INTERNATIONAL TELECOMMUNICATION UNION

ITU-T Q.1922.4

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

(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

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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.

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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 PSS1 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.

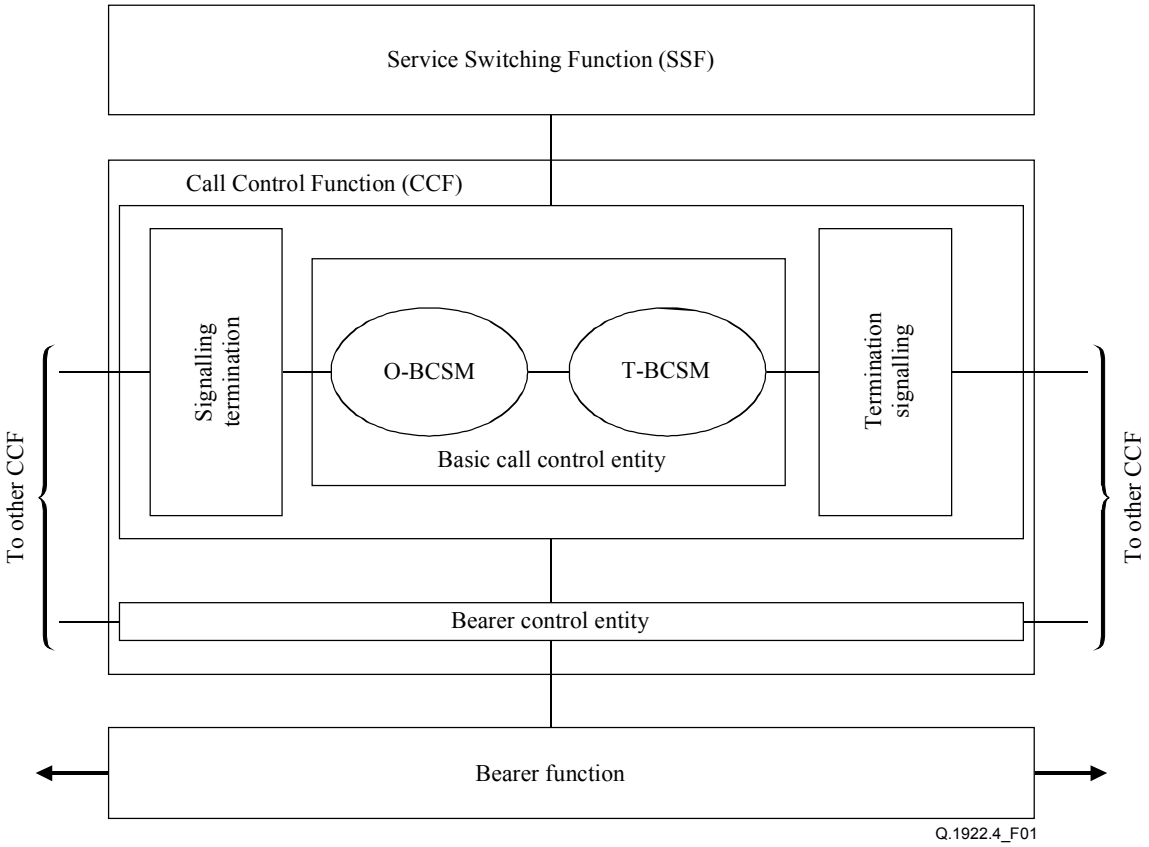


Figure 1/Q.1922.4 – CCF/SSF decomposition

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, refered 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.

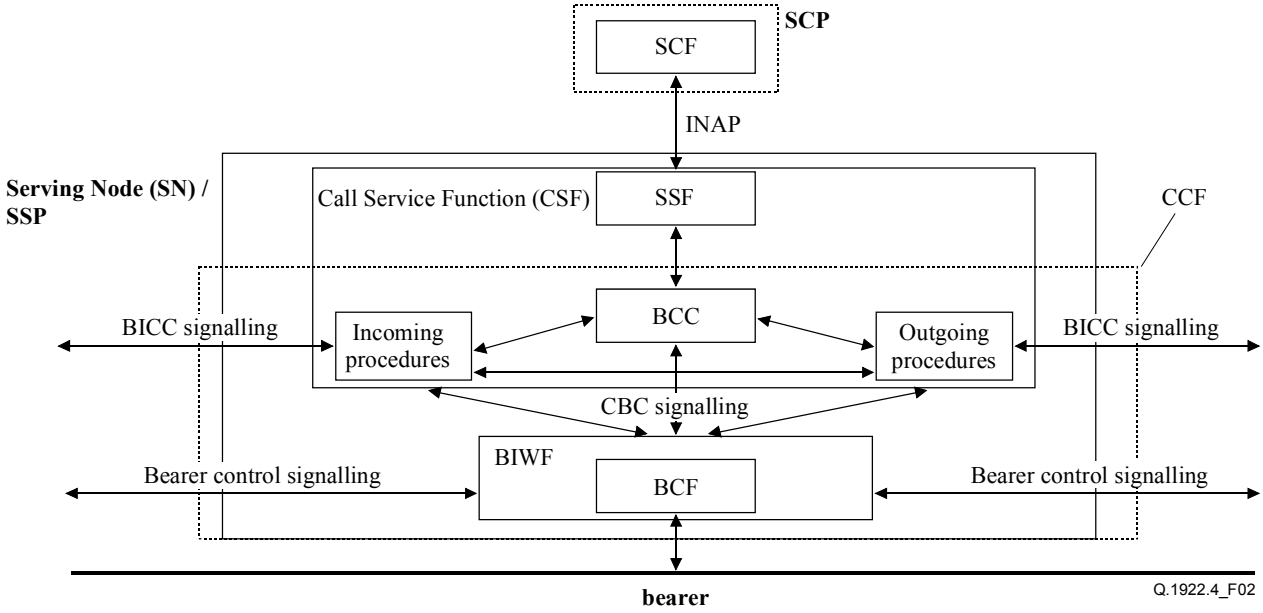


Figure 2/Q.1922.4 – Relationship between CCF/SSF model and BICC reference model

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	
AnalyseInformattion	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
RequestReportBCSMEvent	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.

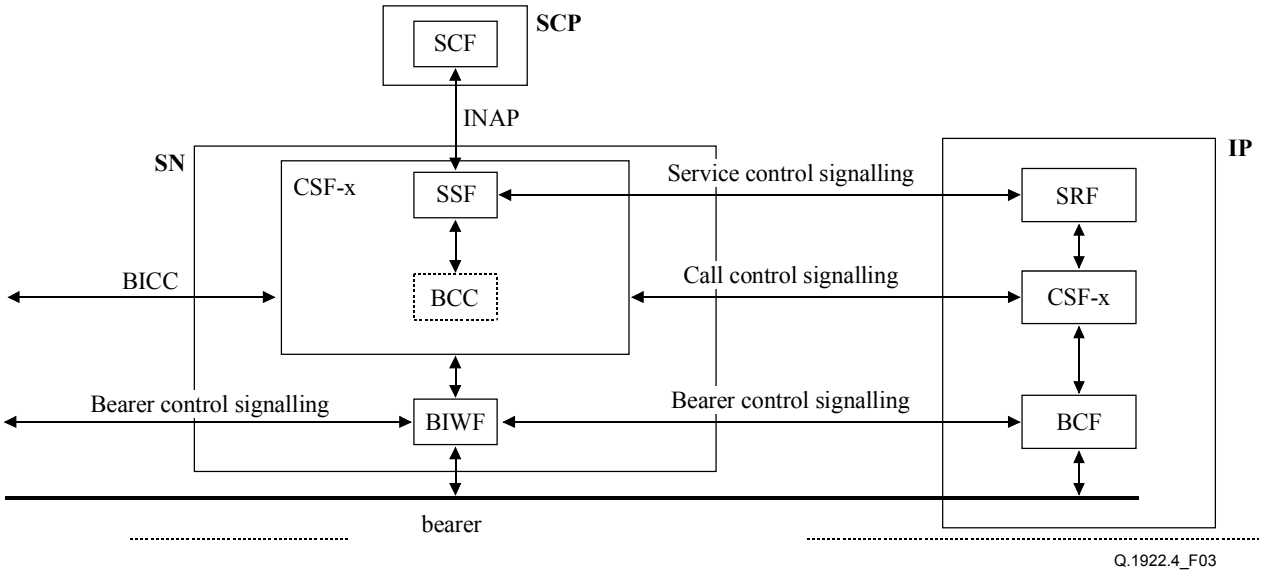


Figure 3/Q.1922.4 – Connection to IP with SSF relay of SRF operations

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.

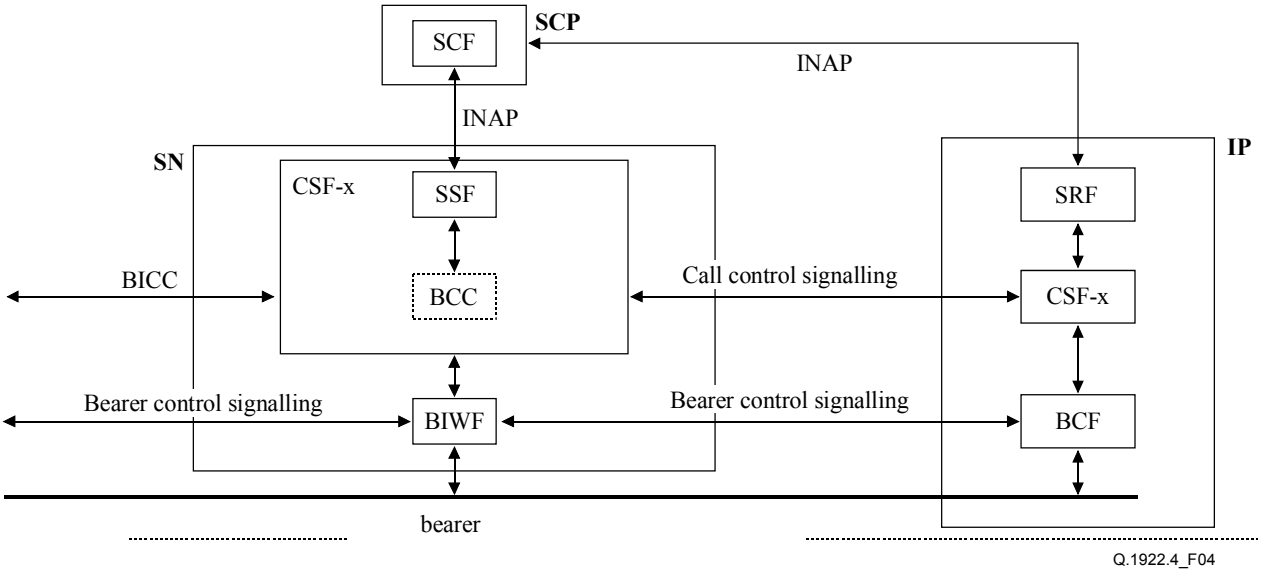


Figure 4/Q.1922.4 – External IP connected via BICC; direct TCAP link between SRF and SCF

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.

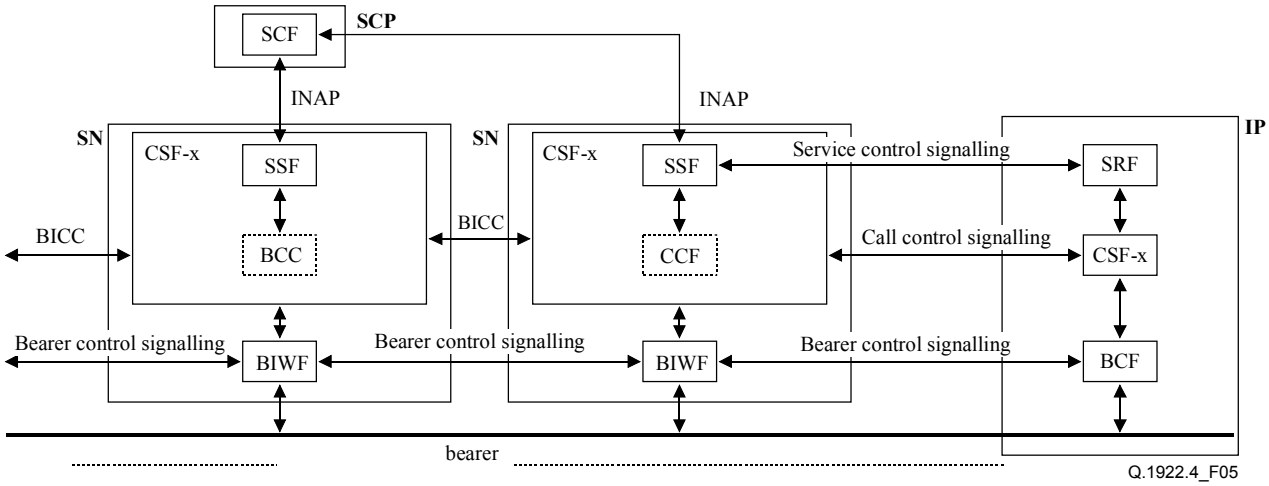


Figure 5/Q.1922.4 – IP attached to an assisting SSP ("Assist" method)

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.	

10.1.1.1.1.1 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

established. The ACM shall contain the corresponding BICC parameters if a serviceInteractionIndicatorsTwo parameter was received in the Connect operation (see below). Other optional parameters will not be sent. The backward call indicators parameter in the ACM is encoded as follows:

Charge indicator:	See 10.1.1.1.2 (SendChargingInformation operation)
Called party's status indicator:	00 (no indication)
Called party's category:	00 (no indication)
End-to-end method indicator:	00 (no end-to-end method available)
Interworking indicator:	0 (no interworking encountered)
End-to-end information indicator:	0 (no end-to-end information available)
ISDN User Part indicator:	1 (ISDN User Part used all the way)
Holding indicator:	National matter
ISDN access indicator:	1 (terminating access ISDN)
Echo Control device indicator:	see 8.4.2.1.2/Q.1902.4 [7]
SCCP method indicator:	00 (no indication)

NOTE – As a network operator option, the sending of the ACM message may be postponed to a later stage during call set-up.

Table 5 illustrates the mapping of parameters received in the Connect operation, to parameters sent in the IAM message to the succeeding exchange. Parameters which were received in the IAM and which are not replaced by parameters of the Connect operation, are treated according to the normal procedures.

On sending of the IAM, the awaiting address complete timer T7 is started. If timer T7 expires, the call is released in both directions and an appropriate indication is returned to the calling subscriber.

