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SERIES Q: SWITCHING AND SIGNALLING

Intelligent Network

Introduction to Intelligent Network Capability Set 3

ITU-T Recommendation Q.1231

(Formerly CCITT Recommendation)

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ITU-T Recommendation Q.1231

Introduction to Intelligent Network Capability Set 3

Summary

Intelligent Network Capability Set 3 (IN CS-3) is the third standardized stage of the Intelligent Network (IN) as an architectural concept for the creation and provision of services, including telecommunication services, service management services and service creation services. This Recommendation gives an introduction to IN CS-3. It describes the main characteristics and overall capabilities of IN CS-3 and defines the service aspects, network aspects and functional relationships that form the basis of the IN CS-3 capabilities.

This Recommendation is the first in the Q.123x-series Recommendations devoted to IN CS-3, which builds on the architectural principles of IN as described in the Q.121x- and the Q.122x-series Recommendations.

The IN CS-3 Recommendations form a detailed and stable basis for implementing IN CS-3 telecommunication services. They also provide high level guidelines for supporting service management services, service creation services and some partially supported telecommunication services. The IN CS-3 Recommendations are intended to give the same degree of technical information as the IN CS-2 Recommendations (1997).

Source

ITU-T Recommendation Q.1231 was prepared by ITU-T Study Group 11 (1997-2000) and approved under the WTSC Resolution 1 procedure on 3 December 1999.

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 Conference (WTSC), 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 WTSC 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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Introduction to Intelligent Network Capability Set 3

1 Scope

Intelligent Network Capability Set 3 (IN CS-3) is the third standardized stage of the Intelligent Network (IN) as an architectural concept for the creation and provision of network services, including telecommunication services, service management services and service creation services. This Recommendation gives an introduction to IN CS-3. It describes the main characteristics and overall capabilities of IN CS-3 and defines the service aspects, network aspects, management aspects and functional relationships that form the basis for the IN CS-3 capabilities.

2 Phased standardization

The phased approach of IN Capability Sets has been described in ITU-T Recommendation Q.1201. IN CS-3 extends the service aspects, network aspects and management aspects of IN CS-2 as specified in the Q.122x-series Recommendations. Definition of IN CS-2 service features may be found in Recommendation Q.1221.

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; all 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.

- ITU-T Recommendation Q.1210 (1995), *Q.1210-series intelligent network Recommendation structure*.
- ITU-T Recommendation Q.1211 (1993), *Introduction to intelligent network capability set 1*.
- ITU-T Recommendation Q.1213 (1995), *Global functional plane for intelligent network CS-1*.
- ITU-T Recommendation Q.1214 (1995), *Distributed functional plane for intelligent network CS-1*.
- ITU-T Recommendation Q.1215 (1995), *Physical plane for intelligent network CS-1*.
- ITU-T Recommendation Q.1218 (1995), *Interface Recommendation for intelligent network CS-1*.
- ITU-T Recommendation Q.1220 (1997), *Q.1220-series intelligent network Capability Set 2 Recommendation structure*.
- ITU-T Recommendation Q.1221 (1997), *Introduction to intelligent network Capability Set 2*.
- ITU-T Recommendation Q.1222 (1997), *Service plane for intelligent network Capability Set 2*.

– ITU-T Recommendation Q.1223 (1997), *Global functional plane for intelligent network Capability Set 2*.

– ITU-T Recommendation Q.1224 (1997), *Distributed functional plane for intelligent network Capability Set 2*.

– ITU-T Recommendation Q.1225 (1997), *Physical plane for intelligent network Capability Set 2*.

– ITU-T Recommendation Q.1228 (1997), *Interface Recommendation for intelligent network Capability Set 2*.

– ITU-T Recommendation Q.1236 (1999), *Intelligent Network Capability Set 3 – Management information model requirements and methodology*.

– ITU-T Recommendation Q.1290 (1998), *Glossary of terms used in the definition of intelligent networks*.

4 General description and scope of IN CS-3

4.1 Criteria for IN CS-3

IN CS-3 defines a set of IN capabilities that meet the following general criteria:

- IN CS-3 is a subset of the target Intelligent Networks architecture;
- IN CS-3 is a superset of IN CS-2, as defined in the IN CS-2 Recommendations;
- IN CS-3 is a set of definitions of capabilities that is help to both manufacturers and network service providers/operators; and
- IN CS-3 provides network capabilities defined to support the set of IN CS-3 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 subclauses outline the work items defined for IN CS-3.

4.2 Basic features

1) *Evolution of IN CS-2*

   Enhancement of the existing CS-2 features.

2) *Multiple points of control*

   Multiple service logic programs are allowed to act on the same (half) call, which implies re-triggering in the same SSF. The involved service logic programs act independently from each other (same behaviour as if the service logic programs 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).

3) *Feature interaction*

   For multiple points of control, but also for subsequently invoked features/services, feature interactions might occur, preferably in a controlled manner.

4) *IN-ISDN interworking, including supplementary services*

5) *Number Portability*

   Enabling Number Portability using IN, impact of Number Portability on IN services.

6) *CUSF Enhancements*

The CUSF-SCF interface is enhanced in order to support user-to-service information (USI) exchange and to allow interworking of an IN service logic programs with a switch based supplementary service, e.g. CCBS. In addition, location of the CUSF at the transit level is supported.

4.3 IN support for mobility

1) IN support for enhanced services in narrow-band mobile networks.
2) IN support for enhanced services in broadband mobile networks, with the limitations as set in the Broadband section.
3) IN support for enhanced services for UPT users in narrow-band wireline and wireless networks.
4) IN support for enhanced services for UPT users in broadband wireline or wireless networks, with the limitation as set in the Broadband section.

4.4 IN support for B-ISDN

IN CS-3 provides initial requirements and support for Broadband ISDN. Given the short time-frame available for IN CS-3, no significant changes on the IN call models have been made. This implies that only a limited set of B-ISDN network capabilities are supported.

