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Intelligent Network (IN); Interaction between IN Application Protocol (INAP) and Integrated Services Digital Network (ISDN) signalling protocols; Part 2: Switching signalling requirements for IN Capability Set 2 (CS2) service support in a Narrowband ISDN (N-ISDN) environment

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE
Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE
Internet: secretariat@etsi.fr - http://www.etsi.fr - http://www.etsi.org

Tel.: +33 4 92 94 42 00 - Fax: +33 4 93 65 47 16

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Foreword

This ETSI Technical Report (ETR) has been produced by the Signalling Protocols and Switching (SPS), Technical Committee of the European Telecommunications Standards Institute (ETSI).

ETRs are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or the application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or an I-ETS.

This ETR is part 2 of a multi-part ETR covering the interactions between the Intelligent Network Application Protocol (INAP) and Integrated Services Digital Network (ISDN) signalling protocols as described below:

Part 1: "Switching signalling requirements for IN Capability Set 1 (CS1) service support in a Narrowband ISDN (N-ISDN) environment";

Part 2: "Switching signalling requirements for IN Capability Set 2 (CS2) service support in a Narrowband ISDN (N-ISDN) environment".

NOTE: Additional parts may cover further development in the IN area.

The standardization works in the fields of ISDN and IN have progressed as parallel, independent activities. Hence no consideration has been given to the provision of IN based services in an ISDN environment. The present document seeks to give guidance and clarification to the signalling requirements needed to fully support IN Capability Set 2 (CS2) services in a Narrowband ISDN (N-ISDN) environment.

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1 Scope

This second part of ETR 186 specifies the signalling requirements for the interaction between Intelligent Network (IN) Capability Set 2 (CS2) services and ISUP/DSS1 switched based services in an N-ISDN environment. It is based on the capabilities supported by the ETSI core Intelligent Network Application Protocol (INAP) for CS2, EN 301 140-1 [2].

The aspects of private networks in this are limited to show the indirect ISDN TE access to the public network. In particular the aspect where the private network has access to the SCF of an IN-structured network via an Intelligent Access Function (IAF) is out of scope of this ETR.

2 References

For the purposes of the present document, the following references apply:

[1] ETS 300 710: "Integrated Services Digital Network (ISDN); Public Switched Telephone Network (PSTN); Universal Access Number (UAN) service; Service description".

[2] EN 301 140-1: "Intelligent Network (IN); Intelligent Network Application Protocol (INAP); Capability Set 2 (CS2); Part 1: Protocol specification".

[3] EN 301 144-1: "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) and Signalling System No.7 protocols; Signalling application for the mobility management service on the alpha interface; Part 1: Protocol Specification".

[4] ETS 300 779: "Network Aspects (NA); Universal Personal Telecommunication (UPT); Phase 1; Service description".

[5] EN 301 175: "Cordless Terminal Mobility (CTM); Phase 1; Service Description".

[6] EN 301 070-1: "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 3 interactions with the Intelligent Network Application Part (INAP); Part 1: Protocol specification [ITU-T Recommendation Q.1600 (1997), modified]".

[7] ETR 164: "Integrated Services Digital Network (ISDN); Intelligent Network (IN); Interaction between IN Application Protocol (INAP) and ISDN User Part (ISUP) version 2".

[8] ETS 300 374-1 (1994): "Intelligent Network (IN); Intelligent Network Capability Set 1 (CS1); Core Intelligent Network Application Protocol (INAP); Part 1: Protocol specification".

[9] ETS 300 710: "Integrated Services Digital Network (ISDN); Public Switched Telephone Network (PSTN); Universal Access Number (UAN) service; Service description".

[10] ETS 300 712: "Integrated Services Digital Network (ISDN); Public Switched Telephone Network (PSTN); Premium Rate (PRM) service; Service description".

[11] ETS 300 779: "Network Aspects (NA); Universal Personal Telecommunication (UPT); Phase 1 - Service description".

[12] ETS 300 823: "Universal Personal Telecommunication (UPT); UPT phase 2; Functional specification of the interface of a UPT Integrated Circuit Card (ICC) and Public Switched Telephone Network (PSTN), Integrated Services Digital Network (ISDN) and Global System for Mobile communications (GSM) terminals (one pass and multiple pass authentication)".

[13] ITU-T Recommendation I.112 (1988): "Vocabulary of terms for ISDNs".