Table 5/Q.1922.4 – Mapping of parameters from Connect to IAM

INAP operation Connect (Note 1)	BICC message IAM
DestinationRoutingAddress (Note 2)	Called party number (Note 3)
CallingPartyNumber	(Note 4)
ServiceInteractionIndicatorsTwo	See 10.1.1.1.1.4 (Mapping of the INAP serviceInteractionIndicatorsTwo)
OriginalCalledPartyID	Original called number
CallingPartysCategory	Calling party's category
RedirectingPartyID	Redirecting number
RedirectionInformation	Redirection information
isdnAccessRelated Information	ATP (Note 5)
ForwardCallIndicators	Forward call indicators
GenericNumbers	Generic Number (Note 4)
Carrier (Note 6)	Carrier Selection Information
Carrier (Note 7)	Transit Network Selection
NOTE 1 – Optional parameters may be absent, i.e. they are only mapped, if received. NOTE 2 – The Connect operation sent by the SCF to the SSF may contain a list of up to three destination routing addresses. Following processing by the SSF, only one of these addresses is passed to BICC. NOTE 3 – The treatment of the called party number, in the case where the cutAndPaste parameter, is present in the Connect operation is described in [5] § 3.3.16. NOTE 4 – The mapping of this parameter must not compromise the existing services supported by BICC (MCID, CLIP, etc.). NOTE 5 – Due to the end-to-end significance of the ATP DSS1 information elements, only the "called party subaddress" and "calling party subaddress" contained in the "IsdnAccessRelatedInformation" are mapped to the "called party subaddress" and "calling party subaddress" of the ATP. Other information elements are copied from the ATP received on the incoming BICC. The mapping of these information elements must not compromise the existing services supported by BICC (CLIP, etc.). NOTE 6 – The first octet of the carrier-parameter is mapped to the first octet of the Carrier Selection Information. NOTE 7 – If the carrier-parameter contains more than one octet and the network option is "TNS", then the rest of the carrier parameter is copied into the Transit Network Selection parameter. In the case where the network option is "carrier Id", the mapping of this part of the carrier-parameter is network specific.	

10.1.1.1.1.2 Continue operation

On receipt of a Continue operation from the SCP, call processing is resumed and the call set-up is performed as described in 7.2.2/Q.1902.4 [7].

10.1.1.1.1.3 ContinueWithArgument operation

On receipt of a ContinueWithArgument operation from the SCP, call processing is resumed and the call set-up is performed as described in 7.2.2/Q.1902.4 [7].

In addition, the following parameter received from the SCP in the ContinueWithArgument operation is sent in the IAM by the SSP as shown in Table 6.

Parameters which were received in the IAM and are not replaced by parameters of the ContinueWithArgument operation, are treated according to the normal procedures.

Table 6/Q.1922.4 – Mapping of parameters from ContinueWithArgument to IAM

INAP operation ContinueWithArgument (Note)	BICC message IAM
serviceInteractionIndicatorsTwo	see 10.1.1.1.1.4 (Mapping of the INAP serviceInteractionIndicatorsTwo)
NOTE – Optional parameters may be absent, i.e. they are only mapped, if received.	

10.1.1.1.1.4 Mapping of the INAP serviceInteractionIndicatorsTwo

The INAP serviceInteractionIndicatorsTwo parameter contains information that is:

- only of local significance, i.e. to be treated in the SSP;
- relevant for the originating local exchange; or
- relevant for the destination local exchange.

NOTE – In the context of IN CS-4, the serviceInteractionsIndicatorsTwo is used. However, the serviceInteractionsIndicators may also be received, but the mapping of the serviceInteractionsIndicators is network operator specific.

Table 7 describes the mapping from the INAP to the BICC with regard to the serviceInteractionIndicatorsTwo.

Furthermore, for the IN basic call, the following rules shall apply:

a) If, in the INAP serviceInteractionIndicatorsTwo parameter, a value has been received indicated as default in Table 7, this value is mapped to the value "no indication" in the appropriate BICC parameter.

b) A BICC parameter is only included in a message, if the parameter contents is unequal to zero.

Table 7/Q.1922.4 – Mapping of the INAP serviceInteractionIndicatorsTwo

INAP serviceInteractionIndicatorsTwo	BICC parameter in ACM/CPG/CON/ANM	IAM
Call to be diverted indicator: – call diversion allowed (default); – call diversion not allowed.	–	**Call diversion treatment indicators parameter** Call to be diverted indicator: – no indication; – call diversion allowed; – call diversion not allowed.
Call to be offered indicator: – call offering not allowed (default); – call offering allowed.	–	**Call offering treatment indicators parameter** Call to be offered indicator: – no indication; – call offering not allowed; – call offering allowed.

Table 7/Q.1922.4 – Mapping of the INAP serviceInteractionIndicatorsTwo

INAP serviceInteractionIndicatorsTwo	BICC parameter in ACM/CPG/CON/ANM	BICC parameter in IAM
Conference at DLE accept. ind.: – accept conference request (default); – reject conference request.	–	**Conference treatment indicators parameter** Conference acceptance ind.: – no indication; – accept conference request; – reject conference request.
Conference at OLE accept. Ind.: – accept conference request (default); – reject conference request.	**Conference treatment indicators parameter** Conference acceptance ind.: – no indication; – accept conference request; – reject conference request.	–

If multiple IN services are invoked for a call, then the serviceInteractionIndicatorsTwo received via the INAP may conflict with the received BICC parameters transferring service interaction information. In this case, the BICC parameters to be sent in forward and backward direction shall transfer the most stringent condition, i.e. the non-default value (refer to Appendix II).

10.1.1.1.4.1 Interworking with an SN/CMN not supporting the parameters

No specific action is required. If the parameters cannot be transferred to the local exchanges, the behavior in these exchanges for IN calls is the same as for basic BICC calls. i.e. no IN controlled treatment of features is possible.

10.1.1.1.2 SendChargingInformation operation

The following mapping is not intended for freephone services but for supporting reverse charging on a per call basis.

The presence of the noCharge parameter in the SendChargingInformation operation indicates that no charge should be applied to the A-party.

If the partyToCharge parameter (also of the sendChargingInformation (SCI) operation) indicates the B-party, then the noCharge parameter, if present, should be ignored.

If the SCI operation is received by BICC after call set-up, then the noCharge parameter, if present, should be ignored.

If the noCharge parameter is determined not be ignored then this parameter should be mapped to the "Charge indicator" within the next backward signalling message which includes the backward call indicators parameter.

This mapping does not exclude a different mapping in a specific national network.

10.1.1.1.3 Address complete or connect message

The procedures as described in 7.7.2/Q.1902.4 [7] are applicable with the following exceptions:

Upon receipt of an ACM or CON message the awaiting address complete timer T7 is stopped. If an ACM message is received, the awaiting answer timer T9 is started.

If an ACM message has not been sent, the received message is passed on. The message shall contain the corresponding BICC parameters, if a serviceInteractionIndicatorsTwo parameter was received in the Connect operation (see 10.1.1.1.1.4 – Mapping of the INAP serviceInteractionIndicatorsTwo).

If an ACM message has already been sent, a received ACM message is mapped to a CPG message and a received CON message to an ANM message, respectively. The mapping of parameters is performed as described in the Call Diversion stage 3n description (see [11]).

10.1.1.1.4 Information message (national option)

The procedure as described in 8.12/Q.1902.4 is applicable. If call set-up information is missing, an INR message should be sent by the SSP before the InitialDP operation is sent to the SCP.

10.1.1.1.5 Answer message

Upon receipt of an ANM message, the awaiting answer timer T9 is stopped and the actions described in 7.8.2/Q.1902.4 [7] are performed.

10.1.1.1.6 Continuity check

If an IAM is received indicating that either a continuity check is requested or is performed on a previous circuit, the normal procedures as described in 7.6.2/Q.1902.4 [7] are applicable.

The setting of the continuity indicator in the outgoing IAM message and the conditions of sending a COT message and its coding, are as described in 7.6.2/Q.1902.4 [7].

NOTE – As opposed to ISUP/INAP interaction, the sending of the InitialDP is not delayed until a COT message is received.

10.1.1.1.7 Simple segmentation

With regard to the simple segmentation procedure the SSP behaves like a local exchange. Consequently, items d), e), f) of 12.2/Q.1902.4 [7] are applicable.

10.1.1.1.8 Pre-release Information message

Upon receipt of a PRI message by an SSP, the received information is stored and processed upon receipt of the associated release message as specified in 12.3/Q.1902.4.

When the SSP detects that additional information is to be sent at release time, this information is sent in a PRI message immediately prior to the REL message.

10.1.1.2 Normal call release

The CCF part of the SSP releases the call as described in item b) of clauses 11.2 and 11.3/Q.1902.4 [7]. For the SSF part of the SSP the general rules described in clause 6/Q.1238.2 [5] are applicable.

10.1.1.3 Suspend, resume

Upon receipt of a SUS message with the indication "network initiated", the timer T_{SUS} is started to ensure that a RES message with the indication "network initiated", or a REL message, is received. The received SUS message is not passed on. If the timer T_{SUS} expires, the procedures described in 10.2/Q.1902.4 [7] apply. The value of timer T_{SUS} depends on the time limits received in serviceInteractionIndicatorsTwo parameter.

10.1.1.4 ReleaseCall operation

Upon receipt of the ReleaseCall operation, the SSP sends REL messages in both directions. The cause indicators parameter contains the releaseCallArg parameter of the ReleaseCall operation. If no releaseCallArg was present, cause value #31 is sent. Furthermore, the normal procedures as described in clause 11/Q.1902.4 [7] are applicable.

10.1.1.5 Transfer of the called IN number and original called IN number

In all cases, the calledPartyNumber parameter sent in the InitialDP operation is transferred in the called IN number parameter to the succeeding exchange.

The address presentation restricted indicator of the Called IN number parameter is set according to the called IN number presentation restricted indicator received in the INAP serviceInteractionIndicatorsTwo parameter.

If the Called IN Number parameter had been received from the preceding exchange, but no Original Called IN Number was received, the contents of the received Called IN Number is transferred unchanged in the Original Called IN number parameter.

If an Original Called IN Number is received, it is passed on unchanged.

10.1.1.5.1 Interworking with a SN/CMN not supporting the called IN number or the original called IN number parameter

No specific action is required.

10.1.1.6 Abnormal conditions

10.1.1.6.1 General requirements on receipt of unrecognized signalling information messages and parameters

With regard to the handling of unrecognized signalling information, an SSP behaves like a type A exchange.

NOTE – In the future this limit may be relaxed.

10.1.2 IN call with SCP request to collect further digits

After sending the InitialDP operation to the SCP, a RequestReportBCSMEvent operation to arm DP CI accompanied by a CollectInformation operation, may be received from the SCP (see clause 6/Q.1238.5 [4], referred to as unmodified in ITU-T Rec. Q.1248). In this case, the specified number of digits is collected in the SSP. Encountering DP CI, i.e. the specified number of digits has been received, will result in sending an EventReportBCSM operation or a CollectedInformation operation, respectively, to the SCP.

In addition to 10.1.1.5, the digits sent to the SCP in the EventReportBCSM operation, or the CollectedInformation operation, shall be taken into account when constructing the called IN number parameter.

There is no further impact on the BICC protocol, and the call handling will continue as described in 10.1.1 (IN basic call), unless a further RequestReportBCSMEvent operation to arm DP CI, accompanied by a CollectInformation operation, is received from the SCP. In this case, the procedure described above is repeated.

10.1.3 Detection point processing

10.1.3.1 General

The SCF uses the RequestReportBCSMEvent operation to request the SSF to monitor for call-related events. The monitor mode is indicated in the operation as either "interrupted" or "notifyAndContinue".

In the "notifyAndContinue" mode the event is reported as EDP-N (notification mode) in the EventReportBCSM operation or a DP-specific operation, respectively, to the SCF and normal call processing continues as described in 10.1.1 (IN basic call).

In the "interrupted" mode, the event is reported as EDP-R (request mode) in the EventReportBCSM operation or a DP specific operation, respectively, and the SSF will wait for instructions from the SCF.

Table 8/Q.1922.4 – Event detection points

DP	DP encountered on.. .
CI	See 10.1.2 (IN call with SCP request to collect further digits).
OTS, CA	Receipt of an ACM or CPG message with an alerting indication.
RSF	Receipt of a route select failure event from called destination. Cause value maps to RSF according to 6.3.5/Q.1238.2 (Note).
OCPB, TB	Receipt of a REL message with cause value mapping to "busy" in 6.3.5/Q.1238.2 (Note).
ONA, TNA	Expiry of timer $T_{noReply}$.
OAns, TAns	Receipt of an ANM or CON message.
OS, TS	Receipt of a SUS message with the indication "network initiated".
ORA, TRA	Receipt of a RES message with the indication "network initiated".
OD, TD	a) Receipt of a REL message with cause value mapping to "disconnect" in 6.3.5/Q.1238.2 in the active phase of a call (Note). b) Expiry of timer T_{SUS}.
OAb, Tab	Receipt of a REL message with cause value mapping to "abandon" according to 6.3.5/Q.1238.2 from a preceding exchange before the call is answered (Note).
NOTE – The mappings defined in 6.3.5/Q.1238.2 only defines mappings for the 128 cause values specified in ITU-T Rec. Q.850. The network operator shall have the possibility to define mapping between cause values and DPs for cause values greater 127.	

In the following subclauses, the differences in call processing for IN calls with dynamically armed detection points compared to the procedures described in 10.1.1 (IN basic call) and 10.1.4 (Set-up of an IN call to destination B) are listed.

10.1.3.1.1 Address complete message

On receipt of an ACM message without cause parameter, the timer $T_{NoReply}$ is started if either DP ONA or TNA has been armed by the SCF. Event report to SCF, see 10.1.3.1.

10.1.3.1.2 Answer or connect message

The timer $T_{NoReply}$ is stopped, if applicable. Event report to SCF, see 10.1.3.1.

10.1.3.1.3 Release message

If a REL is received from either the preceding or succeeding CSF and corresponds to a DP armed as EDP-N (notification mode), the CCF part of the SSP releases the call like an ordinary transit exchange. For the SSF part of the SSP, the general rules described in clause 6/Q.1238.2 [4] are applicable.

If a REL is received from the preceding or succeeding CSF at a CMN, and corresponds to a DP armed as EDP-R (request mode), the CCF part of the SSP releases the call like an ordinary CMN. For the SSF part of the SSP, the general rules described in clause 6/Q.1238.2 [4] are applicable.

If a REL is received at an SN from the preceding CSF and corresponds to a DP armed as EDP-R (request mode), the CCF part of the SSP releases the call like an ordinary transit SN. For the SSF part of the SSP, the general rules described in clause 6/Q.1238.2 [4] are applicable.

If a REL is received at an SN from the succeeding CSF and corresponds to a DP armed as EDP-R (request mode), the CCF part of the SSP releases the outgoing leg of the connection (both call control and bearer control related disconnection) and holds the incoming signalling leg.

NOTE – This procedure does not directly apply in the CMN case but methods for remotely influencing bearer control have to be introduced (e.g. bearer redirection).

For the SSF part of the SSP, the general rules described in clause 6/Q.1238.2 [4] are applicable. The call processing is suspended, and the SSP waits for SCP instructions.

10.1.3.2 Actions to be performed in case of DPs armed in the request mode (except for DP Collect information)

10.1.3.2.1 Storage and release of initial address information

Initial address information is not released from memory on receipt of an ACM message. This is not true for a possible received bearer related information (e.g. Codec List for codec negotiation), because the bearer redirect procedure will completely renegotiate bearer information.

