



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Q.1922.4

(12/2002)

SERIES Q: SWITCHING AND SIGNALLING

Specifications of signalling related to Bearer Independent
Call Control (BICC)

Interaction between the Intelligent Network application CS-4 protocol and the Bearer Independent Call Control protocol

ITU-T Recommendation Q.1922.4

ITU-T Q-SERIES RECOMMENDATIONS
SWITCHING AND SIGNALLING

SIGNALLING IN THE INTERNATIONAL MANUAL SERVICE	Q.1–Q.3
INTERNATIONAL AUTOMATIC AND SEMI-AUTOMATIC WORKING	Q.4–Q.59
FUNCTIONS AND INFORMATION FLOWS FOR SERVICES IN THE ISDN	Q.60–Q.99
CLAUSES APPLICABLE TO ITU-T STANDARD SYSTEMS	Q.100–Q.119
SPECIFICATIONS OF SIGNALLING SYSTEM No. 4	Q.120–Q.139
SPECIFICATIONS OF SIGNALLING SYSTEM No. 5	Q.140–Q.199
SPECIFICATIONS OF SIGNALLING SYSTEM No. 6	Q.250–Q.309
SPECIFICATIONS OF SIGNALLING SYSTEM R1	Q.310–Q.399
SPECIFICATIONS OF SIGNALLING SYSTEM R2	Q.400–Q.499
DIGITAL EXCHANGES	Q.500–Q.599
INTERWORKING OF SIGNALLING SYSTEMS	Q.600–Q.699
SPECIFICATIONS OF SIGNALLING SYSTEM No. 7	Q.700–Q.799
Q3 INTERFACE	Q.800–Q.849
DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1	Q.850–Q.999
PUBLIC LAND MOBILE NETWORK	Q.1000–Q.1099
INTERWORKING WITH SATELLITE MOBILE SYSTEMS	Q.1100–Q.1199
INTELLIGENT NETWORK	Q.1200–Q.1699
SIGNALLING REQUIREMENTS AND PROTOCOLS FOR IMT-2000	Q.1700–Q.1799
SPECIFICATIONS OF SIGNALLING RELATED TO BEARER INDEPENDENT CALL CONTROL (BICC)	Q.1900–Q.1999
BROADBAND ISDN	Q.2000–Q.2999

For further details, please refer to the list of ITU-T Recommendations.

ITU-T Recommendation Q.1922.4

Interaction between the Intelligent Network application CS-4 protocol and the Bearer Independent Call Control protocol

Summary

This Recommendation specifies procedures in order to provide interaction between the Bearer Independent Call Control (BICC) and INAP CS-4, i.e. to support IN services in an ISDN environment.

It also specifies ISUP/INAP CS-4 interaction procedures as exceptions to BICC/INAP interaction procedures (see Annex B).

The interaction between other signalling systems and INAP can be found by consulting the relevant interworking Recommendation to the BICC in combination with the BICC/INAP interaction Recommendation.

Source

ITU-T Recommendation Q.1922.4 was prepared by ITU-T Study Group 11 (2001-2004) and approved under the WTSA Resolution 1 procedure on 29 December 2002.

Keywords

BICC, INAP, SS7, SSP.

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.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

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.

© ITU 2003

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

CONTENTS

Page

1	Scope	1
2	References.....	1
3	Terms and definitions	2
4	Abbreviations.....	3
5	Conventions	4
6	Description.....	4
6.1	Establishment of bearer-related connections.....	4
6.2	Establishment of bearer unrelated connections	13
7	Operational requirements.....	13
8	Coding requirements.....	13
8.1	Messages.....	13
8.2	Parameters	13
9	State definitions	14
10	Signalling procedures	14
10.1	Bearer-related connections	14
10.2	Bearer unrelated connections	44
11	Interaction with other networks	44
12	Interaction between IN basic call and ISDN supplementary services.....	44
12.1	Call diversion.....	46
12.2	Calling line identification presentation/restriction	46
12.3	Completion of calls service	46
12.4	Conference.....	47
12.5	Connected line identification presentation/restriction.....	47
12.6	Explicit call transfer	48
12.7	Malicious call identification	48
12.8	Three party.....	48
13	Interactions between IN services	48
13.1	Receiving an IN Service Compatibility in a BICC message.....	49
13.2	Handling of IN Service Compatibility in case outgoing legs are created by IN.....	49
14	Parameter values (timers)	50

	Page
Annex A – Signalling flows.....	50
Annex B – Exceptions for ISUP/INAP interaction.....	56
Appendix I – Coding of the compatibility information for the parameters	57
Appendix II – Contents of the INAP serviceInteractionIndicatorsTwo	58
Appendix III – Limitations for BICC basic call procedures and supplementary services for different types of IN calls.....	59

.....

ITU-T Recommendation Q.1922.4

Interaction between the Intelligent Network application CS-4 protocol and the Bearer Independent Call Control protocol

1 Scope

This Recommendation specifies the interaction between BICC and INAP CS-4. It also specifies ISUP/INAP CS-4 interaction procedures as exceptions to BICC/INAP interaction procedures (see Annex B).

For the purpose of this Recommendation the interface INAP CS-4 between SSP and SCP is regarded as being an intra-network interface.

The interaction between other signalling systems and INAP can be found by consulting the relevant interaction Recommendation to BICC in combination with this Recommendation.

This Recommendation specifies procedures in order to provide interaction between BICC and INAP, i.e. to support IN services in an ISDN environment. In addition, new protocol elements for the BICC are defined in this Recommendation in order to satisfy IN specific requirements. Based on the protocol inherent compatibility mechanism, a stepwise upgrade of the BICC functionality is possible. However, the new function is only available for an IN call, if supported in any of the affected service nodes.