Within this constraint, the following benchmark services and service features for Broadband are supported:

1) *Broadband (BB) conversational*

Bidirectional communication with real-time end-to-end information transfer from user to user or between user and host (e.g. data processing). The flow of the user information may be bidirectional symmetric, bidirectional asymmetric, or unidirectional.

Examples of Broadband Video Conference Service, Video Surveillance, Video Telephony:

- only point-to-point connections are supported (Connection Type 1).

2) *Broadband retrieval*

Provides the user with the means to retrieve information stored in information centres provided for public use. An example is Video-on-Demand

- only point-to-point connections are supported (Connection Type 1).

4.5 IN and IP networks

Some aspects of interworking between IP network services/applications and Intelligent Network services/features are addressed in IN CS-3:

– IN support for telecommunication services initiated from an IP network (with the restriction that the services are not content related).

4.6 General aspects

1) *Network technology transparency*

The target IN is considered an overlay service network common to all network technologies. Where possible and appropriate, network technology transparency is strived for.

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.

3) *Flow control*

Independent of benchmark services and/or service features, flow control between physical entities within the network is taken into account where appropriate.

5 Overview of IN CS-3 Recommendations

Table 1 contains an overview of the Recommendations that are specifically related to IN CS-3. It was decided not to update the Recommendation of the Service Plane, Global Functional Plane and Physical Plane for IN CS-3. Where appropriate, the existing CS-2 Recommendations Q.1222, Q.1223 and Q.1225 can be taken as a reference. The contents of IN CS-2 Recommendation Q.1224 was partitioned into Q.1231 (functional architecture aspects) and Q.1238 (call modelling aspects, SDLs, etc.).

Table 1/Q.1231 – IN CS-3 related Recommendations

Rec.	Title
Q.1231	Introduction to Intelligent Network Capability Set 3
Q.1236	Intelligent Network Capability Set 3 – Management Information Model Requirements and Methodology
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.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 the lists of the IN CS-3 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-3. These lists were used to develop the current Q.123x-series Recommendations and were intended for this purpose only. However, the lists provide an overview of the capabilities offered by IN CS-3, and can, in combination with information provided on how network capabilities can be realized with the developed protocol, offer guidance for platform and service designers.

6.1 Definitions

The definition for Service Feature and Network Capability, as used throughout Q.123x-series Recommendations, is given below. The definition of Service Feature deviates slightly from definitions used in earlier Capability Sets, and as stated in Q.1290. Service Feature descriptions may apply not only to service end-users, but to all users of IN, 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). Note that the user can be an end-user, the service subscriber, 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 to a call).

Service features and network capabilities are listed in tables in the following subclauses.

6.2 Service Features IN CS-3

In this subclause the Service Features for IN CS-3 are listed. The column "Uses NC" indicates the Network Capabilities identified to realize the Service Feature in question. The "Tag" is used elsewhere in this Recommendation to refer to a particular Service Feature.

Service Features IN CS-3		
Tag	**Name and description**	**Uses NC**
	Basic features	
CCBSS	CCBS support Call Completion to Busy Subscriber support by IN functionality to enable for example CCBS in combination with call-related IN number translation services/features like Number Portability, Personal Number. These IN services can be invoked either at local exchange level or at transit exchange level.	ASESP
CICME	Correlation of Call Detail Record (CDR) Information from Multiple Entities. It shall be possible for a network or service provider to collect CDR information from different physical entities in the network involved in the same call, and be able to correlate the information in the billing systems.	CRCDR
CSHND	Carrier Selection Handling For IN initiated calls and terminal initiated calls that are handled in IN it shall be possible to have control over carrier selection. This can be done on a per-call basis or by subscription or default. NOTE 1 – This is an extension of an IN CS-2 capability.	CAIDT
ICLPR	IN Calling Line presentation restriction It should be possible for an IN service subscriber to offer the IN number as COLP number, but restrict presentation of the number.	
INSIN	Inter-Network Service Indicator Permits the receiving network, in an inter-network call, to receive from the originating network, an indication of the service used in the received call. NOTE 2 – The content of the Service Indicator is not specified, which means that the mechanism requires mutual agreements, or can be deployed within a domain.	IEBSL
LASUI	Language Selection for User Interaction Based on e.g. subscriber preferences, user interaction towards a subscriber can be performed in a certain language. If the preferred language is not available, user interaction will fallback to a default language.	
LRORI	Line Restrictions Override Switch-based line restrictions are implemented in almost all networks. Presently a violation of line restrictions is modelled as an error which leads to the PIC O_exception. It should be possible to allow a per-call basis overriding of these restrictions after entering a password.	
MEDUI	Menu driven user interaction Display of information by the user's terminal, with the possibility to perform menu driven user interaction. Service to user information is presented graphically, while the user communicates towards the service via the dial-pad.	SDSSI

Service Features IN CS-3		
Tag	**Name and description**	**Uses NC**
MDDUI	Modem Detection During User Interaction When performing prompt and collect user information, e.g. when offering a random call service via IN (using network initiated call followed by connection to a SRF), one of the possible error conditions from service perspective is that the dialled number is connected to an analogue fax or other modem. The SRF detects this, and informs service logic that a modem was encountered.	
SCONP	Screening Service with an Open Numbering Plan A screening service can be provided in an open numbering plan environment, that is, a numbering plan with variable number length. This implies that the SCF cannot always know how many digits are to be expected still.	SCLDR
SIMUI	Simultaneous User Interaction When party A calls party B, party A can initially hear, for example, a Ring Back Tone from party B's local exchange. As soon as party B answers, an announcement is played immediately to both party A and B. These announcements are not necessarily the same.	CISRF
TADIS	Time announcement and disconnect The user receives an announcement that he will be disconnected after a certain period, and is subsequently disconnected after that period. This could for example be used in combination with prepaid charging method, where this feature is activated on credit limit expiry.	TIMED
TRCFC	Triggering on Call Failure Condition If a Call Failure condition is detected early by a service logic in a certain node (e.g. by user profile consultation, rather than late through an ISUP Release message), it should be possible to use this as a trigger for services located in a different node.	
VPNNI	VPN Node Interface Private networks (e.g. PBXs) can exchange VPN information (PSS1) via the signalling in the public network (via the Application Protocol transport Mechanism of ISUP). Service providers shall be able to monitor and control the use of this capability. The public network can terminate the VPN PINX context, and provide outgoing gateway PINX functionality depending on the functionality supported by (or required to reach) the called party, or depending on e.g. subscriptions.	VPNNO VPNCO

