and complex service requests.	

Tag	Name & Description	Used by SF/BS
CUGC	Service Logic Programs are able to influence the execution of CUG services. The ability to translate the PNP, for example into the E.164 number in the numbering domain that the service is to be provided.	SCUGC
CHECT	Service Logic Programs are able to control the execution of Call Hold and Explicit Call Transfer ISDN supplementary services. INAP and the IN Call models have been enhance to control the complex combination of features and their interactions.	
SBCG	Service Logic Programs are able to influence switch-based call gapping mechanisms, based on E.410 destination.	
SCPGC	Use of the SCP address as GapCriteria in INAP transactions gapping: e.g. Televoting, Overload Control, Emergency Recovery are examples of service usage.	
	INTERWORKING BETWEEN IN AND IP NETWORKS	
SFIPA	Support for IP Addressing IP addressing shall be supported in the operations relevant for IN number translation requests.	undefined
	COOPERATION BETWEEN NETWORKS	
NRTC	Network Request for Temporary Connection Capability for an IAF (e.g. SCF residing in a PN) to request SCF residing in the public switched network to establish a temporary connection and to provide announcements from the SRF.	HCRPN
NNCA	Network Notification of Completion of Announcements Capability for an IAF (e.g. SCF residing in a PN) to request SCF residing in the public switched network to notify the completion of requested announcements in case the IAF requires it.	HCRPN
NRCT	Private Network Request to Connect Through Capability for an IAF (SCF residing in a PN) to request SCF residing in the public switched network to quit providing announcements and to disconnect the temporary connection with the SRF.	HCRPN
NRIC	Private Network Request to Initiate Call Capability for an IAF (SCF residing in a PN) to request SCF residing in the public switched network to create a two-party connection by sending both parties' addresses.	CIRPN

7 Distributed functional model for IN CS-4

7.1 Explanation of diagram

Figure 1 identifies the IN DFP model for IN CS-4. This diagram depicts the functional entities and relationships applicable to IN CS-4. This diagram is a subset of the generic IN DFP model described in clause 2/Q.1204. A general explanation of functional entities, relationships, and the diagram are contained in 2.1/Q.1204.