In this Recommendation the IN SSF is treated as a functional part of the BICC CSF (see Figure 2). It is presupposed that this functional inclusion of the SSF has no impact on the CSF/BIWF interface. Any such impact is out of the scope of this Recommendation.

This Recommendation describes SSF/CSF interaction only on "transit" level, i.e. no special further interworking is described for CSF-Ns with incoming/outgoing call control signalling to access networks (i.e. ISN to ACN-E/TE call control relationships). As a consequence, specific access-related interaction (e.g. interaction of line based triggering with ISDN supplementary services) is not within the scope of this Recommendation.

This Recommendation therefore, also does not specify enhancements to the call control protocols at the access network level (e.g. DSS1), which may be needed due to additional BICC functions or IN requirements, respectively.

The main subjects of this interaction Recommendation are the following:

- description of specific call control functions for IN calls;
- impacts on the BICC basic call setup and the ISDN supplementary services for IN calls; and
- of the BICC protocol due to IN specific requirements.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference is 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. The reference to a document within this Recommendation does not give it, as an stand-alone document, the status of a Recommendation.

- [1] ITU-T Recommendations Q.761 to Q.764 (2000), *Specifications of Signalling system No. 7 – ISDN User Part (ISUP)*.
- [2] ITU-T Recommendation Q.1224 (1997), *Distributed functional plane for intelligent network Capability Set 2*.
- [3] ITU-T Recommendation Q.1231 (1999), *Introduction to the Intelligent Network Capability Set 3*.
- [4] ITU-T Recommendations Q.1238.x, *Specifications of the Intelligent Network Application Protocol Capability Set 3*.
- [5] ITU-T Recommendation Q.1290 (1998) , *Glossary of terms used in the definition of intelligent networks*.
- [6] ITU-T Recommendation Q.1601 (1999), *Signalling system No. 7 – Interaction between N-ISDN and INAP CS-2*.
- [7] ITU-T Recommendations Q.1902.1 to Q.1902.4 (2001), *Specifications of the Bearer Independent Call Control protocol (BICC)*.
- [8] ITU-T Recommendation Q.1912.1 (2001), *Interworking between the Signalling system No. 7 ISDN user part (ISUP) and the Bearer Independent Call Control protocol*.
- [9] ITU-T Recommendation Q.1912.2 (2001), *Interworking between selected signalling systems (PSTN access, DSS1, C5, R1, R2, TUP) and the Bearer Independent Call Control protocol*.
- [10] ITU-T Recommendation Q.1922.2 (2001), *Interworking between the Intelligent Network Application protocol Capability Set 2 and the Bearer Independent Call Control protocol*.
- [11] ITU-T Recommendation Q.931 (1998), *ISDN user-network interface (DSS1); Layer 3 specification for basic call control*.
- [12] ITU-T Recommendation Q.765.1 (1998), *Signalling system No. 7 – Application transport mechanism: Support of VPN applications with PSSI information flows*.
- [13] ITU-T Recommendation Q.769.1 (1999), *Signalling system No. 7 – ISDN user part enhancements for the support of number portability*.
- [14] ITU-T Recommendation Q.1902.6 (2001), *Bearer Independent Call Control protocol (Capability Set 2): Generic signalling procedures and support of ISDN user part supplementary services for bearer redirection*.
- [15] ITU-T Recommendations Q.1248.x (2001), *Interface Recommendation for Intelligent Network Capability Set 4*.

3 Terms and definitions

This Recommendation defines the following terms:

Call Control Function (CCF): see 3.3/Q.1224 [2].

Service Control Function (SCF): see 3.3/Q.1224 [2].

Service Switching Function (SSF): see 3.3/Q.1224 [2].

Specialized Resource Function (SRF): see 3.3/Q.1224 [2].

4 Abbreviations

This Recommendation uses the following abbreviations:

ACM	Address Complete Message (BICC)
ANM	Answer Message (BICC)
APM	Application Transport Mechanism
ATP	Access Transport Parameter (BICC)
BCF	Bearer Control Function (BICC)
BCSM	Basic Call State Model (IN)
BICC	Bearer Independent Call Control
BIWF	Bearer Inter-Working Function (BICC)
CCSS	Call Completion Service Set-up
CMN	Call Mediation Node (BICC)
CON	Connect message (BICC)
COT	Continuity message (BICC)
CPG	Call Progress message (BICC)
CSF	Call Service Function (BICC)
DLE	Destination Local Exchange
DP	Detection Point (IN)
DSS1	Digital Subscriber Signalling System No. 1
EDP-N	Event Detection Point – Notification (IN)
EDP-R	Event Detection Point – Request (IN)
ERB	EventReportBCSM (IN)
FAR	Facility Request Message (BICC)
FOT	Forward Transfer Message (BICC)
FRJ	Facility Reject (BICC)
GVNS	Global Virtual Network Service
IAM	Initial Address Message (BICC)
IDR	Identification Request Message (BICC)
IE	Information Element
IN	Intelligent Network
INAP	Intelligent Network Application Protocol
IP	Intelligent Peripheral (IN)
IRS	Identification Response message (BICC)
ISDN	Integrated Services Digital Network
ISN	Interface Serving Node (BICC)
ISUP	ISDN User Part
OLE	Originating Local Exchange

PRI	Pre-release Information message (BICC)
REL	RELease message (BICC)
RES	RESume message (BICC)
RLC	Release Complete message (BICC)
SCP	Service Control Point (IN)
SGM	Segmentation Message (BICC)
SN	Serving Node (BICC)
SS	Signalling System
SSP	Service Switching Point (IN)
SUS	Suspend message (BICC)
TMR	Transmission Medium Requirement
TNS	Transit Network Selection (BICC)

5 Conventions

The name of each element of the following class of terms is capitalized, and capital letters within that term can possibly occur:

- operations.
Example: ContinueWithArgument operation.
- parameters within operations.
Example: CalledPartyNumber.