Service Features IN CS-3		
Tag	**Name and description**	**Uses NC**
	Interworking between IN and IP networks	
RTCBC	Request-to-Call-Back CSN 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 both parties are assumed to be connected to the Switched Circuit Network. 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.	IN CS-2
RQTCC	Request-to-Call CSN 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, which are connected to the Switched Circuit Network. 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.	IN CS-2
	Personal and terminal mobility support	
SCREG	UPT registration with smart card A UPT user can register with the telecommunications network by using a smart card.	NCRUS
UOCWR	UPT Originating Call without registration A UPT user registers him/herself from a certain terminal, and can from then on make UPT calls without explicit per-call identification. In the meantime other users can use the phone for their calls as well, without being identified as the UPT user.	USITR
USIDC	User Identity Confirmation Feature enabling a user to confirm its identity to a network. This confirmation can be requested by the network prior to service invocation, or in an early phase of the service offering, call related or call unrelated.	
NWIDC	Network Identity Confirmation Feature enabling a network to confirm its identity to a user. This shall be provided to the user in case of user registration in the case of a roaming user. It can also be provided prior to service invocation, or in an early phase of a service offering, call related or call unrelated.	

Service Features IN CS-3		
Tag	**Name and description**	**Uses NC**
NOREP	Non-Repudiation The capability of the network or service provider to provide a proof of use towards a user of his services and resources. Some capabilities are provided in present day systems, like storage of data including PIN codes in the SCF/SDF. More advanced mechanisms, e.g. using authentication/authorization tokens, are for further study in CS-4.	
CFNRC	Call Forwarding on Not Reachable Condition Enables a served user to have the network redirect calls which are addressed to the served user's directory number to another directory number, in case the served user is not reachable. The CFNRC IN service operates on all calls. After the CFNRC service has been activated, calls are forwarded only if the served user is not reachable via the dialled directory number, e.g. user's cordless terminal is not reachable. NOTE 3 – There is no explicit Network Capability for the support of this capability, it has been decided to use the BusyDP in the BCSM with a specific causeValue.	
	IN support for Broadband-ISDN	
PTPCO	Point-To-Point Communication (Connection Type 1) The possibility to set up either unidirectional or bidirectional point-to-point connections between two points involved in the call.	
	Number portability	
SPPGN	Service Provider Portability for geographical numbers Number Portability for geographic numbers enables subscribers/ customers/companies to retain their well-known directory numbers if they want to change service provider.	
SPPNG	Service Provider Portability for non-geographic numbers Number Portability for non-geographic numbers as nationwide freephone and premium rate services enables subscribers/customers/ companies to retain their valued freephone and premium access numbers if they want to change service provider. This fact becomes even more compulsory when applying equal access principles for the freephone and premium rate numbering space.	
LOCNP	Location Portability Location Portability enables subscribers to retain the same directory numbers when moving from one location to another. The degree to which this is supported is a business/regulatory issue rather than a technical one. As long as one changes location within the same charging domain, the same technical solution as for service provider portability for geographical numbers can be used. Otherwise Location Portability will not be possible.	

6.3 Network Capabilities IN CS-3

In this subclause, the Network Capabilities for IN CS-3 are listed. The column "Used by SF/BS" indicates for the realization of which Service Features and Benchmark Services the Network Capability in question is needed. The "tag" is used elsewhere in this Recommendation to refer to a particular Network Capability.

Network Capabilities IN CS-3		
Tag	**Name and description**	**Used by SF/BS**
	Basic features	
ASESP	ASE-Support IN connection establishment support for TC-based supplementary services of which the ASE is located in the CCF/CUSF. For e.g. CCBS this includes triggering on the same conditions as for related call attempt, and perform the same number translation service.	CCBSS
CAIDT	Carrier Identification Transfer When the network requests connection setup support from IN, and when IN requests the network to set up a call, it shall be possible to transfer some carrier identification information. This capability already exists in IN CS-2, but is an enhancement due to ISUP enhancements.	CSHND
CISRF	Call Initiation towards SRF It shall be possible to initiate a call towards a remote SRF, while passing the SCF_ID and Correlation_ID information in order for the SRF to report back to the SCF.	SIMUI
CRCDR	Call Reference for Call Detail Record The possibility to convey a unique call reference ID between the SCF and SSF, for both network and user initiated calls. The call reference shall be globally unique. This Call Reference shall appear in Call Detail Records produced by SSF and SCF.	CICME
GEOIS	Geodetic Information Support In ISUP a new parameter with detailed location information will be defined. The location information related to the calling party can be made available to the service logic. This information can be used for e.g. traffic situation report, pizza delivery, emergency calls.	
IEBSL	Information Exchange Between Service Logic Programs This capability enables the exchange of information between different Service Logic Programs which are subsequently invoked on the same call. The SLPs might be located in different SCPs, and might be invoked from different SSPs. The SLPs are not assumed to be aware of each other, but can send generic information in the forward or backward information, just in case that another SLP is active and capable of understanding the information. This may be used for interaction information (e.g. where call re-routing or call forwarding is prohibited) or charging information (e.g. where premium rate call invoked after credit card authorization).	