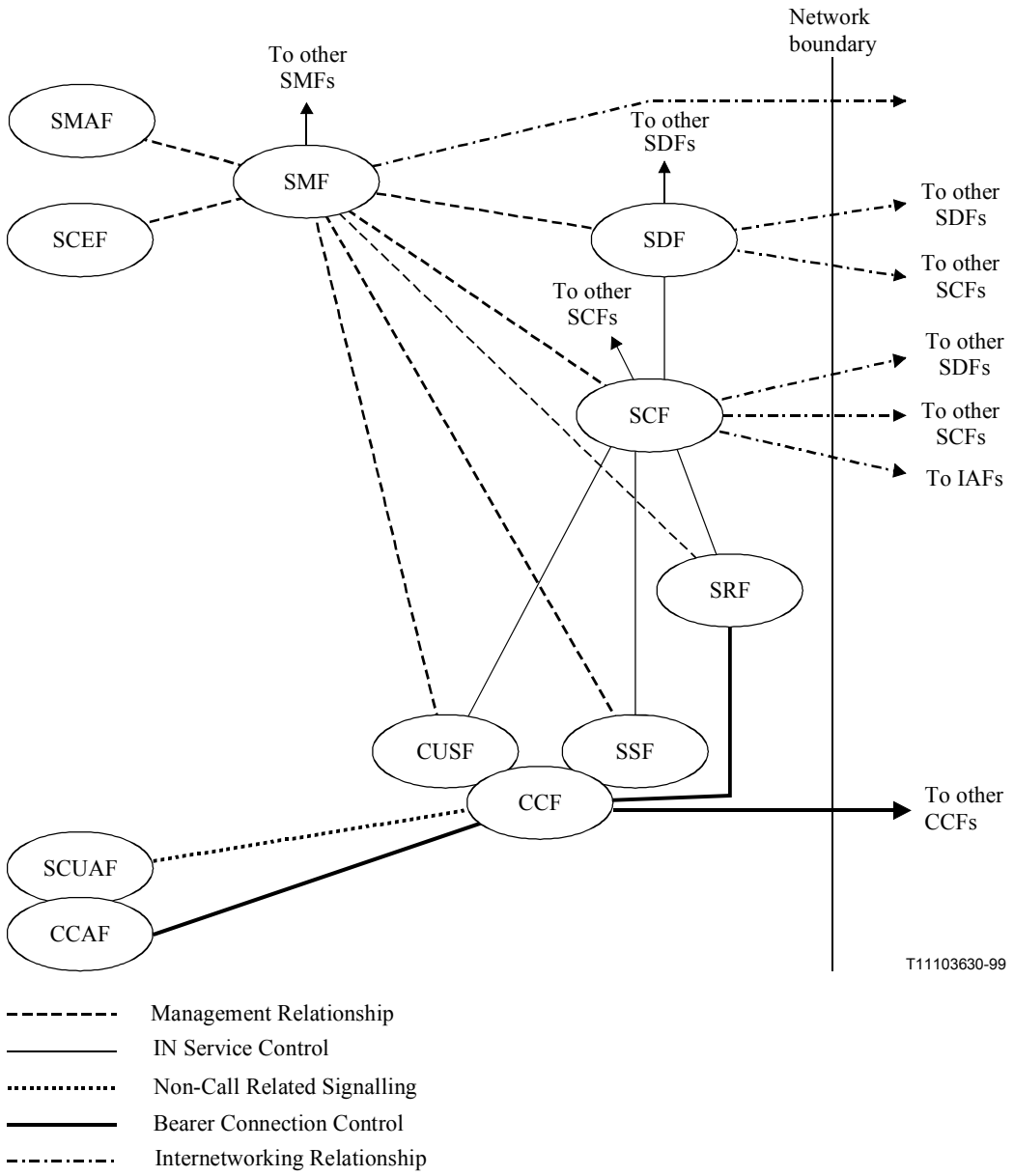

Figure 1/Q.1241 – IN CS-4 DFP Architecture

7.2 IN functional model

As stated earlier, the IN DFP for IN CS-4 is a subset of the general IN DFP. In particular:

– only the CCAF, CCF, SSF, SCF, SDF, SRF and SMS functional entities are included;

– SMS-SCEF and SMS-SMAF relationships are not addressed.

7.3 Definition of functional entities related to IN service execution

7.3.1 CCA function (CCAF)

The CCAF is the call control agent (CCA) function that provides access for users. It is the interface between user and network call control functions. It:

a) provides for user access, interacting with the user to establish, maintain, modify and release, as required, a call or instance of service;

b) accesses the service-providing capabilities of the call control function (CCF), using service requests (e.g. set-up, transfer, hold, etc.) for the establishment, manipulation and release of a call or instance of service;

c) receives indications relating to the call or service from the CCF and relays them to the user as required;

d) maintains call/service state information as perceived by this functional entity;

e) interfaces to the SCUAF for call-unrelated service if needed.

7.3.2 CC function (CCF)

The CCF is the call control (CC) function in the network that provides call/service processing and control. It:

a) establishes, manipulates and releases call/connection as "requested" by the CCAF;

b) provides the capability to associate and relate CCAF functional entities that are involved in a particular call and/or connection instance (that may be due to SSF requests);

c) manages the relationship between CCAF functional entities involved in a call (e.g. supervises the overall perspective of the call and/or connection instance);

d) provides trigger mechanisms to access IN functionality (e.g. passes events to the SSF);

e) manages basic call resource data (e.g. call references).

7.3.3 SS function (SSF)

The SSF is the service switching (SS) function, which, associated with the CCF, provides the set of functions required for interaction between the CCF and a service control function (SCF), and associated with the NCSF for the call-unrelated service handling if necessary. It:

a) extends the logic of the CCF to include recognition of service control triggers and to interact with the SCF;

b) manages signalling between the CCF and the SCF;

c) modifies call/connection processing functions (in the CCF) as required to process requests for IN provided service usage under the control of the SCF;

d) interfaces to the CUSF for handling call-unrelated interactions;

e) supports the relay case, in which it ensures the relay of information between the SCF and SRF possibly using the Out Channel Call Related User Interaction (OCCRUI) capabilities.