NOTE – Memory capacity in the exchange may limit the use of services requiring the storage of initial address information.

10.1.3.2.2 Signalling procedures for connection type allowing fallback

If:

a) an IAM was received with the TMR value set to "64 kbit/s unrestricted preferred"; and

b) no fallback has already been performed,

then a fallback is performed on receipt of the Connect operation as described in 8.6/Q.1902.4 [7].

10.1.3.2.3 Impact on supplementary services

10.1.3.2.3.1 User-to-user signalling

10.1.3.2.3.1.1 User-to-user signalling, service 1

If user-to-user service 1 is implicitly requested, the user-to-user information parameter is discarded from the IAM message and the user-to-user indicators parameter indicating "user-to-user information discarded by the network" is sent in the ACM message,

If the user-to-user service 1 was explicitly requested as "not essential", the user-to-user indicators parameter is discarded from the IAM and service 1 is indicated as "not provided" in the ACM.

If the user-to-user service 1 was explicitly requested as "essential", the call is cleared with cause value #29 and diagnostics in the REL message.

10.1.3.2.3.1.2 User-to-user signalling, service 2

If the user-to-user service 2 was explicitly requested as "not essential", the user-to-user indicators parameter is discarded from the IAM and service 2 is indicated as "not provided" in the ACM.

If the user-to-user service 2 was explicitly requested as "essential", the call is cleared with cause value #29 and diagnostics in the REL message.

10.1.3.2.3.1.3 User-to-user signalling, service 3

a) *Service request during call set-up*

If the user-to-user service 3 was explicitly requested as "not essential", the user-to-user indicators parameter is discarded from the IAM and service 3 is indicated as "not provided" in the ACM.

If the user-to-user service 3 was explicitly requested as "essential", the call is cleared with cause value #29 and diagnostics in the REL message.

b) *Service request after call set-up*

An FRQ with facility indicators set to "user-to-user service" and the user-to-user indicators parameter (containing the relevant service 3 information) is responded by an FRJ message indicating "not provided" for service 3 in the user-to-user indicators.

10.1.4 Set-up of an IN call to destination B

This clause describes the set-up of an IN call to destination B after a user interactive dialogue has been performed, or after the SSF has reported an EDP-R in the EventReportBCSM operation, or a DP specific operation, respectively, to the SCF. In these situations, the call set-up differs from the normal call set-up for the "IN basic call".

10.1.4.1 Successful call set-up

10.1.4.1.1 Forward address signalling

10.1.4.1.1.1 Connect operation

On receipt of the Connect operation, the actions described in 10.1.1.1.1.1 (Connect operation) are performed with the following exception:

a) An ACM message is sent towards the originating local exchange, if none had been sent before, when the following conditions are satisfied:

- if the incoming IAM indicated *"COT to be expected"*, a Continuity message, with the Continuity Indicators parameter set to *"continuity"*, has been received.
- the incoming bearer set-up procedure is successfully completed.

10.1.4.1.2 Mapping of the INAP serviceInteractionIndicatorsTwo

The SCF logic may generate new service interaction information for the call.

In this case, the indicators of the INAP serviceInteractionIndicatorsTwo parameter relevant for the forward direction, i.e. to be mapped into the IAM, are treated as described in 10.1.1.1.1.4 (Mapping of the INAP serviceInteractionIndicatorsTwo).

The handling of the indicators relevant for the backward direction is, however, different:

- The indicators contained in the received INAP serviceInteractionIndicatorsTwo parameter are compared one by one against the indicators that are stored in the SSP, i.e. that have been received in an earlier INAP operation.
- If the received value of an indicator differs from the one that is stored in the SSP, then this indicator is mapped to the corresponding value in the appropriate BICC parameter.
- If the received value of an indicator is equal to the one that is stored in the SSP, then this indicator is mapped to the value "no indication" in the appropriate BICC parameter.

If, for the call, no new service interaction information was received, then the exchange applies the information that is stored, i.e. the forward indicators sent in the IAM are the same as for the previous connection, backward indicators need not be sent.

10.1.4.1.3 Sending of backward messages

If backward messages have already been sent to preceding exchanges, it may be required:

a) to map a received message into another message; or

b) to generate another message instead of the message, that would normally be generated.

Table 9 describes which message is to be sent in the different cases.

Table 9/Q.1922.4 – Sending of backward messages

Message received or message to be sent, respectively ➔ / **Messages already sent** ⬇	**ACM**	**CPG "alerting" or "in-band information or an.. ."**	**CPG "progress"**	**CON**	**ANM**
ACM/CON not sent	ACM (Note 1)	Not relevant	Not relevant	CON (Note 1)	Not relevant
ACM sent, ANM not sent	CPG (Note 1)	CPG	CPG	ANM (Note 1)	ANM
ANM/CON sent for previous connection, but ANM/CON not received for actual connection	CPG "progress" (Notes 1 and 2)	CPG "progress" (Note 2)	CPG "progress"	CPG "progress" (Notes 1 and 2)	CPG "progress" (Note 2)
ANM/CON sent for previous connection and ANM/CON received for actual connection	Not relevant	Not relevant	CPG "progress"	Not relevant	Not relevant
NOTE 1 – If a serviceInteractionIndicatorsTwo parameter was provided in the INAP operation, this message carries the corresponding BICC parameters, if applicable. NOTE 2 – An originating local exchange conforming to [1] discards this CPG message since no generic notification parameter is contained in the message.					

10.1.4.1.4 Address complete message

Upon receipt of an ACM message the following actions shall be performed:

a) The awaiting address complete timer T7 is stopped.

b) If a UID action indicators parameter indicates "stop or do not start T9", then the SSP shall not start/shall stop timer T9 and shall start timer T_{UID}, else timer T9 is started or restarted, respectively.

c) If a UID action indicators parameter indicates "through-connect in both directions", the SSP shall through-connect the transmission path in both directions (if not already connected).

Which message is sent to preceding exchanges is described in 10.1.4.1.3 (Sending of backward messages). If the ACM contains a UID action indicators parameter, then the parameter shall be passed on transparently to preceding exchanges unless an ANM has already been sent.

10.1.4.1.5 Call Progress message (Basic call)

Upon receipt of a CPG message the following actions shall be performed:

a) If a UID action indicators parameter indicates "stop or do not start T9", then SSP shall not start/shall stop timer T9 and shall start timer T_{UID}.

b) If a UID action indicators parameter indicates "through-connect in both directions", the SSP shall through-connect the transmission path in both directions (if not already connected).

Which message is sent to preceding exchanges is described in 10.1.4.1.3 (Sending of backward messages). If the CPG contains a UID action indicators parameter, then the parameter shall be passed on transparently to preceding exchanges unless an ANM message has already been sent.

10.1.4.1.6 Connect message

Upon receipt of a CON message, the awaiting address complete timer T7 is stopped and the transmission path is throughconnected in forward direction, if not already connected.

Which message is sent to preceding exchanges is described in 10.1.4.1.3 (Sending of backward messages).

10.1.4.1.7 Answer message

Upon receipt of an ANM message, the awaiting answer timer T9 or the timer T_{UID}, respectively, is stopped and the transmission path is throughconnected in forward direction, if not already connected.

Which message is sent to preceding exchanges is described in 10.1.4.1.3 (Sending of backward messages).

10.1.4.2 Timer T_{UID} expiry

If T_{UID} expires, the call is released using cause value #31 (normal, unspecified).

10.1.4.3 Abnormal conditions

10.1.4.3.1 Handling of unexpected messages

The procedures described in 13.4.2/Q.1902.4 [7] are applicable with the following exceptions:

a) If an ACM message has already been sent for the incoming leg of the call, but an ACM has not been received for the outgoing leg of the call, then
   i) a CPG received in forward direction shall be discarded, i.e. the message is not treated as an unexpected message;
   ii) an unrecognized message received in forward direction shall not be passed on and the procedure described in item xi) of 13.4.3/Q.1902.4 [7] shall be applied.

b) If an ANM message has already been sent for the incoming leg of the call, but an ANM has not been received for the outgoing leg of the call, then the following messages received in forward direction shall be discarded, i.e., the messages are not treated as unexpected messages: SUS, RES, FAR and FOT.

10.1.4.4 Impact on supplementary services

10.1.4.4.1 Call hold

On receipt of a CPG message with the generic notification indicator set to "remote hold", a note in memory shall be set. The note shall be reset on receipt of a CPG message with the generic notification indicator set to "remote retrieval".

If the note is set on receipt of a connect operation, then an artificial CPG message with the generic notification indicator set to "remote retrieval" shall be generated.

10.1.4.4.2 Malicious call identification

On receipt of an IDR message two cases exist:

a) If an IDR or an ANM was already sent to the preceding exchange, then the IDR message is not passed on and is immediately responded to by an IRS message.

b) If an IDR was not sent to the preceding exchange, then the IDR message is passed on transparently towards the originating local exchange.

If bit A of the MCID request indicators was set to 1, then, in addition to the normal procedure, the service switching point includes the charged party identification parameter, if available, into the IRS message.

10.1.5 User interactive dialogue (in-band)

If in response to the InitialDP operation, the EventReportBCSM operation or a DP specific operation, a ConnectToResource or EstablishTemporaryConnection operation is received from the SCF, then the incoming call shall be connected to a physical entity containing the SRF, i.e. intelligent peripheral (IP). In case of ConnectToResource, the SSP that interacts with the SCP supports the requested IP capabilities, and the IP is therefore either integrated or co-located in the SSP. In case of EstablishTemporaryConnection, the IP is available in another network element. Consequently, the Assist method is applied.

10.1.5.1 SSP supports requested IP capabilities

10.1.5.1.1 Successful call set-up

10.1.5.1.1.1 Forward address signalling

10.1.5.1.1.1.1 ConnectToResource operation

On receipt of the ConnectToResource operation at an SN, the IP is connected to the incoming call if the TMR value received in the IAM message is set to either "speech" or "3.1 kHz audio" or "64 kbit/s unrestricted preferred". For the latter case, see also 10.1.3.2.2 (Signalling procedures for connection type allowing fallback). If other TMR values are received, the call is released using cause value #65.

As the further call setup to the SRF is bound to the establishment of the complete incoming bearer connection, depending on network specific configurations, the following options for further call setup are possible:

1) In case the SRF supports the Continuity Check protocol, the setup to the SRF will continue. An ACM will be sent backwards by the SN when the following conditions are satisfied:
   - if the incoming IAM indicated *"COT to be expected"*, a Continuity message, with the Continuity Indicators parameter set to *"continuity"* has been received;
   - the incoming bearer set-up procedure is successfully completed.
2) In case the SRF does not support the Continuity Check protocol, the setup to the SRF will be delayed until the following conditions are satisfied:
   - if the incoming IAM indicated *"COT to be expected"*, a Continuity message, with the Continuity Indicators parameter set to *"continuity"* has been received.
   - the incoming bearer set-up procedure is successfully completed.

An ACM will be sent backwards when the above conditions are satisfied.

In this case, the codec negotiation in the SN (acting as Terminating SN) depends on the internal knowledge of the capabilities of the SRF. In the worst case, the SN may have to start a codec modification when the setup starts to the called party.

NOTE 1 – This possible delay has to be taken into account for the provision of the application timers in the SCF.

NOTE 2 – In case of a CMN, these procedures cannot be directly applied but methods for remotely influencing bearer control have to be introduced (e.g. bearer redirection).

10.1.5.1.1.2 Address complete message or call progress message

An ACM message containing an optional backward call indicators parameter indicating "in-band information, or an appropriate pattern is now available", is sent depending on the options mentioned in 10.1.5.1.1.1. The backward call indicators parameter in the ACM is encoded as described in 10.1.1 (IN basic call).

Depending on the contents of the INAP serviceInteractionIndicatorsTwo and capabilities of the preceding exchanges, the UID action indicators parameter may be included in the ACM:

a) *Through-connection instruction*

If the bothway through-connect indicator in the serviceInteractionIndicatorsTwo parameter of the ConnectToResource operation was set to "required", and if a UID capability indicators parameter was received with bit A coded 1 (through-connection modification possible) in the IAM, then the UID action indicators parameter shall be included into the ACM message with bit A coded (through-connect in both directions).

b) *T9 timer instruction*

If the dialogue duration indicator in the serviceInteractionIndicatorsTwo parameter of the ConnectToResource operation was set to "long duration" and if a UID capability indicators parameter was received with bit B coded 1 (stopping of timer possible) in the IAM, then a UID action indicators parameter shall be included into the ACM with bit B coded 1 (stop or do not start T9).

If backward messages have already been sent to preceding exchange then, instead of ACM, a CPG message is sent. This is described in 10.1.4.1.3 (Sending of backward messages). The CPG message shall contain the UID action indicators parameter as described above for the ACM message.

10.1.5.1.1.3 Answer message

When the IP answers, the sending of an ANM message depends on the following conditions:

a) If the bothway through-connect indicator in the serviceInteractionIndicatorsTwo parameter of the ConnectToResource operation was set to "required", and if a through-connection capability indicator set to "through-connection modification possible" was not received in the IAM, then an ANM message is sent.

b) If the dialogue duration indicator in the serviceInteractionIndicatorsTwo parameter of the ConnectToResource operation was set to "long duration", and if a T9 timer indicator set to "stopping of timer possible" was not received in the IAM, then an ANM message is sent.

If backward messages have already been sent to preceding exchange then, instead of ANM, a different message may be sent. This is described in 10.1.4.1.3 (Sending of backward messages).

NOTE – The sending of an ANM message may also be required, if a chargeable announcement is to be connected. However, charging aspects are outside the scope of this Recommendation.

10.1.5.1.2 Storage and release of initial address information

Initial address information is retained in memory to allow a call set-up to a new destination after disconnecting the IP. This is not true for a possible received bearer-related information (e.g. Codec List for codec negotiation), because the bearer redirect procedure will completely renegotiate bearer information.

NOTE – Memory capacity in the exchange may limit the use of services requiring the storage of initial address information.

10.1.5.1.3 Signalling procedures for connection type allowing fallback

If:

a) the TMR value received in the IAM is set to "64 kbit/s unrestricted preferred";

b) no fallback has already been performed; and

c) an ANM message is to be sent, i.e., the bothway throughconnect indicator in the serviceInteractionIndicatorsTwo parameter of the ConnectToResource operation was set to "required",

then a fallback is performed on receipt of the ConnectToResource operation as described in 8.6/Q.1902.4 [7].

10.1.5.1.4 DisconnectForwardConnection operation

When the DisconnectForwardConnection operation is received, the IP is disconnected.

10.1.5.1.5 Impact on supplementary services

10.1.5.1.5.1 Connected line identification presentation

The following text is only applicable if an ANM message is to be sent for the IP connection and no ANM message was sent before.

If the connected line identity was requested by the calling user, the SSP behaves as follows:

If "no impact" was received in the INAP serviceInteractionIndicatorsTwo (connected number treatment indicator):

a) and a connected number is available for the IP, the procedure as described in 5.5.2.5/Q.731.5 and .6 is performed.

b) and a connected number is not available for the IP, the SSP sends a connected number parameter in the ANM message encoded as follows:

nature of address indicator:	0000000
numbering plan indicator:	000
address presentation restricted indicator:	10 (address not available)
Screening indicator:	11 (network provided), no address signals.