Network Capabilities IN CS-3		
Tag	**Name and description**	**Used by SF/BS**
ISSSI	Inter SCP Service to Service Information In case the SCF functionality is distributed, e.g. over different operator domains, two different SCPs shall be able to exchange Service to Service Information (SSI) within an established SCF-SCF relationship. The mechanism to exchange service specific data shall be bidirectional, flexible and generic.	ADVIN
IOCWI	Inhibition Of Call Waiting Indication The ability for a service logic to inhibit the invocation of the switch based call waiting service.	
LRLCV	Logical Referral plus Language Choice for Voice User Interaction For all voice user interaction it is possible to refer to the message in the SRF via a logical reference, and select the language via a separate parameter. This includes voice user interaction related to call gapping and filtering.	LASUI
MODDR	Modem Detection Request When requesting the SRF to perform a prompt and collect user interaction, the SCF requests the SRF to perform a check on the presence of a modem (e.g. analogue fax), and to stop user interaction and report back when this situation occurs.	MDDUI
MPCTR	Multiple points of control More than one service logic programs are allowed to act on the same (half) call (Retriggering in same SSP). The involved service logic programs act independently from each other (same behaviour as if the service logic programs 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).	

Network Capabilities IN CS-3		
Tag	**Name and description**	**Used by SF/BS**
MPCUI	Multiple points of control User Interaction An SCF shall be able to request an SSF to connect a resource (for User Interaction) on one leg of call already involved in another User Interaction. The SSF shall be able to either disconnect the bearer of the existing User Interaction and connect the bearer to the requested User Interaction or reject the request based on conditions previously established for the initial User Interaction. 1) When requesting user interaction, service logic programs shall be able to indicate whether the complete user interaction phase can be interrupted (by another user interaction request). 2) When requesting user interaction, service logic programs shall be able to indicate a request to interrupt ongoing user interactions. 3) In the case user interaction is interrupted, the interrupted service logic programs shall be notified. 4) In the case user interaction cannot be interrupted, the requesting service logic programs shall receive a reject. 5) A bearer connection shall be reconnected to the interrupted user interaction if the interrupting user interaction finishes before the interrupted user interaction. (This is for further study; if a service logic is notified of an interruption it might choose to stop the UI, rather than letting it continue.) User Interaction Handling shall follow the same rules for a single or multiple SSPs.	
NCRUS	Non-call-related USI Support for the transport of User to Service Information (USI), also for non-call related IN invocation.	SCREG
PNPIT	The call unrelated support for transfer of a number in a private numbering plan where such a number is used in the interaction between two public network services (e.g. CCBS, GVNS).	CCBSS
SCLDR	SCF Control Less Digits Received Allows the SCF to receive a report of collected digits, when complete called party number has been determined in the CCF/SSF and the SCF does not know the exact number of digits to be collected, e.g. due to an open Numbering Plan. The SCF requests the SSF for a certain number of additional digits, while indicating the SSF not to clear the call if a timeout occurs before the requested number of digits is received, but to give control over the callback to the SCF.	SCONP
SDSSI	INAP interworking with Server Display Script Services The SCF controls Server Display Script Services (SDSS) information exchange between the user terminal and the SDSS application. The SDSS protocol on the analogue interface (V23) is presently used to enhance the User Interface ergonomy of PSTN supplementary services located in the switch.	MEDUI

Network Capabilities IN CS-3		
Tag	**Name and description**	**Used by SF/BS**
TABDT	Terminal Alerting before data transmission Before sending data to a terminal, e.g. SDSS information, an alerting signal is sent to the terminal (and acknowledged). The role of this signal is to notify the terminal equipment that data transmission is expected, while avoiding unwanted bell tinkle.	MEDUI
TIMED	Timed Disconnect It shall be possible to instruct the SSF to release the call after an indicated amount of time.	TADIS
USITR	USIServiceIndicator as DP criterium It shall be possible to use a certain value of the USIServiceIndicator as one of the Trigger Detection Point criteria, for both call related and call unrelated service triggering.	UOCWR SCREG
VPNNO	VPN notification It shall be possible for an SSF to notify an SCF providing an IN VPN service that the use of the network capability to transport PSS1 signalling enhancements to basic call is present in the received call request message.	VPNNI
VPNCO	VPN control An SCF providing an IN VPN service shall be able to instruct the SSF to prohibit or allow the use of the network capability to transport PSS1 signalling enhancements to basic call. When this control is used, the VPN with the PSS1 APM is correctly terminated, and the SCF and SSF shall cooperate to provide outgoing gateway PINX functionality according to PSS1 information flows. If this control is not used Transit PINX is the default functionality.	VPNNI
	Personal and terminal mobility support	
DTDPA	Dynamic TriggerDetectionPoint activation/deactivation It shall be possible to activate/deactivate several existing TDPs in the SSF. Hence more than one TDP may exist at the same DP. It shall be possible to activate/deactivate these TDPs on a per-call basis.	ADVIN SPRMS
DTDPL	Dynamic TriggerDetectionPoint loading It shall be possible to create a new TDP in the SSF by downloading SSF triggering information associated with the newly created TDP. The TDP can either be active immediately, or require explicit activation later. In case of terminal mobility or user mobility this capability can be used to implement dynamic geographic placement of statically armed DPs.	ADVIN
SCPAT	SCP address transfer A requesting Functional Entity in the visited network shall be able to address the Home Networks SCP. Relevant in case of home based services.	VHE SPRMS
	Interworking between IN and broadband networks	
APTPC	Point-To-Point Connections Only simultaneous call and connection setup, bidirectional point-to-point connections are supported, multimedia communication shall be supported at call/connections setup.	PTPCO