7.3.4 SC function (SCF)

The SCF is a function that commands call control functions in the processing of IN provided and/or custom service requests. The SCF may interact with other functional entities to access additional logic or to obtain information (service or user data) required to process a call/service logic instance. It:

a) interfaces and interacts with Service Switching Function/Call Control Function (SSF/CCF), Specialized Resource Function (SRF), Service Data Function (SDF), other Service Control Functions (SCF), and Call Unrelated Service Function (CUSF) functional entities;

b) contains the logic and processing capability required to handle IN provided service attempts, both related to a call and not related to a call;

c) interfaces and interacts with other SCFs in a secured fashion for distributed service control and unsolicited service notifications. As a consequence of distributed service control, the result of service logic execution is transferred between two SCFs;

d) interfaces and interacts with SDF's for secured data acquisition and manipulation of data;

e) provides a point of interconnection to the network for the purpose of internetworking, effectively hiding the specific structure of the network;

f) interfaces and interacts with SRF for call-related interactions by indicating to the SRF the User Interaction script to be run, by providing to the SRF the additional information it requests during the User Interaction script execution and by waiting for the end of the User Interaction script execution;

g) interfaces and interacts with SRF for call-unrelated interactions by monitoring the availability of resources at the SRF, requesting control of some SRF resources outside the context of a call;

h) provides security mechanisms, for the purposes of internetworking, to enable secured information transfer across the boundary between networks.

7.3.5 SD function (SDF)

The SDF contains customer and network data for real-time access by the SCF in the execution of an IN provided service. For example, the SDF may store both user and terminal related data. It:

a) interfaces and interacts with SCFs for secured manipulation and acquisition of data through simple database requests of data management scripts;

b) interfaces and interacts with other SDFs as required, enabling the hiding of data location in the network. This knowledge can be used for data distribution transparency (e.g. to the SCF);

c) provides security mechanisms, for the purposes of internetworking, to enable secured information transfer across the boundary between networks;

d) interfaces and interacts with other SDFs enabling copying of data together with the access rights to the data;

e) provides authentication and access control facilities for providing secure access to service data;

f) facilitates the cooperation of traffic management to prevent or solve congestion situation in data acquisition;

g) provides data support for security services. This data support can be used by the SDF itself for secured data management;

h) facilitates the cooperation of a robust recovery mechanism for copying of data (e.g. in the case the SDF is unavailable);

i) provides data access scripts (methods) which may be invoked by the SCF in order to simplify the information transfer via the SCF-SDF interface. Such kind of data access scripts do provide simplified data manipulation on an entry. The SCF continues to provide service specific processing logic and command call control functions in the SSF.

NOTE – The SDF contains data relating to the provision or operation of IN provided services. Thus it does not necessarily encompass data provided by third party such as credit information, but may provide access to this data.

7.3.6 SR function (SRF)

The SRF provides the specialized resources required for the execution of IN provided services (e.g. digit receivers, announcements, conference bridges, etc.). It:

a) interfaces and interacts with SCF and SSF (and with the CCF);

b) may contain the logic and processing capability to receive/send and convert information received from users;

c) may contain functionality similar to the CCF to manage bearer connections to the specialized resources.

7.3.6.1 SRF Automatic Speech Recognition (ASR)

The ASR resource allows the IN services user to input commands and data in his/her own voice. ASR can be both speaker-independent and speaker-dependent. In case of speaker-dependent ASR, a mechanism should be provided which enables the user to directly manage his/her voice templates used for recognizing commands and data: such a mechanism should allow the user to review, update, delete and insert both:

– the voice templates; and

– the correspondences between the templates and the SRF internal format of the recognized voice (e.g. between a voice input name and the corresponding string of ASCII characters).