6 Description

6.1 Establishment of bearer-related connections

6.1.1 Integration of IN service control into a BICC serving node

ITU-T Rec. Q.1248.1 [15] provides a distributed functional plane architecture for IN Capability Set 4 (CS-4). Interactions between the following functional entities (FEs) are relevant for this Recommendation:

- Call Control Function (CCF);
- Service Switching Function (SSF);
- Service Control Function (SCF); and
- Specialized Resource Function (SRF).

The functional entities can be implemented in one or more network elements called physical entities. The service control point (SCP) is the physical entity in the intelligent network that implements the SCF. The CCF and SSF are realized in the service switching point (SSP) and the SRF is realized in the intelligent peripheral (IP).

The main function of the CCF, according to ITU-T Rec. Q.1248.1 (see [15]), is to provide the IN service logic with an abstract view of the call state and specific call(-state) associated data according to a "Basic Call State Model" (BCSM). This BCSM defines "detection points" at which the SSF can interrupt normal call processing and access an IN service logic in the SCF to change call data, or reconfigure the call, before continuing call processing at a specified BCSM-point.

Instead of interrupting call processing, the SSF may also only retrieve call-related information to notify it to the IN service logic.

The CCF can in turn be decomposed into several entities. Figure 1 depicts a functional decomposition of the CCF and its relationship to other components that are involved in call and service processing. Within the CCF, the Basic Call Control (BCC) Entity is responsible for the overall coordination of basic call processing, separated into control of the originating/terminating BCSM and their interactions. It interacts with the Signalling Terminations for call control signalling and the Bearer Control Entity that controls media resources embedded in a Bearer Function.

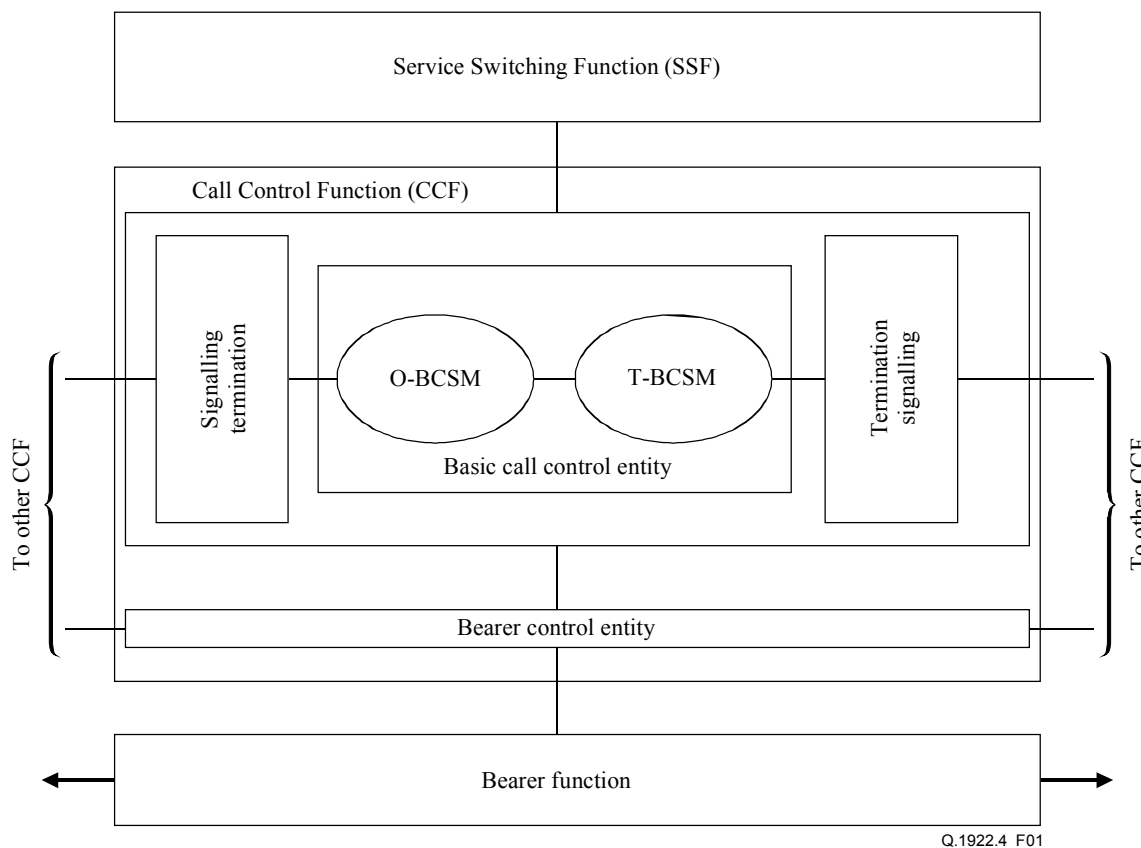


Figure 1/Q.1922.4 – CCF/SSF decomposition

The BICC protocol (see ITU-T Rec. Q.1902-1 [7]) provides the signalling functions required to support narrowband ISDN services independent of the bearer technology and signalling transport technology used. To separate the call control signalling from the bearer control aspects, nodes that support BICC signalling are decomposed in the BICC reference model into the Call Service Function (CSF) and the Bearer Control Function (BCF).