Network Capabilities IN CS-3		
Tag	**Name and description**	**Used by SF/BS**
NIPTP	Network Initiated Point-to-Point Connection Establishment and release of point-to-point bidirectional connection via invocation of B-ISDN signalling.	PTPCO
ATMTC	ATM Traffic Capabilities Control For network initiated B-ISDN connections IN shall be able to control the Quality of Service at call setup. The presently defined QoS classes and associated parameters as specified in Recommendation I.356 shall be supported for the ATM Traffic Capabilities ATM Block Transfer (ABT), DBR, SBR and ABR, as defined in Recommendation I.371.	PTPCO
ATCNG	ATM Traffic Capabilities Notification The possibility to report to the SCF a notification of the traffic parameters for the indicated, modified and negotiated ATM Traffic Capabilities. The notification is only provided in InitialDP and connect message.	PTPCO
ASEAA	Support for AESA Addressing Apart from the native E.164 numbering, the non-E.164 ATM Service Endpoint Addressing as presently defined by ITU-T Study Group 2 shall be supported in the operations relevant for IN number translation requests.	PTPCO
ATMTR	SCF triggering from B-ISDN Signalling Trigger processing and parameter population rules appropriate for DSS2 and B-ISUP support shall be provided. There shall be only one control relationship to B-ISDN Signalling per half-call.	PTPCO
	Number portability	
NPTIES	Number Portability ISUP Enhancements Support For the support of Number Portability new ISUP parameters are defined, containing either Directory Number (DN) or Network Routing Number (NRN), depending on network choice. It shall be possible to perform a NP database query via INAP and to provide the appropriate Routing Number for a ported number via INAP to the SSF. The different possible ISUP signalling scenarios, i.e. using DN or NRN or concatenated option, shall be supported on INAP in a generic way.	SPPGN SPPNG LOCNP
NRNTR	Network Routing Number Trigger It shall be possible to trigger on the Network Routing Number and it shall be possible to make this parameter available to IN services, and/or change it by IN services. Note that a DN and the related NRN have to be considered as a pair, since the NRN is derived from the DN. In the case of value added IN services (e.g. Freephone) the IN service logic programs will change the dialled number; the NRN has then to be omitted. The NRN may be modified by IN service logic programs while maintaining the DN.	

7 Distributed functional model for IN CS-3

7.1 Explanation of diagram

Figure 6-1 identifies the IN DFP model for IN CS-3. This diagram depicts the functional entities and relationships applicable to IN CS-3. 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.

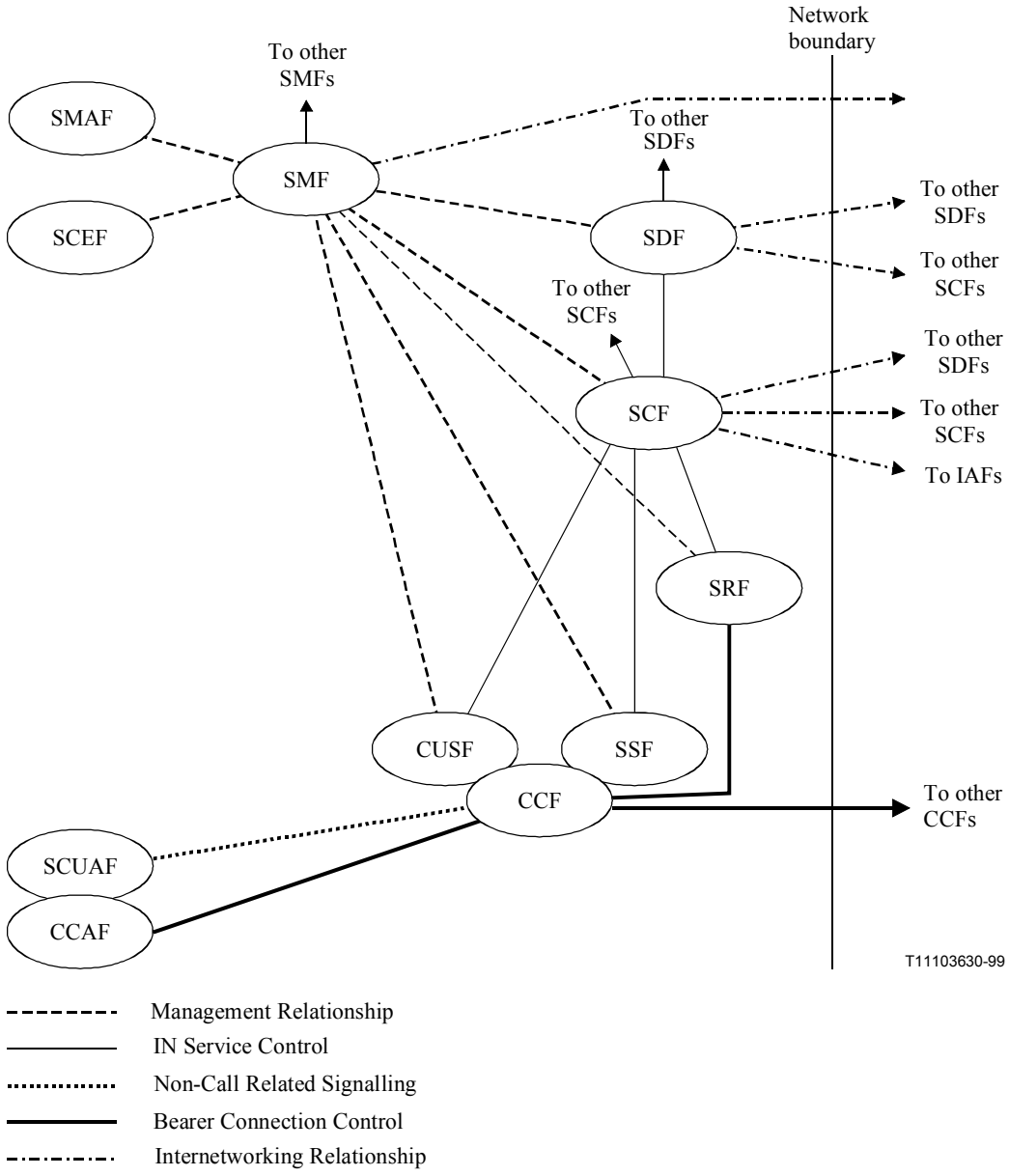

Figure 6-1/Q.1231 – IN CS-3 DFP Architecture

7.2 IN functional model

As stated earlier, the IN DFP for IN CS-3 is a subset of the general IN DFP. In particular:

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

– SMF-SCEF and SMF-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. setup, 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 association/connection as "requested" by the SCUAF;

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

c) manages the relationship between SCUAF functional entities involved in an association (e.g. supervises the overall perspective of the Association and/or connection instance);

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

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 SDFs 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) 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 association/connection processing functions (in the CCF) as required to process requests for IN provided service usage under the control of 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 user interaction which may be user initiated or SCF initiated;

f) interfaces to the SSF for handling call-related interactions.