This mechanism could be either controlled by the SCF or directly performed by the SRF with no intervention by the SCF. In the latter case, the SRF would inform the SCF of the result of the operation, should this have been requested by the SCF. The basic ASR resource should provide for the recognition of isolated words (i.e. the ten digits and a number of basic commands such as "yes" and "no" spoken at least in the local network provider language) in a speaker-independent manner over the PSTN.

Considering that multilingual ASR could also be useful, it is recognized that the SRF should handle the indication of the requested language to be used for voice inputs, in the same way as announcement generation described above.

7.3.6.2 SRF Text-to-Speech

The SRF can have a Text-to-Speech (TTS) function. This functionality consists of two logical functions. The first function converts the input text in a phonetics-prosodic representation. The second function produces the synthesized voice signal, processing and connecting of voice elements.

7.3.7 IA function (IAF)

The Intelligent Access Function provides access between the SCF of an IN-structured network and an entity which is not an IN-structured network. This latter entity may be other networks or customers (private networks, simple databases used for instance in the CCR service, terminals and PABXs). It:

a) provides access to and from the SCF of the IN-structured network;

b) maps the information between the internal and external representation;

c) resides in the entity which is not an IN-structured network.

7.3.8 CUS function (CUSF)

The CUSF is the call-unrelated service (CUS) function which, associated with the CCF and the SSF, provides a set of call-unrelated service functions required for out-channel interaction with a SCUAF. It also provides the set of functions required for interaction between the SCUAF and a SCF. It:

a) establishes, manages and releases the relationship between the instance in the SCUAF and the network for the call-unrelated interaction between users and service processing;

b) recognizes a call-unrelated service control trigger and interacts with the SCF;

c) provides the trigger mechanisms for call-unrelated interaction to access IN functionality (e.g. manages call-unrelated interaction events and passes them to the SCF);

d) modifies call-unrelated interaction processing functions (in the CUSF) as required to process requests for IN provided service usage under the control of the SCF;

e) supports call-unrelated userinteraction which may be user initiated or SCF initiated.

7.3.9 SCUA function (SCUAF)

The SCUAF is the service control user agent (SCUA) function that provides access for users. It is the interface between a user and the Call Unrelated Service Function (CUSF). It:

a) provides for user access, interacting with the user to establish, maintain, and release, as required, an instance of call-unrelated service;

b) accesses the functions for call-unrelated interaction processing in the Call Unrelated Service Function (CUSF), and the service invocation capabilities of the CUSF, using service requests (e.g. location registration, attach. etc.) for the invocation of call-unrelated services;

c) receives indications relating to call-unrelated services from the CUSF and relays them to the user as required;

d) maintains service state information as perceived by this functional entity.

NOTE – Whether the SCUAF abstracts a new FE for call associate supplementary services is not defined in IN CS-2. Also, IN CS-2 does not define what relationship should be used to model call-related user interaction (the existing relationship between the CCAF and the CCF or an explicit relationship between some FEs).

7.3.10 SM function (SMF)

The SMF is the Service Management Function. This clause describes a number of IN SMF functionalities. These functions can be grouped into five categories:

1) Service Deployment Functions;

2) Service Provisioning Functions;

3) Service Operation Control Functions;

4) Billing Functions;

5) Service Monitoring Functions.

- Service Deployment Functions include:
  - *Service Scripts Allocation*

    This subfunction passes the service scripts and determines for which part of the network the service scripts are relevant and manages the relevant network elements.
  - *Service Generic Data Allocation*

    This subfunction passes the service generic data and determines for which part of the network the service generic data are relevant and manages the relevant network elements.
  - *Signalling Routing data Introduction and Allocation*

    This subfunction passes the signalling routing data and determines for which part of the network the signalling routing data is relevant and manages the relevant network elements. It downloads the signalling routing data into the SS7 network and determines the relevant SS7 network elements for allocation of the signalling routing data.
  - *Trigger Data Introduction and Allocation*

    This subfunction passes the trigger data and determines for which part of the network the trigger data is relevant and manages the relevant network elements. It downloads the trigger data into the PSTN.
  - *Specialized Resource Data Introduction and Allocation*

    This subfunction passes the specialized resource data and determines for which part of the network the specialized resource data are relevant and manages the relevant network elements.