Several arrangements are possible for nodes that support BICC signalling. These nodes may have an associated BCF, in which case they are referred to as Serving Nodes (SN). A node without an associated BCF is referred to as Call Mediation Node (CMN). Between Serving Nodes, the control of bearers is provided by other protocols, referred to as "bearer control signalling".

In a Serving Node (SN), the Call Service Function (CSF) and the Bearer Control Function (BCF) entities may be physically separated. The Call Bearer Control (CBC) signalling is used between these two entities in case of physical separation.

Serving Nodes may be of different type (gateway, transit, interface, access; see ITU-T Rec. Q.1902.1 [7]). In this Recommendation, only transit serving nodes (TSN) and gateway serving nodes (GSN) are within scope.

Relationship between the BICC reference model and the CCF/SSF model

- The SSF can be considered as a part of a BICC Call Service Function (CSF).
- The Signalling Terminations are part of a CSF. They will contain the functions of incoming/outgoing procedures of the Q.1902.x BICC protocol.
- The Basic Call Control entity of the CCF can be considered as a part of a CSF.
- The Bearer Control entity of the CCF can be considered as equivalent to the BICC Bearer Control Function (BCF).

The SSF contains the capabilities beyond those that are needed for basic call control. Consequently, this Recommendation concentrates on the actions that are performed in the CCF. The SSF can be seen as functional entity that may influence the call control performed by the CSF at points notified by the CCF. In ITU-T Rec. Q.1248.1 (see [15]), only an internal functional interface is supposed between CCF and SSF, whereas an open TCAP-based interface is defined between SSF and SCF (the IN Application Protocol, ITU-T Rec. Q.1248.2 [15]).

The minimum configuration of an SSP providing BICC/INAP interworking, according to this Recommendation consists of a CSF (according to [7]), including BCC-functionality (interacting with the BICC incoming/outgoing signalling terminations) and an SSF supporting INAP CS-4 (according to ITU-T Rec. Q.1248 [15]). Whether other functional entities, like the BIWF, are also part of the SSP or externally attached, is not relevant for the IN service switching functionality. However, the use of specific SSF functionality (e.g. for call party handling) may pose specific requirements in regard to the capabilities of the BCF (without which only limited IN functionality could be performed).

The Figure 2 illustrates in a simplified manner a signalling configuration which is to be considered in this Recommendation. In the configuration, it is assumed that SRF support is not needed. The network signalling system used for call control is the ITU-T BICC [7], with any of the several bearer/bearer control systems allowed for BICC according to [7]. The interface between SSF and SCF is the ITU-T INAP [15]. The SSP-unit is seen as equivalent to the SN or CMN.

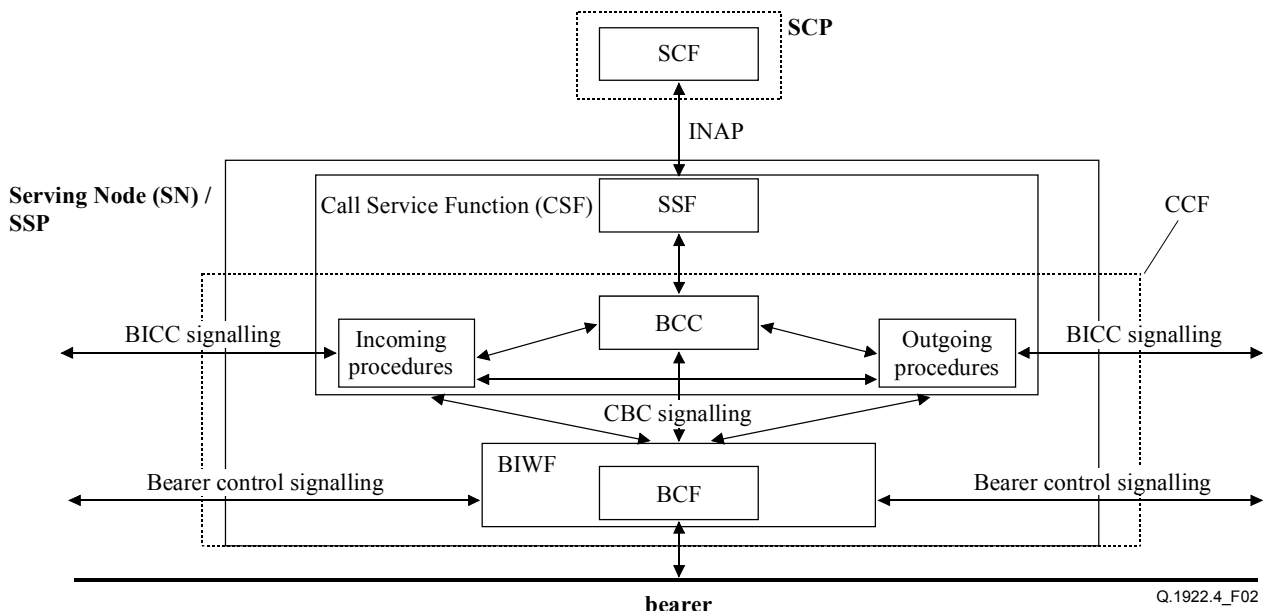


Figure 2/Q.1922.4 – Relationship between CCF/SSF model and BICC reference model

The interaction between BICC and INAP takes place in the CCF and SSF. The following main subjects have to be considered in this area:

- detection point processing in the CCF; and
- receipt of INAP operations in the SSF.

NOTE – in a Call Mediation Node (CMN) there is no bearer control capability. IN interaction on a CMN will only be possible, in case the CMN (in its network) has capabilities for remote bearer control (e.g. bearer redirection).