If "presentation restricted" was received in the INAP serviceInteractionIndicatorsTwo (connected number treatment indicator):

a) and a connected number is available for the IP, the procedure as described in 6.5.2.5/Q.731.5 and .6 is performed.

b) and a connected number is not available for the IP, then the SSP sends a connected number parameter in the ANM message encoded as shown in item b above.

If "present called IN number" was received in the INAP serviceInteractionIndicatorsTwo, then:

a) A connected number parameter is generated as follows:

nature of address indicator and numbering plan indicator are encoded as received in the called party number of the IAM message,

address presentation restricted indicator:	00 (presentation allowed);
address signals:	as received in called party number or subsequent number parameters, respectively, until ACM message was sent.

b) A generic number parameter "additional connected number" is not sent.

10.1.5.1.5.2 User-to-user signalling

The text in the following three clauses is only applicable, if an ANM message is to be sent for the IP connection, and if an ANM message was not sent before.

10.1.5.1.5.2.1 User-to-user signalling, service 1

If user-to-user service 1 is implicitly requested, the user-to-user information parameter is discarded from the IAM message and the user-to-user indicators parameter indicating "user-to-user information discarded by the network" is sent in the ACM message.

If the user-to-user service 1 was explicitly requested as "not essential", the user-to-user indicators parameter is discarded from the IAM and service 1 is indicated as "not provided" in the ACM.

If the user-to-user service 1 was explicitly requested as "essential", the call is cleared with cause value #29 and diagnostics in the REL message.

10.1.5.1.5.2.2 User-to-user signalling, service 2

If the user-to-user service 2 was explicitly requested as "not essential", the user-to-user indicators parameter is discarded from the IAM and service 2 is indicated as "not provided" in the ACM.

If the user-to-user service 2 was explicitly requested as "essential", the call is cleared with cause value #29 and diagnostics in the REL message.

10.1.5.1.5.2.3 User-to-user signalling, service 3

a) *Service request during call set-up*

If the user-to-user service 3 was explicitly requested as "not essential", the user-to-user indicators parameter is discarded from the IAM and service 3 is indicated as "not provided" in the ACM.

If the user-to-user service 3 was explicitly requested as "essential", the call is cleared with cause value #29 and diagnostics in the REL message.

b) *Service request after call set-up*

An FRQ with facility indicators set to "user-to-user service" and the user-to-user indicators parameter (containing the relevant service 3 information) is responded by an FRJ message indicating "not provided" for service 3 in the user-to-user indicators.

10.1.5.2 Assist method – procedure in the initiating SSP

10.1.5.2.1 Successful call set-up

10.1.5.2.1.1 Forward address signalling

10.1.5.2.1.1.1 EstablishTemporaryConnection operation

On receipt of the EstablishTemporaryConnection operation at an SN from the SCP, a connection to an external IP is established if the TMR value received in the IAM message is set to either "speech" or "3.1 kHz audio" or "64 kbit/s unrestricted preferred". For the latter case, see also 10.1.3.2.2 (Signalling procedures for connection type allowing fallback). If other TMR values are received, the call is released using cause value #65.

The IAM message for set-up of the temporary connection is newly generated as in an originating local exchange. The IAM or the backward ACM has to be delayed according to different SRF options as described in 10.1.5.1.1.1.1.

For routing of the call, the called party number is derived from the assistingSSPIPRoutingAddress.

Table 10 illustrates the mapping of parameters received in the EstablishTemporaryConnection operation to parameters sent in the IAM message.

Table 10/Q.1922.4 – Mapping of parameters from EstablishTemporaryConnection to IAM

INAP operation EstablishTemporaryConnection (Note)	BICC message IAM
assistingSSPIPRoutingAddress	Called party number
serviceInteractionIndicatorsTwo	See 10.1.1.1.1.4 (Mapping of the INAP serviceInteractionIndicatorsTwo)
correlationID	Correlation id
ScfID	SCF id
NOTE – Optional parameters may be absent, i.e., they are only mapped if received.	

Except the called party number parameter the remaining mandatory parameters of the IAM message are set as follows:

a) Nature of connection indicators:

Satellite indicator:	set as in an OLE
Continuity indicator:	set according to handling described in 10.1.1.1.6
Echo control device indicator:	set as in an OLE

b) Forward call indicators:

National/international call indicator:	set as in an OLE
End-to-end method indicator:	00 (no end-to-end method available)
Interworking indicator:	0 (no interworking encountered)
End-to-end information indicator:	0 (no end-to-end information available)
ISDN user part indicator:	1 (ISDN user part used all the way)
ISDN user part preference indicator:	10 (ISDN user part required all the way)
ISDN access indicator:	0 (originating access non-ISDN)
SCCP method indicator:	00 (no indication)

c) Calling party's category:

00001010 (ordinary subscriber).

d) Transmission medium requirement:

00000011 (3.1 kHz audio).

Besides the parameters listed in Table 10 (Mapping of parameters from EstablishTemporaryConnection to IAM), the IAM contains the following optional parameters:

- propagation delay counter (set as in an OLE);
- hop counter (set as in an OLE). The necessary optional parameters according to BAT ASE for bearer data may be set as in forward call setup for transit nodes (7.2.2/Q.1902.4 [7]).

On sending of the IAM, the awaiting address complete timer T7 is started.

In the case of unsuccessful establishment of temporary connection, e.g., expiry of timer T7, or route busy to the SRF, the SSP should return ETCfailed error to the SCP. The SSP remains in the same state.

The ACM message is sent to the preceding exchange encoded as described in 10.1.1 (IN basic call).

10.1.5.2.1.1.2 Interworking with a SN/CMN not supporting the Correlation Id and SCF Id parameters

If the parameters cannot be transferred to the assisting SSP, the set-up of the connection will fail.

10.1.5.2.1.2 Address complete message

Refer to 10.1.4.1.4.

10.1.5.2.1.3 Call Progress message (Basic call)

Refer to 10.1.4.1.5.

10.1.5.2.1.4 Connect message

Refer to 10.1.4.1.6.

10.1.5.2.1.5 Answer message

Refer to 10.1.4.1.7.

10.1.5.2.2 Storage and release of initial address information

In the initiating SSP, initial address information is retained to allow a call set-up to a new destination after disconnecting the IP.

NOTE – Memory capacity in the exchange may limit the use of services requiring the storage of initial address information.

10.1.5.2.3 DisconnectForwardConnection operation

When the DisconnectForwardConnection operation is received from the SCP, the normal release procedures are applied for the outgoing circuit. The REL message sent in forward direction contains cause value #31.

10.1.5.2.4 DisconnectForwardConnectionWithArgument operation

When the DisconnectForwardConnectionWithArgument operation is received from the SCP the normal release procedures are applied for the outgoing circuit. The REL message sent in forward direction contains cause value #31.

10.1.5.2.5 Abnormal conditions

10.1.5.2.5.1 Handling of unexpected messages

Refer to 10.1.4.3.1.

10.1.5.2.6 Impact on supplementary services

The actions as described in 10.1.4.4 are applicable.

10.1.5.3 Hand-off method – Procedure in the initiating SSP

On receipt of a Connect operation from the SCP, the actions described in 10.1.1 (IN basic call) or in 10.1.4 (Set-up of an IN call to destination B) are performed. The INAP correlationID and scfID parameters are mapped to the corresponding BICC parameters in the IAM message.

10.1.5.4 Assist/Hand-off method – Procedure in the assisting SSP

10.1.5.4.1 Successful call set-up

10.1.5.4.1.1 Forward address signalling

If an IAM is received in an SSP and the call is recognized as a call which is to be routed to an IP, an AssistReqInstructions operation is sent from the SSF to the SCF. The mapping of parameters is shown in Table 11.

Table 11/Q.1922.4 – Mapping of parameters from IAM to AssistRequestInstruction

BICC message IAM	INAP operation AssistRequestInstruction
Correlation id	correlationID

10.1.5.4.1.1.1 ConnectToResource operation

The procedure to be performed after receipt of the ConnectToResource operation is identical to the procedure described in 10.1.5.1 (SSP supports requested IP capabilities).

10.1.6 Call gapping

When receiving the CallGap operation, the SSF reduces the rate at which specific service requests are sent to the SCF. The detailed procedure is described in 11.4.2/Q.1224 [2] .

If the call is to be gapped and the gapTreatment parameter was present in the CallGap operation, then:

a) If the "informationToSend" indicates announcement or tone, then the ACM message contains an optional backward call indicators parameter indicating "in-band information or an appropriate pattern is now available" when the following conditions are satisfied (see Note):

- if the incoming IAM indicated *"COT to be expected"*, a Continuity message, with the Continuity Indicators parameter set to *"continuity"* has been received.
- the incoming bearer set-up procedure is successfully completed.

NOTE – This possible delay has to be taken into account for the provision of the application timers in the SCF.

After the calling user has received the "informationToSend", the call is released and the cause indicators parameter contains the releaseCause parameter of the CallGap operation. If no releaseCause was present, cause value #31 is sent.

b) If the "informationToSend" indicates display information, then the call is released and a display information parameter is included in the REL message. The cause indicators parameter contains the releaseCause parameter of the CallGap operation. If no releaseCause was present, cause value #31 is sent.

If the gapTreatment is not present in the CallGap operation, the SSF will use a default treatment depending on network-operator implementation.

10.1.7 Service filtering

When receiving the ActivateServiceFiltering operation, the SSF handles calls which are to be filtered in a specified manner without request for instructions to the SCF. The detailed procedure is described in 11.2.14/Q.1224 [2].

a) If a call is to be filtered and the "informationToSend" indicates announcement or tone, then an ACM message is sent to the preceding exchange with an optional backward call indicators parameter indicating "in-band information or an appropriate pattern is now available" when the following conditions are satisfied (Note):

- if the incoming IAM indicated *"COT to be expected"*, a Continuity message, with the Continuity Indicators parameter set to *"continuity"* has been received.
- the incoming bearer set-up procedures is successfully completed.

NOTE – This possible delay has to be taken into account for the provision of the application timers in the SCF.

In the case of a chargeable in-band information, an ANM is sent in addition. After the calling user has received the "informationToSend" the call is released and the cause indicators parameter contains the releaseCause parameter of the ServiceFiltering operation. If no releaseCause was present, cause value #31 is sent.

b) If a call is to be filtered and the "informationToSend" indicates display information, then:

- if the "informationToSend" is free of charge, the call is released and a display information parameter is included in the REL message. The cause indicators parameter contains the releaseCause parameter of the ServiceFiltering operation. If no releaseCause was present, cause value #31 is sent;
- if the "informationToSend" is not free of charge, an ANM message containing the display information parameter is sent. Then the call is released and the cause indicators parameter contains the releaseCause parameter of the ServiceFiltering operation. If no releaseCause was present, cause value #31 is sent.

10.1.7.1 Impact on supplementary services

10.1.7.1.1 Closed user group

If the call is a CUG call with outgoing access not allowed, then the "informationToSend" is not provided and the call is released using cause value #29 with diagnostics. The diagnostics field contains the CUG interlock code parameter name.

10.1.8 SCP-initiated call

For an SCP-initiated call, the SSP behaves like an originating local exchange with the exception that no information is received/sent from/to the access protocol. The call set-up information needed for the generation of the IAM message is partly provided with the InitiateCallAttempt operation. The remaining mandatory fields of the IAM message are supplied with default values. This is described in the subclauses below.

As there is no setup information received from an incoming access protocol, there is no implicit creation of a bearer connection, when the call legs of an SCP initiated call are build. An intermediate default BIWF may be used for the bearer setup. This intermediate bearer connection may be used for applying tones or announcements. If, later on, other legs are to be connected to a leg created with InitiateCallAttempt, a redirection of the bearer connections may be required.

10.1.8.1 Successful call set-up

10.1.8.1.1 Forward address signalling

On receipt of an InitiateCallAttempt operation from the SCP the contents is stored and call processing is suspended.

10.1.8.1.1.1 Continue operation

The actions described in 7.2.1/Q.1902.4 [7] are performed. For routing of the call, the called party number is derived from the destinationRoutingAddress (see Table 12 – Mapping of parameters from InitiateCallAttempt to IAM).

Table 12 illustrates the mapping of parameters received in the InitiateCallAttempt operation to parameters sent in the IAM message.

Table 12/Q.1922.4 – Mapping of parameters from InitiateCallAttempt to IAM

INAP operation InitiateCallAttempt (Note 1)	BICC message IAM
destinationRoutingAddress	Called party number
callingPartyNumber	Calling party number
serviceInteractionIndicatorsTwo	See 10.1.1.1.1.4 (Mapping of the INAP serviceInteractionIndicatorsTwo)
Carrier	Carrier Selection Information (Note 2)
Carrier	Transit Network Selection (Note 3)
NOTE 1 – Optional parameters may be absent, i.e. they are only mapped if received. NOTE 2 – The first octet of the INAP carrier parameter is mapped to the first octet of the Carrier Selection Information. NOTE 3 – If the carrier-parameter contains more than one octet and the network option is "TNS", then the rest of the carrier parameter is copied into the Transit Network Selection parameter. In case of network option is "carrier Id", the mapping of this part of the carrier-parameter is network specific.	

Except for the called party number parameter, the remaining mandatory parameters of the IAM message are set as follows:

a) Nature of connection indicators:

Satellite indicator:	set as in an OLE.
Continuity check indicator:	set as in an OLE.
Echo control device indicator:	set as in an OLE.

b) Forward call indicators:

National/international call indicator:	set as in an OLE.
End-to-end method indicator:	00 (no end-to-end method available).
Interworking indicator:	0 (no interworking encountered).
End-to-end information indicator:	0 (no end-to-end information available).
ISDN user part indicator:	1 (ISDN user part used all the way).
ISDN user part preference indicator:	00 (ISDN user part preferred all the way).
ISDN access indicator:	0 (originating access non-ISDN).
SCCP method indicator:	00 (no indication).

c) Calling party's category:

00001010 (ordinary subscriber).

d) Transmission medium requirement:

00000011 (3.1 kHz audio).

Besides the parameters listed in Table 12, the IAM contains the following optional parameters:

- propagation delay counter (set as in an OLE);
- hop counter (set as in an OLE).
- BAT ASE with bearer data for intermediate bearer connection.

10.1.9 GVNS

This clause describes the set-up of an GVNS call. In this situation, the call set-up differs from the normal call set-up for the "IN basic call".

10.1.9.1 Procedure in the SSP providing the GVNS access function

In addition to the description given in 10.1.1 (IN basic call) the following actions are to be performed.

When receiving the Connect or the ContinueWithArgument Operation with the forwardGVNS parameter, the SSP maps it to the BICC parameter "Forward GVNS" in IAM in addition to the mapping given 10.1.1 (IN basic call) according to Table 13.