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 service-providing capabilities of the call control function (CCF), using service requests (e.g. setup, location registration) for the establishment, manipulation and release of an association or instance of service;

c) receives indications relating to call-unrelated services from the CCF 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. As well, 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 subclause 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 includes 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.

8 Functional relationships and interfaces

This clause describes the relationships between various Functional Entities identified earlier and Control Classes in IN CS-3.

8.1 Functional relationships and control classes

Five groups of control capabilities, called control classes, have been identified to support the functional relationships:

1) Bearer Connection Control: the class of capabilities to establish, clear the bearer connections (e.g. voice paths through the network), and provide surveillance.
2) Non-IN Call Control: the class of capabilities to invoke the user and provide an end-to-end control required for the non-IN delivery of supplementary services. The non-IN delivery does not involve the structured separation of the CCF, SSF, and SCF.
3) IN Service-Control: the class of capabilities that involve the structured separation of the SSF from SCF.
4) Service Management Control: the class of capabilities that involve service deployment, service provisioning, service operation control, and service monitoring.
5) Non-IN Call Unrelated Control: the class of capabilities to establish, provide monitoring, and clear a non-bearer connection (e.g. out-channel interaction via the DSS1 D-channel without a bearer connection).

Figure 7-1 depicts the classes of control capabilities required for the functional relationships. The following subclauses further describe the control relationships for each control class, respectively. A control relationship is the relationship between a functional relationship and a control class.

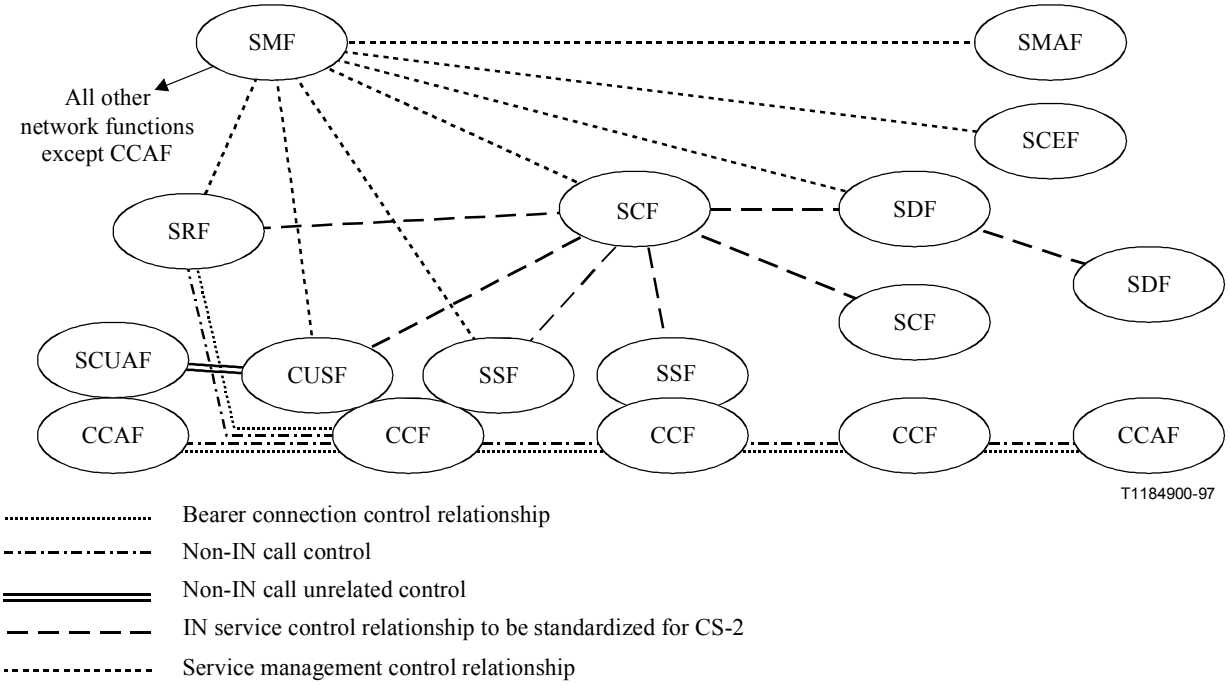

Figure 7-1/Q.1231 – Functional relationships and control classes for IN CS-3

8.1.1 Bearer Connection Control

Control relationships exist between the bearer connection control class and the CCAF-CCF, CCF-CCF, and CCF-SRF functional relationships, respectively. Standard interfaces are employed to realize these control relationships and are listed below by the involved functional relationships:

- CCAF-CCF: DSS1/Q.931.
- CCF-CCF: SS7/ISUP.
- CCF-SRF: DSS1/Q.931; SS7/ISUP.

8.1.2 Non-IN Call Control

Control relationships exist between the non-IN call control class and the CCAF-CCF, CCF-CCF, and CCF-SRF functional relationships, respectively. Standard interfaces are employed to realize these control relationships and are listed below by the involved functional relationships:

- CCAF-CCF: DSS1/Q.932.
- CCF-CCF: SS7/ISUP.
- CCF-SRF: DSS1/Q.932; SS7/ISUP.

8.1.3 IN Service Control

Control relationships exist between the IN service control class and the SCF-CUSF, SCF-SCF, SCF-SDF, SCF-SRF, SCF-SSF, and SDF-SDF functional relationships, respectively. They can be realized through SS7/TCAP/INAP.