Detection point processing

The provision of detection points (DPs) is required in the BICC basic call handling in order to access IN functionality and to allow IN service logic to influence the processing of IN calls. The detection points (DPs) of the BCSM indicate points in call (PICs) at which transfer of control can occur. If a DP is recognized, an operation from the SSF to the SCF is sent. Thus the communication towards the SCP is performed. The DPs defined in [15] are listed in Table 1.

The column "Support" indicates whether the DP is supported with the ITU-T BICC [7].

Table 1/Q.1922.4 – List of detection points

Detection points for the originating side	Support	Detection points for the terminating side	Support
OA Origination_Attempt	No impact on BICC	TA Terminating_Attempt	No impact on BICC
OAD Originating_Attempt_Denied	No impact on BICC	TAD Terminating_Attempt_Denied	No impact on BICC
OAA Origination_Attempt_Authorized	No impact on BICC	TAA Terminating_Attempt_Authorized	No impact on BICC
CI Collected_Information	Yes		
AI Analysed_Information	Yes		
ARF Authorize_Route_Failure	For further study		
RSF Route_Select_Failure	Yes		
OCPB O_Called_Party_Busy	Yes	TB T_Busy	Yes
		FSA Facility_Selected and _Available	For further study
OTS O_Term_Seized	Yes	CA Call_Accepted	Yes
ONA O_No_Answer	Yes	TNA T_No_Answer	Yes
OAns O_Answer	Yes	Tans T_Answer	Yes
OMC O_Mid_Call	for further study	TMC T_Mid_Call	For further study
OS O_Suspend	Yes	TS T_Suspend	Yes
ORA O_Re_Answer	Yes	TRA T_Re_Answer	Yes
OD O_Disconnect	Yes	TD T_Disconnect	Yes
OAb O_Abandon	Yes	Tab T_Abandon	Yes

Receipt of INAP operations

Table 2 lists the INAP operations with direction SCF-SSF and indicates which operation will influence the BICC call control handling.

Table 2/Q.1922.4 – INAP operations (direction: SCF-SSF)

Operation	Influence on BICC call handling	Reference clause
ActivateServiceFiltering	Yes	10.1.7 (Service filtering)
ActivityTest	No	
AnalyseInformation	For further study (Note)	
ApplyCharging	No	
Authorize Termination	For further study (Note)	
CallFiltering	No	
CallGap	Yes	10.1.6 (Call gapping)
CallInformationRequest	No	
Cancel	No	
CancelStatusReportRequest	For further study (Note)	
CollectInformation	Yes	10.1.2 (IN call with SCP request to collect further digits)
Connect	Yes	10.1.1.1.1.1 (Connect operation)
Continue	Yes	10.1.1.1.1.2 (Continue operation)
ContinueWithArgument	Yes	10.1.1.1.1.3 (ContinueWithArgument operation)
ConnectToResource	Yes	10.1.5.1 (SSP supports requested IP capabilities)
CreateCallSegmentAssociation	No	
ConnectOrRemoveTriggerData	No	
DisconnectForwardConnection	Yes	10.1.5.2 (Assist method – procedure in the initiating SSP)
DisconnectForwardConnectionWithArgument	Yes	10.1.5.2 (Assist method – procedure in the initiating SSP)
DisconnectLeg	For further study (Note)	
EstablishTemporaryConnection	Yes	10.1.5.2 (Assist method – procedure in the initiating SSP)
FurnishChargingInformation	No	
HoldCallInNetwork	For further study (Note)	
InitiateCallAttempt	Yes	10.1.8 (SCP initiated call)
ManageTriggerData	No	
MergeCallSegments	For further study (Note)	
MonitorRouteRequest	No	

Table 2/Q.1922.4 – INAP operations (direction: SCF-SSF)

Operation	Influence on BICC call handling	Reference clause
MoveCallSegments	For further study (Note)	
MoveLeg	For further study (Note)	
Reconnect	For further study (Note)	
ReleaseCall	Yes	10.1.1.4 (ReleaseCall operation)
RequestCurrentStatusReport	For further study (Note)	
RequestEveryStatusChangeReport	For further study (Note)	
RequestFirstStatusMatchReport	For further study (Note)	
RequestNotificationChargingEvent	Yes	The treatment is national network specific and not described further within this Recommendation
RequestReportBCSMEEvent	Yes	10.1.3 (Detection Point processing)
RequestReportFacilityEvent	No	
RequestReportUTSI	No	
ResetTimer	No	
SelectFacility	For further study (Note)	
SendFacilityInformation	No	
SelectRoute	For further study (Note)	
SendSTUI	For further study (Note)	
SplitLeg	For further study (Note)	
SendChargingInformation	Yes	10.1.1.1.2 (SendChargingInformation operation)
NOTE – More information can be found in reference [4].		

6.1.2 Support of the SCF-SRF relationship

A Specialized Resource Function (SRF) is used in the IN context to provide the IN service logic (in the SCF) with the possibility of inserting user interactive (UI) dialogues into the controlled call. This may consist of playing announcements, voice recording, voice recognition, DTMF collection, etc. The SRF is modeled as part of a physical entity called Intelligent Periphery (IP). In ITU-T Rec. Q.1238.3 (see [4], CS-3, document unchanged in CS-4) a number of scenarios for support of the SCF, SSF, and SRF functional entities as physical entities have been identified. The scenarios differ in the method to support the SCF-SRF relationship and are summarized in Figure 4/Q.1238.3 of the ITU-T INAP [4].

The following figures provide, in a simplified manner, some signalling configurations for IN calls needing an IP for user interaction. The figures are only included to ease the understanding and should not be seen as exhaustive representation of the various physical scenarios.