Table 13/Q.1922.4 – GVNS Mapping of parameters from Connect/ContinueWithArgument to IAM

INAP operation Connect/ContinueWithArgument	BICC message IAM
forwardGVNS	Forward GVNS

On receipt of ANM/CON the received BICC parameter "Backward GVNS" parameter is mapped to ERB "backwardGVNS" parameter on INAP (if armed) according to Table 14.

Table 14/Q.1922.4 – GVNS Mapping of parameters from ANM/CON to ERB

BICC message ANM/CON	INAP operation EventReportBCSM
Backward GVNS	backwardGVNS

In addition, the SSP discards the "backward GVNS" parameter received in ANM/CON.

On receipt of ANM/CON the Backward GVNS parameter is mapped to the backwardGVNS parameter of the EventReportBCSM operation, if applicable.

10.1.9.2 Procedure in the SSP providing the originating GVNS routing function

In addition to the description given in 10.1.1 (IN basic call) the following actions are to be performed.

On receiving the IAM, the actions described in 10.1.1 (IN basic call) are performed. In addition to the mapping given there, the mapping in Table 15 is applied.

Table 15/Q.1922.4 – GVNS Mapping of parameters from IAM to InitialDP

BICC message IAM	INAP operation InitialDP
Forward GVNS	forwardGVNS

When receiving the Connect or the ContinueWithArgument Operation with the forwardGVNS parameter, the SSP maps it to the BICC parameter "Forward GVNS" in IAM in addition to the mapping given in 10.1.1 (IN basic call), according to Table 16.

Table 16/Q.1922.4 – GVNS Mapping of parameters from Connect/ContinueWithArgument to IAM

INAP operation Connect/ContinueWithArgument	BICC message IAM
forwardGVNS	Forward GVNS

10.1.9.3 Procedure in the SSP providing the terminating GVNS routing function

In addition to the description given in 10.1.1 (IN basic call), the following actions are to be performed.

When receiving the IAM, the actions described in 10.1.1 (IN basic call) are performed. In addition to the mapping given there, the mapping in Table 17 is applied.

Table 17/Q.1922.4 – GVNS Mapping of parameters from IAM to InitialDP

BICC message IAM	INAP operation InitialDP
Forward GVNS	forwardGVNS

When receiving the Connect or the ContinueWithArgument Operation with the backwardGVNS parameter, the SSP maps it to the BICC parameter "Backward GVNS" in ANM/CON according to Table 18 in addition to the actions described in 10.1.1 (IN basic call).

Table 18/Q.1922.4 – GVNS Mapping of parameters from Connect/ContinueWithArgument to ANM/CON

INAP operation Connect/ContinueWithArgument	BICC message ANM/CON
backwardGVNS	Backward GVNS

The Forward GVNS parameter received in IAM is discarded.

10.1.10 Support of VPN applications with PSS1 information flows

This clause describes the set-up of a VPN call requesting support of PSS1 information flows (see ITU-T Rec. Q.765.1 [12]) in the context of a VPN service provided by an IN Service logic.

10.1.10.1 Actions in a SSP at call set-up

If, in the node addressed as PAN, the initial address message (IAM) received contains an Application Transport parameter with the Application Context Identifier coded "PSS1 ASE (VPN)", the exchange shall apply the actions described in 10.2.2.1/Q.765.1. If the call is recognized as IN call by detecting a DP as TDP, an InitialDP operation is sent from the SSF to the SCF.

In addition to the description given in 10.1.1 (IN basic call) the following actions are to be performed. In addition to the mapping given there, the mapping in Table 19 is applied.

Table 19/Q.1922.4 – VPN Mapping of parameters from IAM to InitialDP

BICC message IAM	INAP operation InitialDP
CNID indicator CNID	cNInfo (Note)
NOTE – The first octet is coded as the first octet of the NNI-specific information received in the APP parameter (only bits 5 and 6 (CNID indicator) are significant – see 14.2/Q.765.1). The following octets contain the Corporate Telecommunications Network Identifier (CNID) if it was present in the NNI-specific information.	

In addition, the optional parameter vPNIndicator set to TRUE is included in the InitialDP operation.

10.1.10.2 IN intervention to allow or stop the transfer of PSS1 information flows

If the INAP serviceInteractionIndicatorsTwo parameter is received in a Connect or ContinueWithArgument operation with the suppressVPNAPP indicator (as part of this parameter) set to TRUE, then the Gateway PINX functionality is invoked by the node as described in 7.2.3.2.6/Q.765.1 (Gateway PINX transformation request mechanism/ Node determining gateway PINX functionality is required). The ISUP Application Transport parameter with Application Context Identifier set to "PSS1 ASE (VPN)" is not transmitted in the outgoing IAM message and any following message.

If the INAP serviceInteractionIndicatorsTwo parameter is received with the suppressVPNAPP indicator set to FALSE, the SSF shall ignore this indicator.

10.1.11 Number Portability

This clause describes the call set-up of a call using a query to an IN based Number Portability server insofar as it differs from the normal call set-up for the "IN basic call" (as given in 10.1.1).

Addressing options are according to ITU-T Rec. Q.769.1 ("separate directory number", "concatenated addressing method" (with specific nature of address), "separate RN method"), whereby INAP uses the "separate directory number" method for providing NP-related address information.

NOTE – in case the concatenated addressing method option with NoA "national significant number" is used, the procedures described in 10.1.1 for IN basic call are applied.

10.1.11.1 Mapping of parameters from IAM to InitialDp

If the IAM is received and number parameters for NP purposes are included in this message, they are to be mapped to parameters in the INAP operation IDP in addition to Table 4 as shown in Table 20.

Notes to Tables 20 and 21

a) The network options according to ITU-T Rec. Q.769.1 are indicated in the column "Option" as "separate directory number" (preferred option), "concatenated addressing method" (Option Annex A), "separate network routing number" (Option Annex B).

b) A number parameter coded with Nature of Address indicator set to "network routing number in national (significant) number format" (6.1.1/Q.769.1) will be indicated by postfixing it with "(NRN)". A number parameter with Nature of Address indicator set to "network routing number concatenated with called directory number" (6.1.1/Q.769.1) will be indicated by postfixing it with "(concat)".

Table 20/Q.1922.4 – NP-related mapping of IAM to InitialDP

Option (Note 1)	BICC message IAM	INAP operation InitialDP
BICC (separate DN)	CalledPartyNumber (NRN)	networkRoutingNumber
	CalledDirectoryNumber	calledPartyNumber
BICC Option Annex A (concatenated)	CalledPartyNumber (concat)	networkRoutingNumber (Note 2) calledPartyNumber
BICC Option Annex B (separate RN)	NetworkRoutingNumber	networkRoutingNumber
	CalledPartyNumber	calledPartyNumber

NOTE 1 – The network option is determined by analysing the NoA of the BICC:CdPN and the existence of the parameters CDN or NRN. In case no CDN or NRN parameter and none of the NP-related NoA indicators are present, the mapping of Table 4 remains valid (no number portability took place before IN triggering).

NOTE 2 – The usage of the network routing number (length, numbering plan, ...) is network specific. In order to separate the RN from the DN in the concatenated case, the SSP must have knowledge about all types of RNs used in that network and for each RN modification the SSP would have to be updated.

10.1.11.2 Mapping of parameters from INAP operation Connect to IAM

When the Connect operation is received from the NP server, the number parameters included in this operation have to be mapped to parameters in the BICC:IAM message in addition to Table 5 as shown in Table 21. In case the INAP parameter DestinationRoutingAddress does not contain the NoA for NRN, the mapping of Table 5 remains valid as a whole and the CDN is discarded (see also 10.1.12.3).

Table 21/Q.1922.4 – NP-related mapping of CONNECT to IAM

Option	INAP operation CONNECT	BICC message IAM
BICC (separate DN)	destinationRoutingAddress (NRN)	CalledPartyNumber (NRN)
	calledDirectoryNumber (Note 1)	CalledDirectoryNumber
BICC Option Annex A (concatenated)	destinationRoutingAddress (NRN)	CalledPartyNumber (concat)
	calledDirectoryNumber (Note 2)	
BICC Option Annex B (separate RN)	destinationRoutingAddress (NRN)	NetworkRoutingNumber
	calledDirectoryNumber (Note 3)	CalledPartyNumber

NOTE 1 – The INAP:calledDirectoryNumber parameter needs not to be received. In this case, the Called Party Number stored when receiving Connect has to be mapped to the BICC:CalledDirectoryNumber.

NOTE 2 – The INAP:calledDirectoryNumber parameter needs not to be received. In this case, the Called Party Number stored when receiving Connect has to be prefixed by the destinationRoutingAddress and the NoA changed to "network routing number concatenated with called directory number".

NOTE 3 – The INAP:calledDirectoryNumber parameter needs not to received. In this case, the stored Called Party Number is not changed if an INAP:destinationRoutingAddress with NoA "network routing number in national (significant) number format" is received.

10.1.11.3 SCP (non-NP-server) acting on a ported number

In addition to the description in 10.1.1 (IN basic call), the following actions have to be performed.

In case a calledDirectoryNumber or networkRoutingNumber parameter is received in the incoming IAM message, and a destinationRoutingAddress is received without NP-specific NoA-indication, these parameters have to be discarded in the outgoing IAM. I.e., the INAP: destinationRoutingAddress (without NP-specific NoA) sent in a CONNECT operation for non-NP specific service from an SCP is mapped to a calledPartyNumber parameter (without NP-specific NoA) as in normal "IN basic call".

10.1.11.4 Mapping of the INAP ServiceInteractionIndicatorsTwo

Additionally to the description in 10.1.1.1.3 (IN basic call), the "Call to be offered indicator" is extended by the new value "callOfferingNoINImpact".

In case the callOfferingTreatmentIndicator is contained in the SIITwo parameter and set to "callOfferingNoINImpact", the SSP shall not generate a CallOfferingTreatmentIndicator nor modify an already received one.

10.1.11.5 Transfer of the called IN number

Additionally to the description in 10.1.1.5 (IN basic call), the treatment of the called IN number is extended by using an additional parameter "calledINNumberOverriding" within SIITwo.

If this parameter is set to FALSE, the SSP shall not generate the CalledINNumber, nor overwrite an already existing one.

10.1.12 Global Call Reference

The Global Call Reference Parameter is introduced in BICC (Rec. ITU-T Q.1902.3) and INAP CS-4 to assist the correlation of Charging Data Records for the same call from different nodes and operators by using a common call reference which uniquely identifies the call.

10.1.12.1 Treatment of Global Call Reference at call setup

In addition to the description given in 10.1.1 (IN basic call), the following actions are to be performed. In addition to the mapping given there the mapping in Table 22 is applied.

Table 22/Q.1922.4 – Mapping of parameter from IAM to InitialDP

BICC message IAM	INAP operation InitialDP
Global Call Reference	globalCallReference
NOTE – In case the CCF receives separately a Call Reference parameter from BICC, it will be mapped to the INAP callReference parameter, but should not influence the globalCallReference parameter.	

10.1.12.2 Treatment of Global Call Reference for outgoing legs created by a T-BCSM processing

In case T-BCSM processing creates a new outgoing leg (e.g. CONNECT after a trigger detection point T_Busy), the same handling of the Global Call Reference has to be done as for call diversion supplementary services, e.g., optionally a new Global Call Reference for the outgoing leg may be determined (see ITU-T Rec. Q.732.7). Otherwise, triggering of TDPs does not influence the Global Call Reference.

10.1.12.3 Providing the Global Call Reference for SCP-initiated calls

In addition to the description given in 10.1.8 (SCP initiated call), the following actions are to be performed. In addition to the mapping given there, the mapping in Table 23 is applied.

Table 23/Q.1922.4 – Mapping of parameters from InitiateCallAttempt to IAM

INAP operation InitiateCallAttempt	BICC message IAM
globalCallReference	Global Call Reference
NOTE – In case the INAP callReference parameter is recived, it is mapped to the BICC Call Reference parameter.	

10.1.13 Pivot Routing and Redirection

This clause describes an interaction using the Pivot Routing and Redirection which are specified in ITU-T Rec. Q.730 associated with an IN call. In addition to the description given in 10.1.1.1.1.1 (Connect operation), the following actions are to be performed in an SSP.

When an SSP receives a redirectServiceTreatmentIndicator parameter included in a serviceInteractionIndicatorsTwo parameter by Connect operation from a SCP, the SSP may decide the invocation of either Pivot Routing or Redirection in order to reroute the call toward a new destination address indicated by destinationRoutingAddress parameter. If a redirectServiceTreatmentIndicator parameter does not exist, neither Pivot Routing nor Redirection is allowed and the Connect operation is normally processed in the SSP (see 10.1.1.1.1.1).

In the event of the existence of a redirectReason parameter in the redirectServiceTreatmentIndicator parameter, whether the Pivot Routing/Redirection can be actually invoked depends on the indicated redirectReason parameter value within the redirectServiceTreatmentIndicator parameter and the conditions of the SSP as specified in ITU-T Rec. Q.730 (e.g., whether the SSP receives a Pivot/Redirection capability parameter in an IAM or not). When the invoking reason was indicated in the received redirectReason parameter, the SSP decides according to it whether the Pivot Routing/Redirection can be invoked. If the indicated redirectReason parameter value corresponds to

the received Performing Pivot/Redirection Reason (included in the Pivot/Redirection forward information parameter) in the IAM message, the SSP can invoke the Pivot Routing/Redirection, and the redirectReason parameter value should be set in the "Invoking Pivot/Redirection Reason" field in the Pivot routing/Redirection backward information parameter in a FAC/REL message. In the other cases, neither Pivot Routing nor Redirection is allowed and the Connect operation is normally processed in the SSP (see 10.1.1.1.1.1).

In the event of the absence of a redirectReason parameter in the redirectServiceTreatmentIndicator parameter, whether the Pivot Routing/Redirection can be actually invoked depends on the conditions of the SSP as specified in ITU-T Rec. Q.730. (e.g., whether the SSP received a Pivot/Redirection capability parameter in an IAM or not). In the other cases, neither Pivot Routing nor Redirection is allowed and the Connect operation is normally processed in the SSP (see 10.1.1.1.1.1).

When the SSP invokes the Pivot Routing, the mapping in Table 24 is applied.

Table 24/Q.1922.4 – Mapping of parameters from Connect to FAC for Pivot Routing

INAP operation Connect	ISUP/BICC message FAC
destinationRoutingAddress	Redirection Number
redirectReason	Pivot routing backward information (Note)
NOTE – If the redirectReason parameter exists, it should be mapped to the "Invoking Pivot Reason" field in the Pivot routing backward information parameter.	

When the SSP invokes the Redirection, the mapping in Table 25 is applied.

Table 25/Q.1922.4 – Mapping of parameters from Connect to REL for Redirection

INAP operation Connect	ISUP/BICC message REL
destinationRoutingAddress	Redirection Number
redirectReason	Redirection backward information (Note)
NOTE – If the redirectReason parameter exists, it should be mapped to the "Invoking Redirection Reason" field in the Redirection backward information parameter.	

10.1.14 Actions to be performed in local exchanges

10.1.14.1 Actions in the originating local exchange

For an IN basic call, the normal BICC basic call procedures are applicable as described in [7] for originating local exchanges, unless indicated otherwise in the subclauses below.