– *Service Testing*

This subfunction collects the service software from the Service Creation Environment Function to be loaded into a stand-alone IN-network, in order to test the newly developed service. The function enters service and service subscriber specific data. It performs management related test operations.

- Service Provisioning Functions include:

– *Customer Specific Data Introduction and Allocation*

This subfunction collects service subscriber specific data and administrates that in subscriber databases and contract databases. The function translates the service and subscriber data into network specific data. This subfunction determines for which part of the network the data is relevant and manages the relevant network elements.

- Service Operation Control Functions include:

– *Service Maintenance*

Service Maintenance included the following functionality:

– *Software Maintenance*

Software maintenance consists of the modification of service logic (modification of service logic is a function of the SCEF). Introduction of modified script in the IN structured network is done in service deployment.

– *Updating Service Generic Data*

This subfunction passes the service generic data and determines for which part of the network the service generic data are relevant and manages the relevant network elements.

– *Updating Customer Specific Data*

This subfunction provides the control functions for service subscriber specific data and administration to those subscriber databases and contract databases. This subfunction determines for which part of the network the data is relevant and manages the relevant network elements.

– *Updating Signalling Routing Data*

This subfunction provides the control functions for the signalling routing data and determines for which part of the network signalling routing data is relevant and manages the relevant network elements. It downloads the signalling routing data into the SS7 network and determines the relevant SS7 network elements for allocation of the signalling routing data.

– *Updating Trigger Data*

This subfunction provides the control functions for the trigger data and determines for which part of the network the trigger data is relevant and manages the relevant network elements. It downloads the trigger data into the PSTN.

– *Updating Specialized Resource Data*

This subfunction provides the control functions for the specialized resource data and determines for which part of the network the specialized resource data are relevant and manages the relevant network elements.

– *Adjustment of the SMAF*

  The service subscriber/network operator interface to the SMF is provided by the SMAF. The interface to the service subscriber and network operator has to be accommodated to the adjustments in their data. For instance, a service subscriber who has changed peripheral-type (customer specific data: DTMF-telephone to VTX-terminal). This change of peripheral also may cause a change of menu options.

– *Service Reconfiguration*

  This activity consists of the re-allocation of service scripts, service generic data and customer specific data. For instance, the reason for service reconfiguration could be a change in the network configuration or improvement of the performance of services.

– *Service (de)activation*

  This activity gives the network operator the possibility to (de)activate (part of) a service temporarily. For instance, for maintenance purposes a televoting service which is only used on set times.

– *Service dismantlement*

  A service will be taken out of operation.

– *Security*

  In the SMF, two types of security can be distinguished: access control and data control. Access control covers the identification, authentication and authorization (command control) of both service subscriber and network operator. Data control covers the control of the input of data by both the service subscriber and the network operator.

• Billing Functions include:

– *Generating and Storing Charging Records*

  This subfunction monitors the service usage. This function logs the call records.

– *Collecting Charging Records*

  This subfunction collects the call records and the management detail records. Then it uniforms and correlates them. This function logs the call records.

– *Modification of Tariffs*

  This subfunction determines the tariff structure and the tariff for a newly developed service or changes them for an existing one.

• Service monitoring includes:

– *Initiating Measurements and Collecting Measurement Data*

  This subfunction monitors the service usage and service performance. It also monitors network performance. Therefore, it needs measurement results from the underlying parts: the SS7 management function and Network management function.

– *Analysis and Reporting of Measurement Data*

  This subfunction analyses the service usage and service performance. It also analyses the results of the initiation and collection measurement data function.

– *Receive information from fault monitoring data*

  This subfunction acts upon the receipt of fault monitoring data from Network elements. Implications and impact on Service performance will be computed and the appropriate action taken.

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