6.1.2.1 SSF relay method

The control of the SRF is done by the SCF using the INAP operations ConnectToResource, PlayAnnouncement, PromptAndCollectUserInformations, PromptAndReceiveMessage, DisconnectForwardConnection and receiving INAP operations SpecializedResourceReport, ReturnReportForPromptAndReceiveMessage. Therefore, an extra service control channel between SCF/SRF has to be provided additionally to the normal call/bearer control for a connection of the user to the IP. For the service control channel, several physical scenarios are defined in [5]. The first of them being the relaying of the service control messages between SCP and IP using the SSP.

Figure 3 shows the relay of INAP-operations via a logical service control channel between SSF and SRF. Note that the operations ConnectToResource/DisconnectForwardConnection are not only relayed through the service control channel, but also send to CCF for Call/Bearer control. The procedure for this scenario is described in 10.1.5.1 (SSP supports requested IP capabilities) and a typical arrow diagram is given in Figure A.3.

NOTE – In the following figures the service/call/bearer control signalling are displayed as *logically* separate. In fact there may even be only one physical type of signalling for this three types of relationship. Additional interface functions are needed in the BICC SN for this purpose, that are not displayed in the figures.

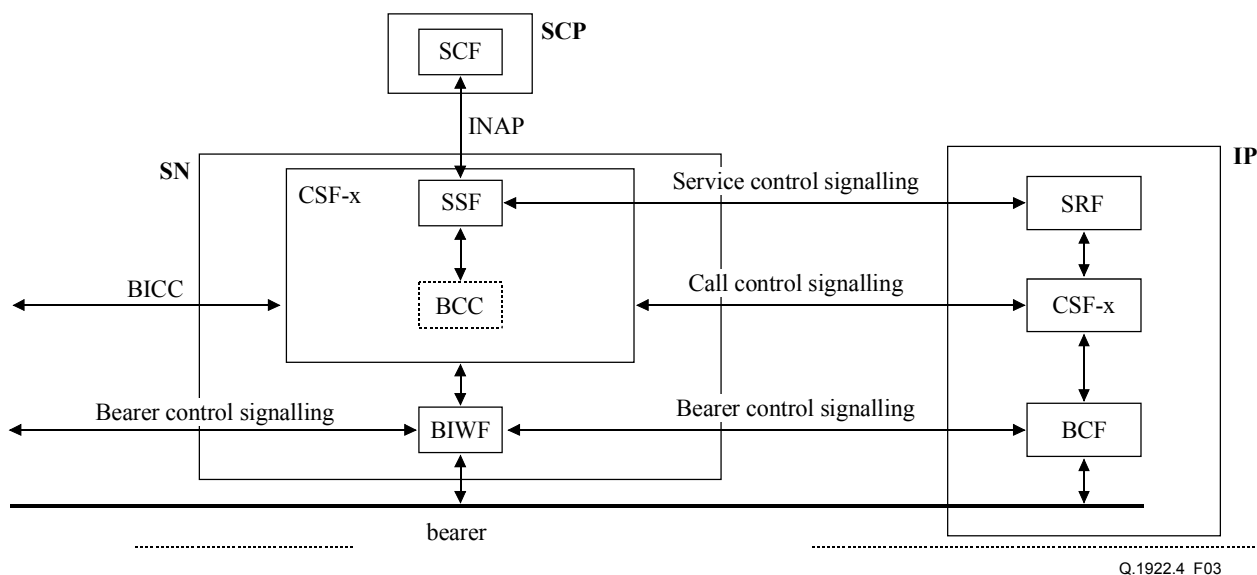


Figure 3/Q.1922.4 – Connection to IP with SSF relay of SRF operations

Different implementations of the service/call control between SN and IP for SSF relay are possible in alignment with 7.3.5/Q.1238.3:

- The IP may be physically integrated into the SSP ("internal IP"), with the control signalling being internal interfaces (7.3.5.1/Q.1238.3). This case is of no relevance to this Recommendation.
- The IP may be connected to the SSP via an access network. In 7.3.5.2/Q.1238.3 the DSS1 signalling is explicitly used for service/call/bearer control signalling, whereby the service control signalling is implemented using facility information elements for the relayed INAP-operations. The extension of this example to other access network types is for further study (depending on how relay of INAP-operations could be performed).

NOTE – The case of a DSS1 connection between SSP and IP has to be modeled using a BICC interface SN to narrowband ISDN (see [8]).

- The IP may be connected to the SSP via ISUP using TCAP for relaying INAP operations (7.3.5.2/Q.1238.3). The connection between SSP and IP has to be modeled using a BICC interface SN to narrowband ISDN (see [8]). The TCAP relaying between SSF and SRF is out of the scope of this Recommendation.
- The external SRFs mentioned so far (using narrowband ISDN access) can be attached to BICC-SNs only by the intermediation of a Media Gateway. In INAP CS-4 (see ITU-T Rec. Q.1244) a new kind of Media Gateway containing a SRF is defined. All the control signalling in this case is done using H.248.x procedures. The impact of this scenario on 10.1.5 is for further study.

6.1.2.2 Direct SCP-IP information transfer

In Figure 4 the SRF-SCF INAP operations are directly exchanged between IP and SCP.

When receiving the ConnectToResource operation in this context, "assist request instructions" are sent via call control signalling to the IP (correlating the SCP connected to the SSP with the SCP/IP-connection). On completion of the user interaction, control is returned to the initiating SSP. This procedure is called the "Assist" method. The procedure for this scenario is described in 10.1.5.2 (Assist method – procedure in the initiating SSP). The procedure between the SCP and the SRF has no impact on the BICC and is outside the scope of this Recommendation. More information can be found in [5]. A typical arrow diagram is given in Figure A.4.