8.1.4 Service Management Control

Control relationships exist between the service management control class and the SMF-CUSF, SMF-SCF, SMF-SCEF, SMF-SDF, SMF-SMAF, SMF-SRF, and SMF-SSF functional relationships, respectively. They can be realized through CMIP/Q.812. No modification to INAP (i.e. Q.1238) is foreseen for management aspects. In addition, no modification to the IN Physical Plane (i.e. Q.1225) is foreseen; namely, no additional Physical Entities (PEs) are required assuming basic PEs exist for management aspects.

8.1.5 Non-IN Call Unrelated Control

Control relationships exist between the non-IN call unrelated control class and the CCAF-CCF, CCF-CCF, and CCF-SRF functional relationships, respectively. Standard interfaces are employed to realize these control relationships and are listed below by the involved functional relationships:

- CCAF-CCF: DSS1/Q.931.
- CCF-CCF: SS7/ISUP.
- CCF-SRF: DSS1/Q.931; SS7/ISUP.

8.2 Control Architecture Principles

As stated in 4.2 (Basic Features), the service scope of IN CS-3 includes multipoint of control services. The scope is however still restricted to single-ended services. This subclause identifies the principles for the control architecture of IN CS-3, in the context of this service scope.

This subclause is organized around three control aspects:

– service invocation and control;
– end-user interaction with and without the SRF;
– feature interaction; and
– service management.

8.2.1 Service invocation and control

This control aspect involves the CCF, SSF and SCF.

As in IN CS-1 and IN CS-2, the following key principles remain in force for IN CS-3:

1) The CCF retains ultimate responsibility for the integrity and control of the local connection at all times.
2) The SSF to SCF relationship is, by definition, service-independent. Therefore the CCF and SSF should never contain service logic specific to IN CS-2 supported services.
3) In the event of SCF malfunction, or time-out in the SCF to SSF response, the SSF/CCF combination should be capable of reverting to a default call completion sequence, with appropriate announcement(s) to the calling and/or called party.
4) The SSF should never have to interact with more than one SCF at any given time in order to complete a sequence of query/response interactions on behalf of a calling or called party.
5) Call hand-offs (transfer of responsibility) between SCFs, and between SSFs are permitted as in IN CS-2. However, the hand-off must be explicit, and must not violate principle 4).

8.2.2 End-user interactions

As part of the process of formulating a response to the SSF, the SCF may need to enter into a dialogue with the calling or called party. This would take the form of a prompt and collection sequence with the aid of an SRF, or the form of call unrelated/out-channel call related interactions, which are consistent with IN CS-2.

Again, the following key principles apply, when the SRF is being used in IN CS-3:

1) The SCF has full IN-supported service control of instruction formulation and sequencing with respect to the SRF and SSF.

2) As a corollary to principle 1), there shall be no direct service control interaction between the SSF and SRF for IN CS-3 based services. The SSF and SRF have a peer-peer relationship for the control of IN CS-3 based services, and both are subsidiary to the SCF.

3) The SCF will require the capability of suspending processing of an IN CS-3 based service on behalf of a calling or called party, and then resuming on behalf of the same party at a later time.

8.2.3 Feature interactions

As in IN CS-2, the constraints placed on the IN CS-3 architecture have been put in place primarily to minimize and control feature interactions within single domains of responsibility.

The multiple points of control of IN CS-3 based services means that all aspects of a call are under the control of one CCF/SSF and one or more SCFs at any given point in time. The SCF and SSF are therefore responsible for the handling of interactions between IN CS-3 based SSF/CCF capabilities, and non-IN features already provided in the basic network.

8.2.4 Service management

The control aspects covered in 8.2.1 and 8.2.2 address the real-time interactions between IN CS-3 functions on behalf of a particular calling or called party. In contrast, the service management aspect primarily addresses the network operator's interaction with the SSF, SCF, SDF, and SRF. This interaction normally takes place outside the context of a particular call or service invocation.

However, IN CS-3 must neither preclude nor constrain the capability of service customers to interact directly with customer-specific service management information (e.g. a personal service profile).

The following points capture key principles for IN CS-3:

1) The SMF may be used to add, change or delete IN CS-3-based service-related information or resources in the SSF/CCF, CUSF, SCF, SDF, and SRF. Such changes should not interfere with IN CS-3 based service invocations or calls that are already in progress.

2) The SMAF may be used to add, change, or delete appropriate customer-specific information. The mechanism and safeguards that are put into place by the network operator for this interaction may take advantage of IN CS-3 functions and capabilities.

3) The SCEF may be used by service providers to introduce new services. The task of deploying the service is the role of the SMF and is initiated from within the SMF.

8.3 Internetworking

Internetworking is the process in which several networks (potentially of different types, such as IN-structured, non-IN-structured, public and private) cooperate to provide a service. The need for internetworking capabilities results from the fact that customers may want to access services which span multiple networks. A typical situation is when the data needed by a service (e.g. UPT, VPN and Global Virtual Network Services) reside in a network that is different from the one in which the call has originated.

IN CS-3 identifies the SCF-SCF, SCF-SDF, SCF-IAF, SDF-SDF and SMF-SMF relationships for internetworking purposes. Distributed service logic, but not distributed service control, is supported. Additionally, internetwork management interactions and distributed data handling processes are supported.

8.3.1 Internetworking between IN-structured networks

General requirements for internetworking capabilities are presented in 2.2.6/Q.1201.

Although the involved networks may have different access types (e.g. PSTN and ISDN), as well as different levels of IN structure, IN CS-3 internetworking services are to be provided to customers in a consistent way, regardless of such differences.

Similar to Figure 6-1, which depicts the functional relationships between the IN functions within one network, Figure 7-2 depicts possible functional relationships between the IN functions that are located in two different networks.