10.1.14.1.1 Successful call set-up

10.1.14.1.1.1 Forward address signalling

If the exchange has the capability to through-connect the transmission path in both directions upon receipt of the UID action indicators parameter with bit A coded 1, then the exchange shall send the UID capability indicators parameter in the IAM message with bit A coded 1.

If the exchange has the capability to stop or not to start timer T9 upon receipt of the UID action indicators parameter with bit B coded 1, then the exchange shall send the UID capability indicators parameter in the IAM message bit B coded 1.

10.1.14.1.1.2 Address complete, call progress, connect or answer message

Upon receipt of an ACM or CPG message with the UID action indicators parameter indicating "through-connect in both directions" (bit A coded 1), the local exchange shall through-connect the transmission path in both directions, if not already connected.

Upon receipt of an ACM or CPG message with the UID action indicators parameter indicating "stop or do not start T9 timer" (bit B coded 1), the local exchange shall not start/shall stop timer T9 and shall start timer T_{UID} to guard the connection. If T_{UID} was already running upon receipt of the UID action indicators parameter with bit B coded 1, then T_{UID} shall be restarted.

Upon receipt of an ANM or CON message, the local exchange shall stop T9 or T_{UID}, if running.

If T_{UID} expires, see subclause 10.1.4.2 (Timer T_{UID} expiry).

If received in these messages, the conference treatment indicators parameter shall be stored in the exchange. If the parameters have already been stored, then the stored information is overwritten. The application of this parameter is described in clause 12 (Interaction between IN basic call and ISDN supplementary services).

10.1.14.2 Actions in the destination local exchange

10.1.14.2.1 Successful call set-up

10.1.14.2.1.1 Forward address signalling

If received in the IAM message, the following parameters shall be stored: conference treatment indicators, call diversion treatment indicators, called IN number, Original Called IN number.

The application of these parameters is described in clause 12 (Interaction between IN basic call and ISDN supplementary services).

10.1.14.2.1.1.1 Preventing of call offering for calls not routed via IN at a destination access

Upon receipt of an IAM for an access which is marked as "prevent call offering for non-authorized calls", the following actions are performed:

- If the IAM contains the call to be offered indicator set to "call offering allowed" in the call offering treatment indicators parameter field, the call is set up as described in 7.2.8/Q.1902.4 [7].
- If the IAM contains either the call to be offered indicator set to "call offering not allowed" in the call offering treatment indicators parameter field, or no call offering treatment parameter field at all, the call is released using cause value #21 (call rejected) without diagnostics in the REL message.

NOTE – If the functionality required for this procedure is not implemented in the DLE the call to be offered indicator is regarded as an unknown parameter value and treated as described in 13.4/Q.1902.4 [7]. The compatibility information for the call offering treatment indicators parameter field is given in Appendix I.

10.1.15 Actions in an intermediate exchange

10.1.15.1 In an intermediate exchange not starting timer T9

An intermediate exchange not starting timer T9 shall not modify the UID capability and UID action indicators parameters; these two parameters shall be passed on transparently.

10.1.15.2 In an intermediate exchange starting timer T9

On receipt of the UID capability parameter, the intermediate exchange shall pass it on transparently to the succeeding exchange, if it has the capability to stop or not to start T9 timer upon receipt of the UID action indicators parameter with bit B coded 1. Otherwise, the bit B of the UID capability parameter shall be set to 0.

On receipt of the UID action indicators parameter indicating "stop or do not start T9 timer" (bit B coded 1), the intermediate exchange shall not start/shall stop timer T9 and shall start timer T_{UID} to guard the connection. If T_{UID} was already running upon receipt of the UID action indicators parameter with bit B coded 1, then T_{UID} shall be restarted.

The UID action indicators parameter shall be passed on transparently to the preceding exchange.

Upon receipt of an ANM or CON message, the intermediate exchange shall stop T9 or T_{UID}, if running.

If T_{UID} expires, see 10.1.4.2 (Timer T_{UID} expiry).

10.1.16 Actions in international gateway exchanges

The UID action indicators and UID capability indicators parameters are only sent across the international interface if a bilateral agreement between both network operators exists.

10.2 Bearer unrelated connections

For further study.

11 Interaction with other networks

For further study.

12 Interaction between IN basic call and ISDN supplementary services

The description in this clause assumes that the SCF controls IN service(s) dependent whether ISDN supplementary services are influenced for a call.

An overview on the interactions between IN services and ISDN supplementary services is given in Table 26.

The second column of the table marked "possibly impacted by IN services" identifies the ISDN supplementary services for which SCF control is needed. As a consequence, indications "impact/no impact" are required for these supplementary services which are to be sent via the INAP in an appropriate operation (see Appendix II). The third column contains the reference to the clause describing the action to be taken in case of "impact". The fourth column identifies the exchange where the action is to be performed. In the case where the affected exchange is not the SSP itself, a new instruction indicator is needed which is to be transferred in an BICC message to the originating or destination local exchange, or both respectively.

Table 26/Q.1922.4 – Interactions between IN basic call and ISDN supplementary services

ISDN Supplementary service	BICC protocol possibly impacted by IN services	if impacted by IN service(s) the following action is performed	Affected exchange
Advice of charge at call set-up	No		
Advice of charge during the call	No		
Advice of charge at the end of the call	No		
Call deflection	Yes	See 12.1 (Call diversion)	SSP/DLE
Call forwarding on busy	Yes	See 12.1 (Call diversion)	SSP/DLE
Call forwarding on no reply	Yes	See 12.1 (Call diversion)	SSP/DLE

Table 26/Q.1922.4 – Interactions between IN basic call and ISDN supplementary services

ISDN Supplementary service	BICC protocol possibly impacted by IN services	if impacted by IN service(s) the following action is performed	Affected exchange
Call forwarding unconditional	Yes	See 12.1 (Call diversion)	SSP/DLE
Calling line identification presentation Calling line identification restriction	Yes	See 12.2 (Calling line identification presentation/restriction)	SSP
Call hold	No		
Call waiting	No		
Closed user group	No		
Completion of calls to busy subscribers	Yes	See 12.3 (Completion of calls service)	SSP
Completion of calls on no reply	Yes	See 12.3 (Completion of calls service)	SSP
Conference call, add-on	Yes	See 12.4 (Conference)	OLE/DLE
Connected line identification presentation Connected line identification restriction	Yes	See 12.5 (Connected line identification presentation/restriction)	SSP
Direct dialling in	No		
Explicit call transfer	Yes	See 12.6 (Explicit call transfer)	SSP
GVNS	No		
International telecommunication charge card	No		
Malicious call identification	Yes	See 12.7 (Malicious call identification)	SSP/DLE
Meet-me conference	No		
Multilevel precedence and preemption	No		
Multiple subscriber number	No		
Reverse charging	Yes	National network specific	
Subaddressing	No		
Terminal portability	No		
Three party	Yes	See 12.8 (Three party)	OLE/DLE
User-to-user service 1 implicit	No		
User-to-user service 1 explicit	No		
User-to-user service 2 explicit	No		
User-to-user service 3 explicit	No		

12.1 Call diversion

12.1.1 Actions in the service switching point

If "suppress information" was received in the INAP serviceInteractionIndicatorsTwo (call diversion notification treatment indicator), then the following parameters shall be discarded, if received:

a) generic notification indicator parameter with "call is diverting";

b) call diversion information parameter;

c) redirection number parameter;

d) redirection number restriction parameter.

12.1.2 Actions in the destination local exchange

12.1.2.1 Call forwarding unconditional

Call forwarding unconditional activated by the ISDN subscriber is suppressed, if "call diversion not allowed" was received in the call diversion treatment indicators (call to be diverted indicator). The call is offered to the subscriber.

12.1.2.2 Call forwarding busy

Call forwarding busy activated by the ISDN subscriber is not performed, if "call diversion not allowed" was received in the call diversion treatment indicators (call to be diverted indicator). The call is released using the appropriate cause in the REL message.

12.1.2.3 Call forwarding on no reply

Call forwarding on no reply activated by the ISDN subscriber is not performed, if "call diversion not allowed" was received in the call diversion treatment indicators (call to be diverted indicator). Call offering to the subscriber continues.

12.1.2.4 Call deflection

Call deflection requested by the ISDN subscriber is rejected, if "call diversion not allowed" was received in the call diversion treatment indicators (call to be diverted indicator). Call offering to the subscriber continues.

12.2 Calling line identification presentation/restriction

12.2.1 Actions in the service switching point

If a callingPartyNumber parameter or GenericNumbers parameter has been received in the Connect operation, then the mapping of these parameters must not compromise existing services supported by BICC (refer to Table 5 – Mapping of parameters from Connect to IAM).

12.3 Completion of calls service

12.3.1 Completion of calls to busy subscribers

12.3.1.1 Actions in the service switching point

If "reject call completion request" was received in the INAP serviceInteractionIndicator parameter (call completion treatment indicator), then in a received REL message a "CCBS possible" in the diagnostics field of the cause indicators is replaced with "CCBS not possible".

12.3.2 Completion of calls on no reply

12.3.2.1 Actions in the service switching point

If "reject call completion request" was received in the INAP serviceInteractionIndicator parameter (call completion treatment indicator), then in a received ACM (subscriber free) or CPG (alerting)

message a "CCNR possible" in the CCNR Possible indicator parameter is replaced with "CCNR not possible".

12.4 Conference

12.4.1 Actions in the originating or destination local exchange

A request from an ISDN subscriber to add a call to a conference is rejected, if "reject conference request" was received in the conference treatment indicators (conference acceptance indicator).

If "reject conference request" is received in the conference treatment indicators (conference acceptance indicator) for a call which is part of a conference call, then this IN call is cleared.

12.5 Connected line identification presentation/restriction

12.5.1 Actions in the service switching point

If "no impact" was received in the INAP serviceInteractionIndicatorsTwo (connected number treatment indicator), then a connected number parameter and a generic number parameter "additional connected number" are passed on unchanged.

If "presentation restricted" was received in the INAP serviceInteractionIndicatorsTwo, then:

a) If a connected number parameter has been received in the ANM or CON message, the address presentation restricted indicator is set to "presentation restricted".

b) If a generic number parameter "additional connected number" has been received in the ANM or CON message, the address presentation restricted indicator is set to "presentation restricted".

c) If a redirection number parameter has been received, a redirection number restriction parameter is sent in the ANM message with bits AB set to "presentation restricted".

If "present called IN number" was received in the INAP serviceInteractionIndicatorsTwo, then:

a) If a connected number parameter has been received in the ANM or CON message, the connected number parameter is modified as follows:

nature of address indicator and numbering plan indicator are encoded as received in the called party number of the IAM message;

address presentation restricted indicator: 00 (presentation allowed);

address signals: as received in the called party number and possible subsequent number parameters, until the ACM message was sent.

b) A generic number parameter "additional connected number" is deleted from the message, if applicable.

c) A redirection number parameter is deleted from the relevant messages, if applicable.

If "present called IN number restricted" was received in the INAP serviceInteractionIndicatorsTwo, then:

a) If a connected number parameter has been received in the ANM or CON message, the connected number parameter is modified as follows:

nature of address indicator and numbering plan indicator are encoded as received in the called party number of the IAM message;

address presentation restricted indicator: 01 (presentation restricted);

address signals: as received in the called party number and possible subsequent number parameters, until the ACM message was sent.

b) A generic number parameter "additional connected number" is deleted from the message, if applicable.

c) A redirection number parameter is deleted from the relevant messages, if applicable.

12.6 Explicit call transfer

12.6.1 Actions in the service switching point

If "suppress information" was received in the INAP serviceInteractionIndicatorsTwo (call transfer notification treatment indicator), then the following parameter shall be discarded, if received:

a) generic notification indicator parameter with either "call transfer, alerting" or "call transfer, active";

b) call transfer number parameter.

12.7 Malicious call identification

12.7.1 Actions in the service switching point

The service switching point shall pass a received IDR message transparently to the preceding exchange. The subsequent IRS message is passed transparently to the succeeding exchange. If bit A of the MCID request indicators was set to 1, then in addition to the normal procedure the service switching point shall include the charged party identification parameter, if available, into the IRS message.

12.7.2 Actions in the destination local exchange

If the MCID supplementary service is invoked by the called user, the registration of call information is extended by the registration of the called IN number and the charged party identification, if these parameters were received in the IAM or IRS message, respectively.

12.8 Three party

12.8.1 Actions in the originating or destination local exchange

A request from an ISDN subscriber to establish a three-way conference is rejected if for one call, or both, respectively, "reject conference request" was received in the conference treatment indicators (conference acceptance indicator).

If "reject conference request" is received in the conference treatment indicators (conference acceptance indicator) for a call which is part of a three party call, then this IN call is cleared.

13 Interactions between IN services

The INAP [4] does not only support a single point of control anymore, i.e., multiple IN services can be invoked for a call even in one SSP ("multiple points of control"). In this case, the SSF has to manage interaction of several IN service features (see 6.4/Q.1238.2). This can have relevance on call control signalling if IN triggering occurs in different SSPs (see Figure 6).

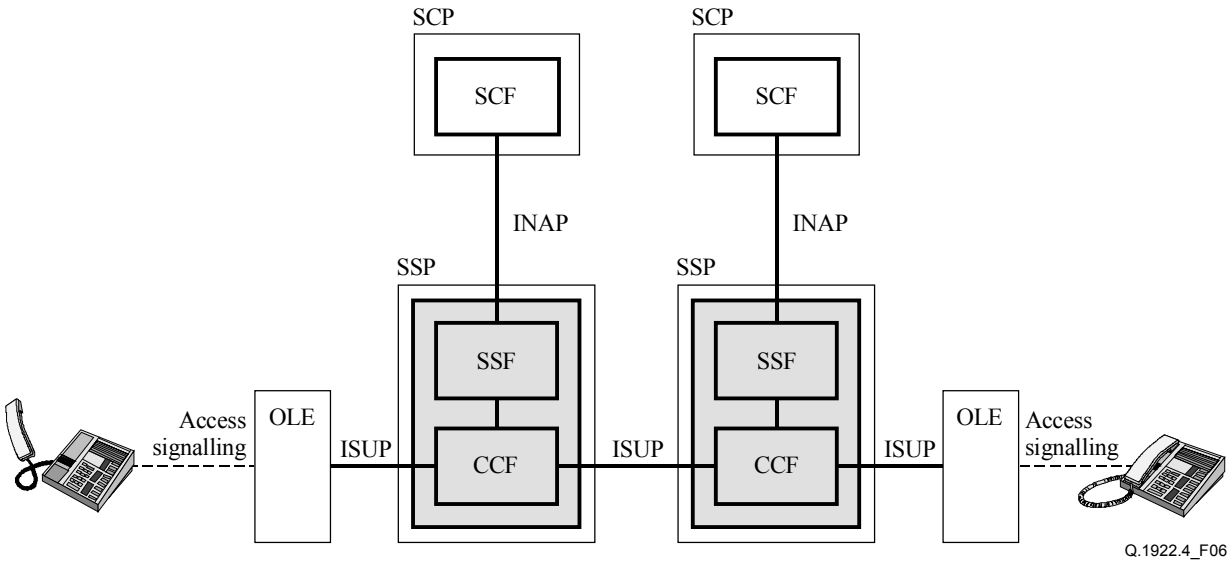


Figure 6/Q.1922.4 – Configuration with two SSPs involved in the call

In IN CS-2, some service compatibility checks have been defined based on the use of ServiceCompatibilityIDs assigned to an IN service. A signalling mechanism for this information is needed so that an IN service triggered somewhere in the network is aware of another IN service previously triggered for the call. As anywhere in the call path, a new triggering may occur, the service compatibility information has to be sent in both directions.