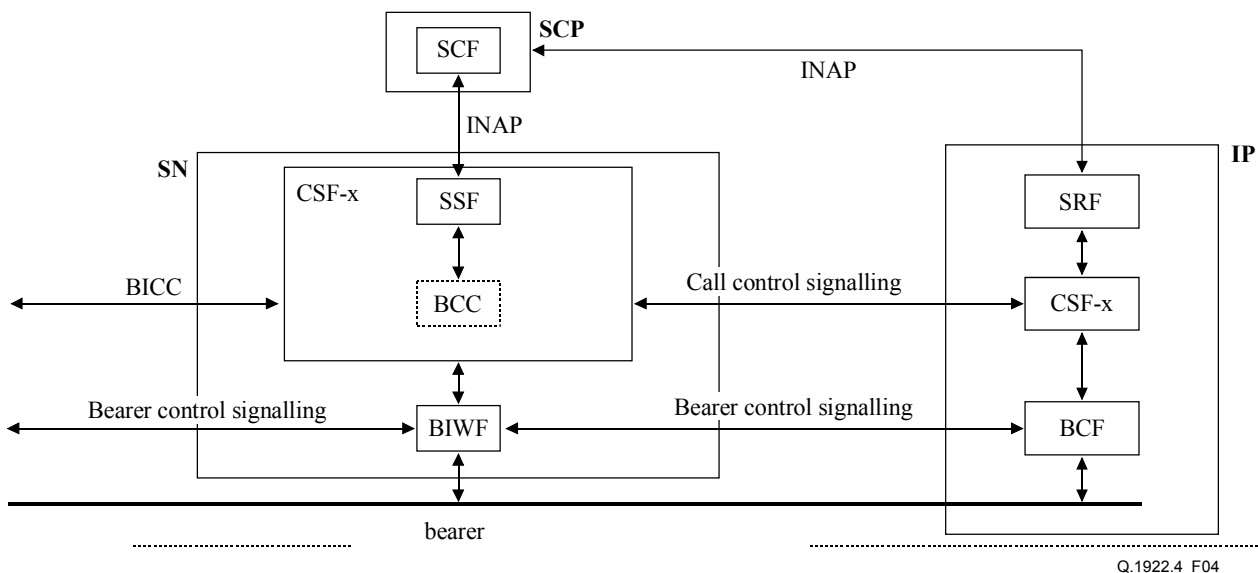


**Figure 4/Q.1922.4 – External IP connected via BICC;
direct TCAP link between SRF and SCF**

NOTE 1 – The same implementation scenarios as in 6.1.2.1 are possible.

NOTE 2 – In the case where the SSP/IP connection is done via BICC, problems were identified regarding network integrity aspects and the lack of standardized ISUP signalling for this type of interface.

6.1.2.3 SSP assist

In Figure 5, the IP is integrated into another SSP (assisting SSP), than the one that is interacting with the SCP (initiating SSP). Whether the SRF-SCF INAP operations are relayed via the SSP, or are directly exchanged between IP and SCP, is not relevant for this Recommendation. However, in Figure 5 only the scenario is shown where a relay via SSP is applied.

On completion of the user interaction, control is returned to the initiating SSP. This procedure is called the "Assist" method. The procedure for this scenario is described in clauses 10.1.5.2 (Assist

method – procedure in the initiating SSP) and 10.1.5.4 (Assist/Hand-off method – procedure in the assisting SSP). A typical arrow diagram is given in Figure A.4.

If the control of the call is retained in the assisting SSP, the "Hand-off" method is applied. This scenario is not explicitly shown in a figure. The procedure for this scenario is described in 10.1.5.3 (Hand-off method – procedure in the initiating SSP) and a typical arrow diagram is given in Figure A.5.

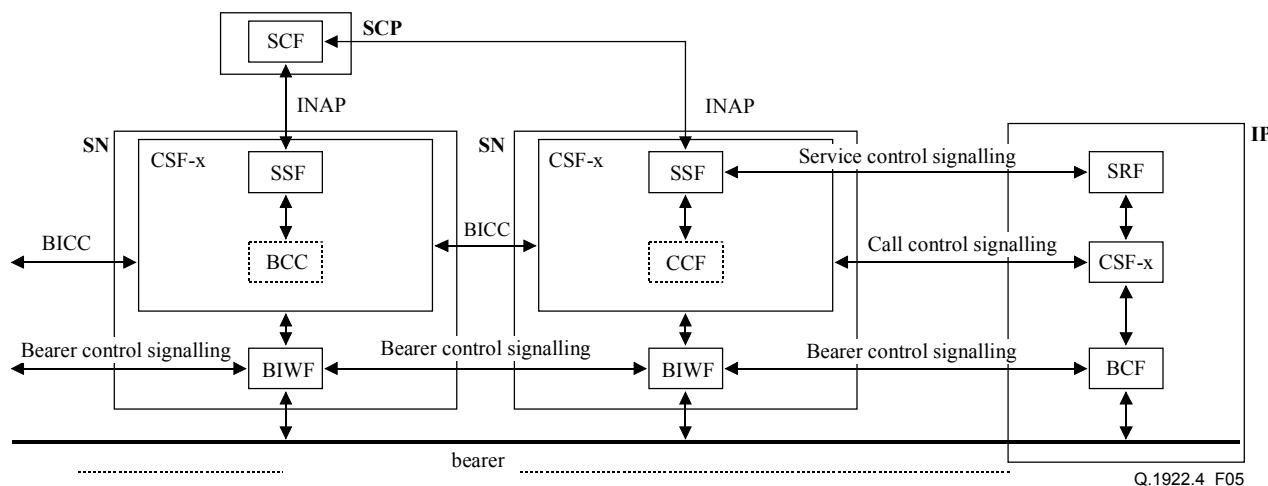


Figure 5/Q.1922.4 – IP attached to an assisting SSP ("Assist" method)

6.2 Establishment of bearer unrelated connections

For further study.