The following observations can be made concerning the applicability of Figure 7-2 to IN CS-3:

1) The SSF-SCF functional relationship across two networks is out of the scope of IN CS-3. As for IN CS-2, and as described in 2.2.6/Q.1201, which underlines the necessity to maintain the network security and network integrity, internetworking between the SSF in one network and the SCF in another one is not an IN CS-3 requirement.
2) IN CS-3 will support the SCF-SCF functional relationship across two networks when only one SCF directly interacts with the call.
3) As in IN CS-2, the SCF-SDF functional relationship across two networks is within the scope of IN CS-3.
4) The SDF-SDF functional relationship across two networks is within the scope of IN CS-3.
5) The SMF-SMF functional relationship across two networks is within the scope of IN CS-3. The assumed protocol should align with TMN generic protocols and the TMN X interface.
6) In IN CS-3, specific internetworking capabilities are assumed to be localized within the FEs which support an internetworking relationship, i.e. within the SCF, SDF and the SMF.
7) The internal architecture of one network is not visible from another network. However, functions needed for processing internetworking are to be visible from the other network (IN or non-IN).

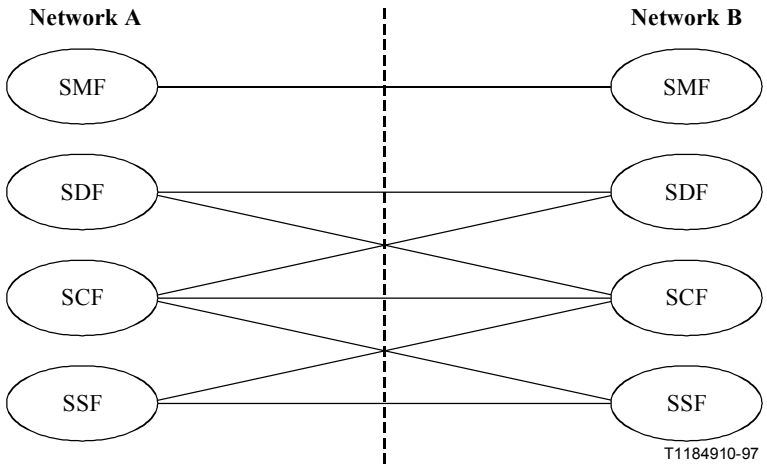

Figure 7-2/Q.1231 – Possible IN network interworking functional relationships

8.3.2 Internetworking with non-IN-structured networks

Subclause 8.3.1 defines the internetworking relationships for two networks, both of which have a structure compatible with the IN functional architecture. For IN CS-3, the Intelligent Access Function (IAF) provides access between the SCF of an IN-structured network and an entity of a non-IN-structured network. This latter entity may be other networks or customers (e.g. private networks, simple databases used for instance in the Customer Call Routing service, terminals, and PABXs). It:

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

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

As such, for the subscriber's each incoming call, information (for instance, dialled number, calling number, and caller entered digits) may be conveyed, for example, from a public network to a private one for the latter to determine how that call will be handled. A private network is defined as a network which provides services only to a specific set of users.

Similar to Figure 7-2, which depicts possible functional relationships between the IN functions that are located in two different IN-structured networks, Figure 7-3 depicts a possible functional relationship between the SCF located in an IN-structured network and the IAF located in a non-IN-structured network.

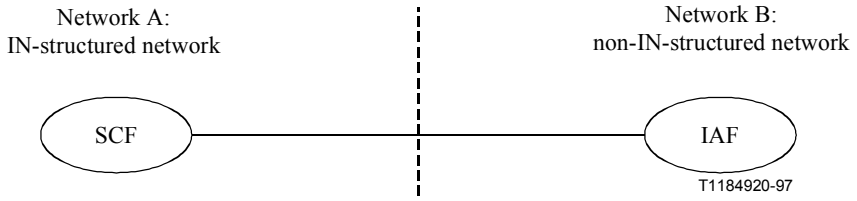

Figure 7-3/Q.1231 – IN to non-IN network interworking functional relationship

8.3.3 Security

Security is a general property which relates to safe and reliable operation. The high level requirements of a secure system are:

- Confidentiality, which is defined in ITU-T Recommendation X.800 as "the avoidance of the disclosure of information without the permission of its owner". Thus, confidentiality may be considered as a property which ensures that conversations or interactions remain private.
- Integrity, which is defined in ITU-T Recommendation X.800 as "the property that data has not been altered or destroyed in an unauthorized manner". Integrity may then be considered as a property which ensures that operations occur as they are expected to.
- Availability, which may be considered as a property relating to the readiness of resources for authorized use.
- Accountability, which may be considered as a property which ensures that any operational request can be correctly attributed in case of doubt or dispute.

The components of an IN system must be assembled and operated in such a way as to provide a defined level of security.

To assist in this, any interface within the IN functional architecture may have the need to apply security assisting functions to the information flows passing across the interface such as:

- Network access security functions: This includes user/terminal authentication (i.e. the result of a process by which a service user proves his or her identity to an IN system), user profile verification (i.e. the verification that a user is authorized to use a functionality).

- Internetworking security functions: This includes peer entity authentication (i.e. a process which allows a communicating entity to prove its identity to another entity in the network), signalling data or TMN data integrity, non-repudiation, confidentiality, entity profile verification (i.e. the verification that an entity is authorized to use a functionality).

ITU-T Recommendation Q.1238 defines a generic set of security mechanisms and procedures to offer some of the generic properties described above. In any particular circumstance, a set of network elements will be required to be configured according to some security scheme.

The definition of IN CS-3 offers the provision of certain security assisting functions at the SCF-SDF, SDF-SDF, and SCF-SCF interfaces. Additional security functions may be required depending on the security schemes in place.

8.3.4 Screening

Screening refers to the ability to filter the messages and the contents of the messages sent and/or received across the internetworking interfaces. The high level screening requirements are:

- INAP protocol screening, which ensures the control per internetwork relationship of the signalling capabilities and the handling of INAP operations, parameters and parameter contents.
- INAP Application Context screening, which ensures the control per internetwork relationship of the Application Context of the INAP capability set.

ITU-T Recommendation Q.1238 defines screening requirements for internetworking interfaces. The definition of IN CS-3 offers the provision of certain screening functions at the SCF-SCF interface. Additional functions may be required depending on the security and screening schemes in place.

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