13.1 Receiving an IN Service Compatibility in a BICC message

For the incoming leg, the IN Service Compatibility parameter (see ITU-T Rec. Q.1902.3 [7]) may be received in an IAM or a FAC or a CPG message. For the outgoing leg, it may be received in a CPG, ACM, ANM, FAC, CON message. If the call is or may become an IN call, the IN Service Compatibility information has to be stored, a previously received one is discarded and the parameter is passed on. If the call may not become an IN call (e.g. because the node is no SSP), the IN Service Compatibility is sent on transparently. In case of an IN call, the IN Service Compatibility parameter is sent on as described in 13.2.

In case a TDP-R is triggered, the actions as described in 10.1 are to be performed, with the following exceptions.

When the SSP determines that an InitialDP operation (or a DP specific operation) is to be sent to the SCP, and if an IN service compatibility value is stored, this value has to be mapped as shown in Table 27.

Table 27/Q.1922.4 – Mapping of stored IN Service Compatibility to InitialDP

BICC message IAM/CPG/ACM/ANM/FAC/CON	INAP operation InitialDP
IN Service Compatibility	INServiceCompatibilityIndication

13.2 Handling of IN Service Compatibility in case outgoing legs are created by IN

IN-triggering may be followed by a range of INAP operations that contain the parameter INServiceCompatibilityResponse (see clause 14/Q.1238.2). This parameter is relevant only for SSF internal functions and, is used by it to create the IN Service Compatibility value or modify it if it already exists. This is done as soon as call processing is resumed when receiving one of the INAP

operations Connect, ContinueWithArgument, Continue or if a new call segment is created with InitiateCallAttempt.

As soon as an outgoing leg is created consequent to these operations, or an existing one reused, depending on the call state, the IAM, CPG, FAC is sent for this outgoing leg with the stored IN Service Compatibility while this parameter is sent back for the incoming leg with ACM, ANM, CON, FAC, CPG.

When releasing the call in both directions, the SSP shall discard a previously stored value of the IN service compatibility indication.

14 Parameter values (timers)

Table 28/Q.1922.4 – BICC timers for the SSP

Symbol	Time-out value	Cause for initiation	Normal termination	At expiry	Reference
T_{SUS}	SCF controlled	When SUS "network initiated" message is received	At receipt of RES "network initiated" or REL message	Initiate release procedure or inform SCF	See 10.1.1.3 (Suspend, resume) See 10.1.3 (Detection Point processing)
$T_{NoReply}$	SCF controlled	At receipt of ACM when DP ONA or TNA has been armed (Note)	At receipt of ANM or REL message	Inform SCF	
T_{UID}	30 minutes	At receipt of UID action indicators parameter with bit B set to 1	At receipt of ANM message	Initiate release procedure	See 10.1.4.2 (Timer T_{UID} expiry)
NOTE – Except for receipt of ACM with cause parameter.					

Annex A
Signalling flows

This annex contains arrow diagrams showing different types of IN calls. In case of discrepancies between the flows contained in this annex and the text in the main part of this Recommendation, the text takes precedence. The different variants of bearer setup are used for illustrative purposes only and relate to the message flow examples of ITU-T Rec. Q.1902.4 (see [7]).

The following abbreviations and notations are used in the figures:

A-SSP	Assisting SSP
AssReqInstr	AssistRequestInstruction operation
(DPx)	arm DP x
DPx !	DP x encountered
DFC	DisconnectForwardConnection
CTR	ConnectToResource operation

EstTempConn	EstablishTemporaryConnection operation
I-SSP	Initiating SSP
P&C	PromptAndCollectUserInformation operation
ReqReportBCSMEv	RequestReportBCSMEvent operation.

The following note applies to all the call set-up flows:

NOTE – The messages AAA and BBB are dependent on whether the Continuity procedure is supported in the subsequent SCN:

Case	Message AAA	Message BBB
Continuity is supported:	IAM indicating *"continuity check performed on previous circuit"*	COT indicating *"continuity check successful"*
Continuity is not supported:	No message is sent at this time	IAM indicating *"continuity check not required"*

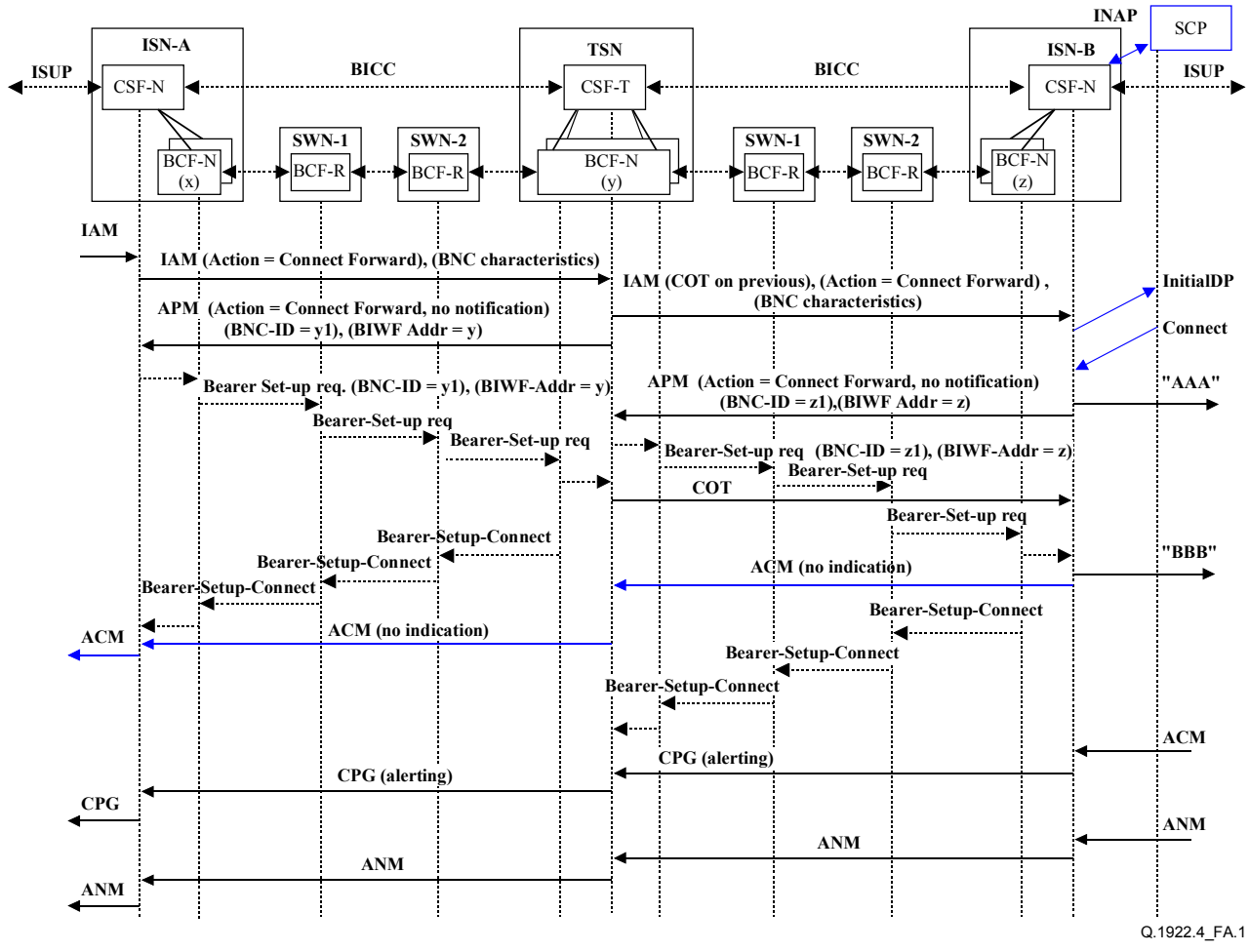


Figure A.1/Q.1922.4 – IN basic call for a call with forward establishment of backbone network connection

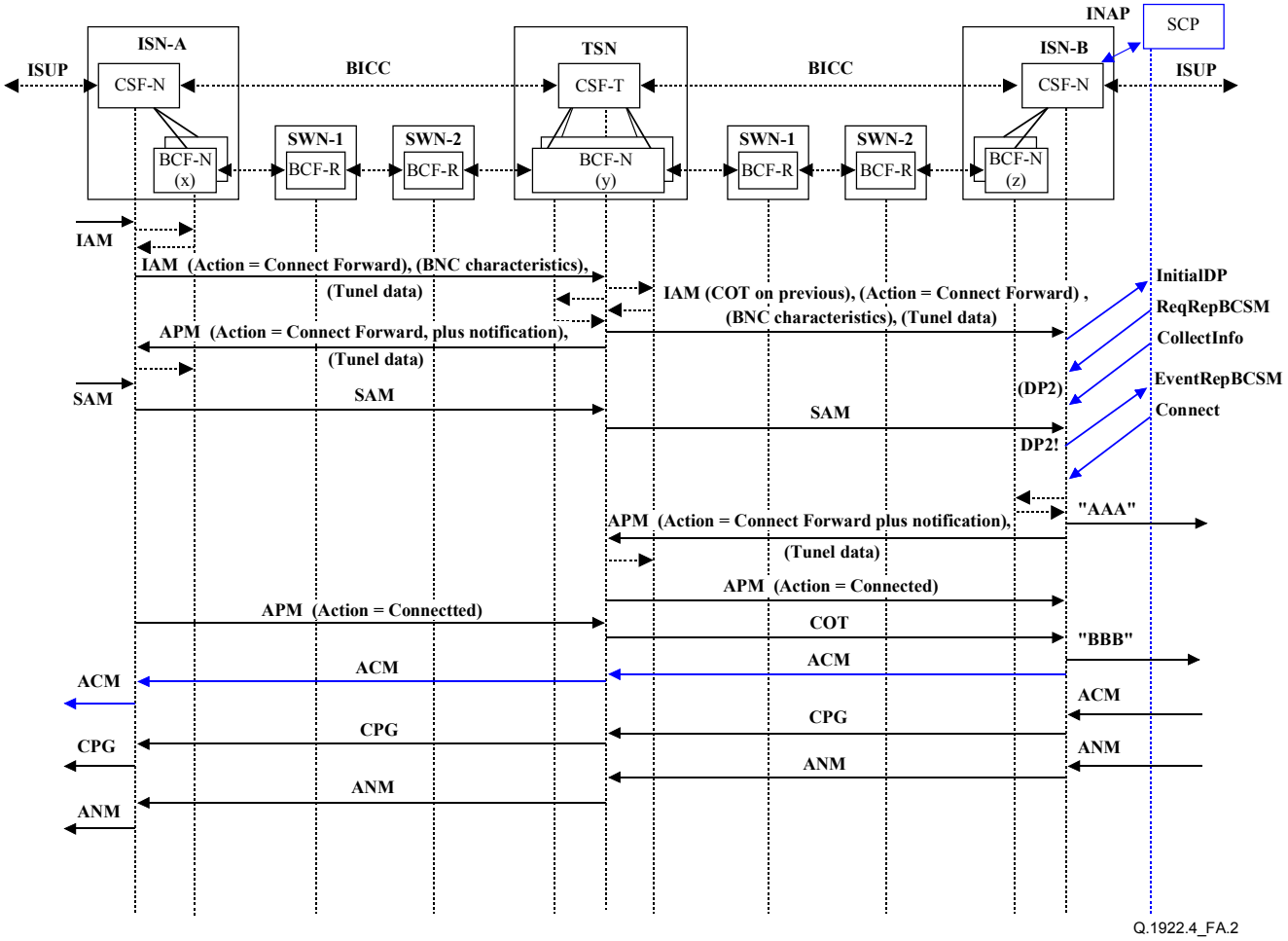


Figure A.2/Q.1922.4 – IN call with SCP request to collect further digits & per-call bearer set-up using bearer information transport tunnel – fast set-up (forward)