7 Operational requirements

Not applicable.

8 Coding requirements

8.1 Messages

None.

8.2 Parameters

8.2.1 Call diversion treatment indicators parameter

The format of the call diversion treatment indicators parameter is defined in ITU-T Rec. Q.1902.3 [7].

8.2.2 Called IN number parameter

The format of the called IN number parameter is defined in ITU-T Rec. Q.1902.3 [7].

8.2.3 Call offering treatment indicators parameter

The format of the call offering treatment indicators parameter is defined in ITU-T Rec. Q.1902.3 [7].

8.2.4 Charged party identification parameter

The format of the charged party identification parameter is defined in ITU-T Rec. Q.1902.3 [7].

8.2.5 Conference treatment indicators parameter

The format of the conference treatment indicators parameter is defined in ITU-T Rec. Q.1902.3 [7].

8.2.6 Correlation id parameter

The format of the correlation id parameter is defined in ITU-T Rec. Q.1902.3 [7].

8.2.7 Display information parameter

The format of the display information parameter is defined in ITU-T Rec. Q.1902.3 [7].

8.2.8 SCF id parameter

The format of the SCF id parameter is defined in ITU-T Rec. Q.1902.3 [7].

8.2.9 UID action indicators parameter

The format of the UID action indicators parameter is defined in ITU-T Rec. Q.1902.3 [7].

8.2.10 UID capability indicators parameter

The format of the UID capability indicators parameter is defined in ITU-T Rec. Q.1902.3 [7].

8.2.11 Original Called IN number parameter

The format of the called IN number parameter is defined in ITU-T Rec. Q.1902.3 [7].

8.2.12 IN Service Compatibility Information parameter

The format of the IN Service Compatibility Information parameter is defined in ITU-T Rec. Q.1902.3 [7].

9 State definitions

No specific state definitions are required.

10 Signalling procedures

10.1 Bearer-related connections

10.1.1 IN basic call

For this Recommendation an "IN basic call" is considered as:

- a normal BICC basic call invoking IN functionality in the SSP;
- with no EDPs armed dynamically in the request mode; and
- no user interaction needed.

For an IN basic call, the normal BICC basic call procedures are applicable as described in ITU-T Rec. Q.1902.4 [7] for national intermediate exchanges, unless indicated otherwise in the clauses below.

10.1.1.1 Successful call set-up

10.1.1.1.1 Forward address signalling

If an IAM is received in an SSP and the call is recognized as IN call, i.e. by detecting a DP as TDP-R (see 10.1.3 (Detection Point processing)), an InitialDP operation, or a DP specific operation for a TDP-R, is sent from the SSF to the SCF. If the IAM is segmented, the remainder of the call set-up information is awaited (see 10.1.1.1.7 (Simple segmentation)).

The mapping of parameters is shown in Table 4.

Table 4/Q.1922.4 – Mapping of parameters from IAM to InitialDP

BICC message IAM (Note 1)	INAP operation InitialDP
Called party number	CalledPartyNumber
Calling party number	CallingPartyNumber
Calling party subaddress IE contained in access transport	CallingPartySubaddress
Calling party's category	CallingPartysCategory
Location number	LocationNumber
Original called number	OriginalCalledPartyID
User teleservice information (1st priority) High layer compatibility IE contained in access transport (2nd priority) (Note 2)	HighLayerCompatibility
Generic number "additional calling party number"	AdditionalCallingPartyNumber
Forward call indicators	ForwardCallIndicators
User service information prime (1st priority) User service information (2nd priority) or TMR (Note 3)	BearerCapability
Redirecting number	RedirectingPartyID
Redirection information	RedirectionInformation
CCSS with "CCSS call indicator"	CCSS
Access Transport	ISDNAccessRelatedInformation
Generic Number	GenericNumbers
Carrier Selection Information	Carrier (Note 4)
Transit Network Selection	Carrier (Note 5)
Calling geodetic location	CallingGeodeticLocation
NOTE 1 – Optional parameters may be absent, i.e. they are only mapped, if these parameters are available at the DP. NOTE 2 – If two high layer compatibility information elements are contained in the access transport parameter, then the second information element, carrying the preferred HLC, is mapped to the INAP highLayerCompatibility parameter. NOTE 3 – The choice whether to use the user service information or the TMR is a network option NOTE 4 – The first octet of the INAP carrier parameter is coded according to the first octet of Carrier Selection Information. NOTE 5 – Starting with the second octet of the carrier-parameter, the TNS may be included here. Instead of this, as a network option, also the "Carrier Id"-coding may be used for this second part of the carrier-parameter (see 14.1/Q.1238.2). If no TNS is received, the second part of the carrier-parameter may be determined by the CCF itself based on the analysis of the called party number.	

10.1.1.1.1 Connect operation

On receipt of a Connect operation from the SCP, the actions described in 7.2.2/Q.1902.4 [7] are performed. For routing of the call, the called party number is derived from the destinationRoutingAddress (see Table 5 – Mapping of parameters from Connect to IAM).

If no cutAndPaste parameter is received in the Connect operation, an ACM message may be sent to the preceding exchange if there is no outstanding O:COT, and the preceding bearer connection is