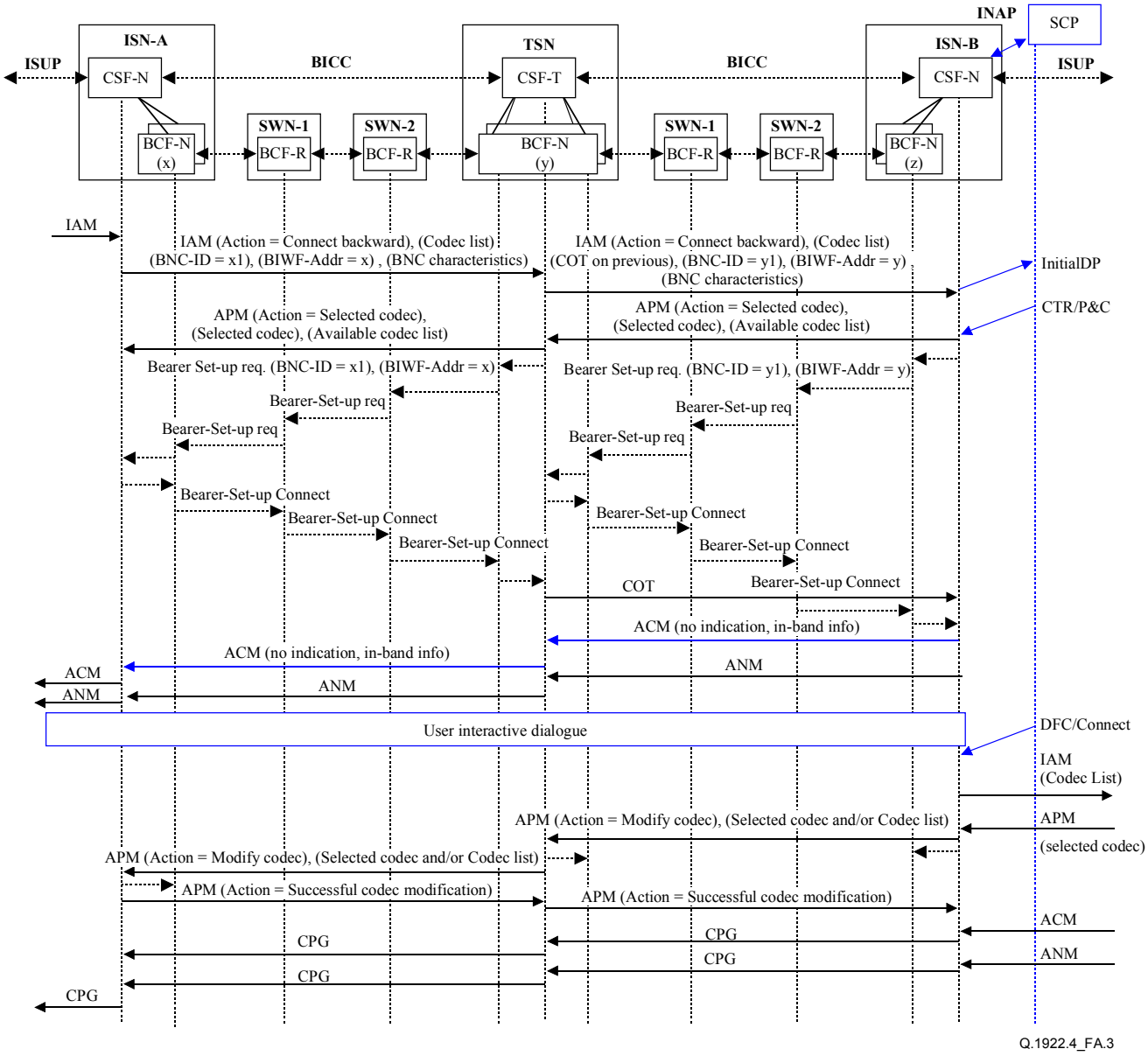
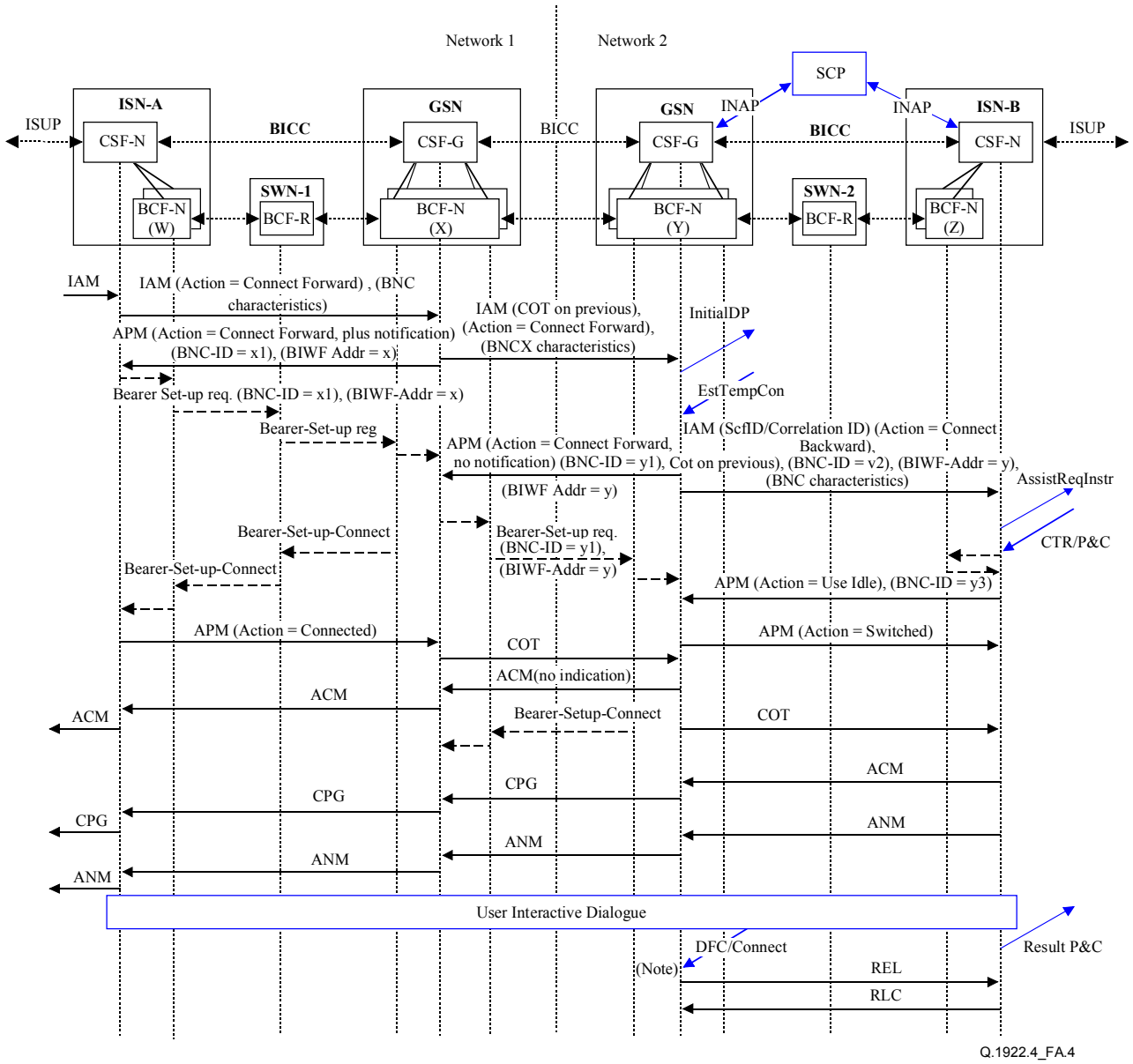
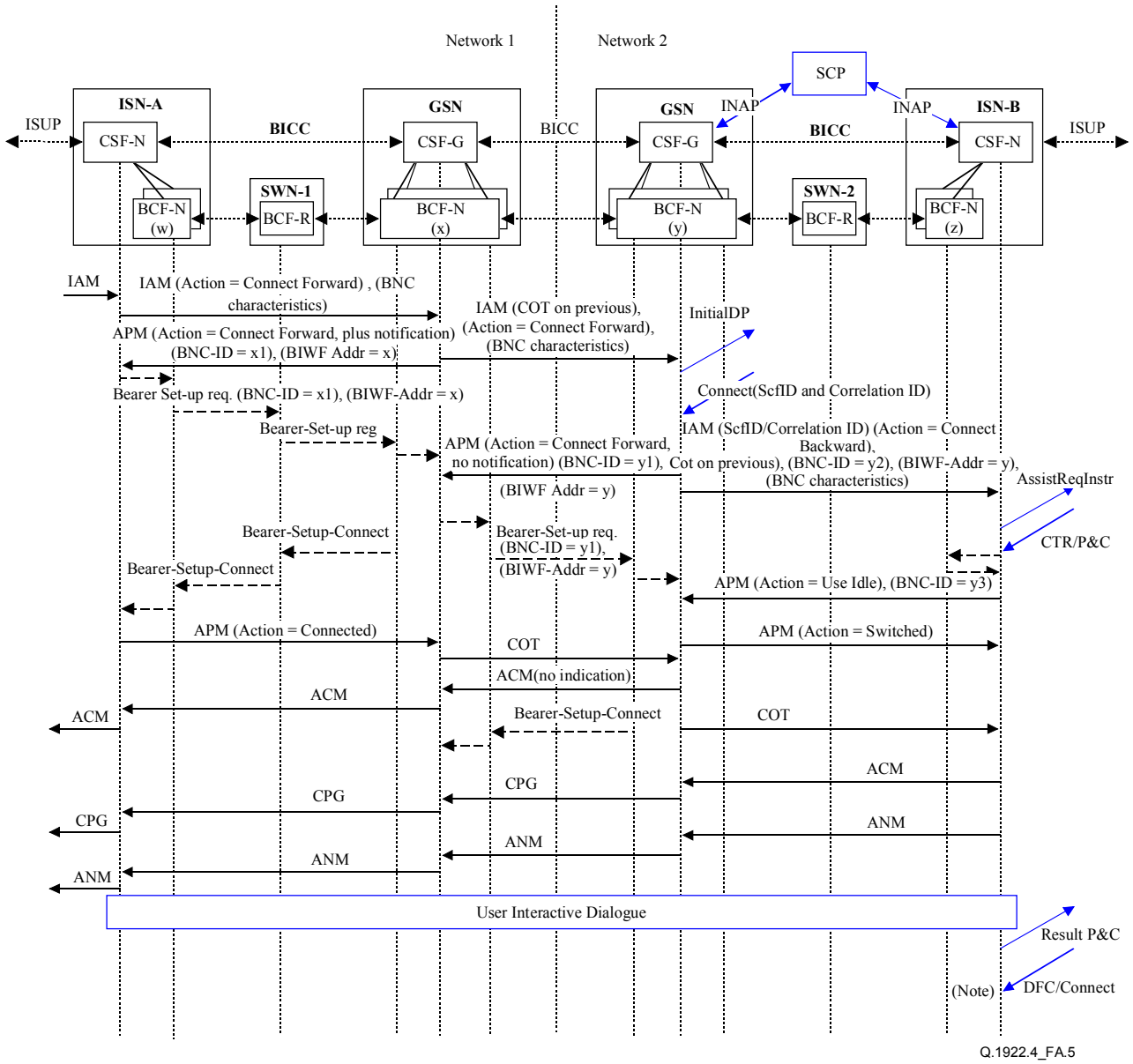


Figure A.3/Q.1922.4 – IN call with user interactive dialogue (in-band) & Backward establishment of backbone network connection, with Codec negotiation



NOTE – Instead of Connect, other operations may be received. If Connect is received, a normal call set-up as shown in Figure A.3 will be performed.

Figure A.4/Q.1922.4 – IN call with user interactive dialogue – Assist method, procedure in initiating SSP and assisting SSP; Multi-Network Example of combinations of Connect forward and backward



NOTE – Instead of Connect, other operations may be received. If Connect is received, a normal call set-up as shown in Figure A.3 will be performed.

Figure A.5/Q.1922.4 – IN call with user interactive dialogue (in-band) Hand-off method; procedure in initiating and assisting SSP; Multi-Network Example

Annex B
Exceptions for ISUP/INAP interaction

The interaction of ISUP to INAP can be derived by concatenating ISUP/BICC- and BICC/INAP-interaction procedures with the following exceptions:

In case of ISUP incoming setup procedure, it is necessary, after receiving an IAM message containing the indication "continuity check is requested or performed on previous circuit", to delay sending of InitialDP until an COT message is received with success-indication. Because of this COT-handling and the different bearer-setup-procedure, it is possible in ISUP to send anACM message as soon as the forward address information is determined after IN interaction (e.g. after CON, CTR, ETC).

The differences relate to chapters: 10.1.1.1.1.1 Connect operation (basic call), 10.1.1.1.6 Continuity check, 10.1.4.1.1.1 Connect Operation (Detection Point Processing), 10.1.5.1.1.1.1 ConnectToResource, 10.1.5.1.1.2 ACM for IP, 10.1.5.2.1.1.1 EstablishTemporaryConnection, 10.1.6 Call gapping, 10.1.7 Service filtering.

With regard to continuity-procedure and ACM-handling in the aforementioned clauses, the descriptions according to ITU-T Rec. Q.1601 [6] remain valid for ISUP/INAP interaction.

Unlike the description given in 10.1.8 SCP-initiated call, the selection of a default BIWF for SCP-initiated call is not relevant in case of ISUP/INAP interaction, and BAT ASE information elements are not sent in the ISUP IAM.

Appendix I

Coding of the compatibility information for the parameters

Table I.1/Q.1922.4 – Coding of the instruction indicators

Default = 0 value for the subfield.

Parameter	Pass on not possible indicator	Discard parameter indicator	Discard message indicator	Send notification indicator	Release call indicator	Transit at intermediate exchange indicator	Broadband/ narrow-band interworking indicator
Call diversion treatment indicators	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Called IN number	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Call offering treatment indicators	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Charged party identification	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Conference treatment indicators	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Correlation id	Release call	Default	Default	Default	Release call	Transit interpretation	Pass on
Display information	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
SCF id	Release call	Default	Default	Default	Release call	Transit interpretation	Pass on
UID action indicators	Discard parameter	Discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
UID capability indicators	Discard parameter	Discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Original Called IN number	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on

Appendix II

Contents of the INAP serviceInteractionIndicatorsTwo

The appendix contains a list of indicators which are to be transferred in the serviceInteractionIndicatorsTwo via the INAP in order to allow the SCF to control the network behaviour for IN calls. This appendix should be considered as a proposal for the INAP to transfer this type of information and not as a requirement for the detailed encoding of the serviceInteractionIndicatorsTwo.

Table II.1/Q.1922.4 – Basic call-related control information

Control information	Values
Call to be offered indicator	– call offering allowed – call offering no IN impact – call offering not allowed (default)
Time limits for timer T_{SUS}	– as in ITU-T Rec. Q.1902.4 for timer T6 – 4 to 10 seconds – 0 seconds (default)
Bothway throughconnect indicator NOTE – The indicator should be set to "required" in the ConnectToResource or EstablishTemporaryConnection operation, if user interaction has to be performed. If an announcement is to be connected or in other operations the indicator should be set to "not required".	– required (default) – not required
Called IN number presentation restricted indicator	– presentation allowed – presentation not allowed (default)
Called IN number Overriding	– TRUE (default) – FALSE
User interactive dialogue duration indicator NOTE – The indicator should be set to "long duration" in the ConnectToResource or EstablishTemporaryConnection operation, if the user interaction may last longer than 90 seconds. Otherwise the indicator should be set to "short duration".	– long duration (default) – short duration

Table II.2/Q.1922.4 – Supplementary service related control information

Control information	Values
Call to be diverted indicator	– call diversion allowed (default) – call diversion not allowed
Conference at DLE acceptance indicator	– accept conference request (default) – reject conference request
Conference at OLE acceptance indicator	– accept conference request (default) – reject conference request
Connected number treatment indicator	– no impact – set "presentation restricted" – present called IN number (default)
Call transfer notification treatment indicator	– no impact (default) – suppress information
Call diversion notification treatment indicator	– no impact (default) – suppress information
Call completion treatment indicator	– reject call completion request – accept call completion request (default)

Appendix III

Limitations for BICC basic call procedures and supplementary services for different types of IN calls

The appendix provides an overview on the limitations for BICC basic call procedures and supplementary services for different types of IN calls.

The CCBS supplementary service is, in general, not available for IN calls that require translation of the called party number. Additional limitations are listed in Table III.1.

Table III.1/Q.1922.4 – Limitations for BICC basic call procedures and supplementary services

Type of IN call ➔ ↓ BICC feature	IN call with DPs armed in the request mode (except DP CI)	IP connection without sending of ANM	IP connection with sending of ANM	IN call set-up after an ANM was sent for a previous connection
Basic call				
Access delivery information				not supported
Connection types allowing fallback capability	not supported		not supported	not supported
Propagation delay determination				In the OLE only the accumulated delay from the OLE to the first answered destination is available
Supplementary Services				
Call diversion				The OLE does not receive the following parameters: call diversion information, generic notification indicator, redirection number and redirection number restriction indicator.
Call waiting				The generic notification indicator can not be delivered to the calling user
COLP				The connected number and generic number received from the destination local exchange can not be delivered to the calling user
UUS1 implicit	not supported		not supported	
UUS1 explicit	not supported		not supported	
UUS2 explicit	not supported		not supported	
UUS3 explicit	not supported		not supported	

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Geneva, 2003