[14] ITU-T Recommendation Q.735: "Stage 3 description for community of interest supplementary services using Signalling System No. 7".

[15] ITU-T Recommendation Q.763: "Signalling System No. 7 – ISDN User Part formats and codes".

[16] ITU-T Recommendation Q.1224 (1997): "Distributed Functional Plane for IN CS2".

[17] ITU-T Recommendation Q.1228: "Interface Recommendation for Intelligent Network Capability Set 2".

[18] ITU-T Recommendation Q.1290 (1994): "Glossary of terms used in the definition of Intelligent Networks".

[19] EG 201 096-1: "Intelligent Network (IN); Cordless Terminal Mobility (CTM); IN architecture and functionality for the support of CTM; Part 1: CTM phase 1 for single public network case".

3 Abbreviations and definition

3.1 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ANM	Answer Message (ISUP message)
ASE	Application Service Element
BCSM	Basic Call State Model
BCUSM	Basic Call Unrelated State Model
BRI	Basic Rate Interface
CCBS	Completion of Calls to Busy Subscriber
CCC	Charge Card Calling
CCF	Call Control Function
CCNR	Completion of Calls on No Reply
CD	Call Distribution
CdINNo	Called IN number
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
COLR	COnnected Line idendification Restriction
CPH	Call Party Handling
CS1	IN Capability Set 1
CS2	IN Capability Set 2
CTM	Cordless Terminal Mobility
CUG	Closed User Group
CUSF	Call Unrelated Service Function
CURUI	Call Unrelated User Interaction
DP	Detection Point
DTMF	Dual Tone Multi-Frequency
DSS1	Digital Subscriber Signalling System No. one
EDP	Event Detection Points
FT	Fixed Termination
GUG	GVNS User Group
GVNS	Global Virtual Network Service
HLR	Home Location Register
IAF	Intelligent Access Function
IN	Intelligent Network
INAP	Intelligent Network Application Protocol
IP	Intelligent Peripheral
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
LE	Local Exchange
MCID	Malicious Call Identification
MSC	Mobile Switching Centre

NNI	Node to Node Interface
OCCRUI	Out Channel Call Related User Interaction
OPSP	Originating Participating Service Provider
PIN	Personal Identification Number
PINX	Private Integrated Network Exchange
PRI	Premary Rate Interface
PRM	Premium Rate
PSTN	Public Switched Telephone Network
PUI	Personal User Identity
QUE	Queuing
REL	Release Message (ISUP message)
ROSE	Remote Operations Service Element
SCF	Service Control Function
SCP	Service Control Point
SRF	Specialized Resource Function
SSF	Service Switching Function
SSP	Service Switching Point
SUI	Service to User Information.
TDP	Trigger Detection Points
TE	Terminal Equipment
TNRN	Terminating Network Routing Number
UAN	Universal Access Number
UPT	Universal Personal Telecommunication
UNI	User to Network Interface
USBS	User Signalling Bearer Service
USI	User to Service Information
VLR	Visited Location Register

3.2 Definition

For the purposes of the present document, terminology is defined in ITU-T Recommendation I.112 [13] and ITU-T Recommendation Q.1290 [18].

4 General

The signalling requirements specified in the present document are related to the following subjects:

- communication between an Integrated Services Digital Network (ISDN) end-user and an Intelligent Network (IN) service;
- support of mid-call events;
- interworking with ISDN supplementary services;
- support of service/feature interaction handling IN-based to IN-based;
- requirements from Cordless Terminal Mobility (CTM);
- transport of display information;
- transport of called IN number;
- requirements from Call Party Handling (CPH);
- support of Global Virtual Network Service (GVNS) configuration #3;
- support of calling user number;
- support of Detection Point (DP): Not_Reachable.

5 Communication between an ISDN end-user and IN service logic

The execution of an IN service or an IN service feature may require a communication between an ISDN end-user and the IN service logic. This communication may include transfer of information from the terminal of an ISDN end-user to the service logic as well as the provision of information to the ISDN end-user.

It is, as a general mechanism in the IN architecture, possible to send tones and announcements to an end-user and to receive additional information in-band, using Dual Tone Multi-Frequency (DTMF) signalling or speech, from an end-user. This user interaction phase is usually provided by an Intelligent Peripheral (IP). The user interaction phase with an IP is controlled by the IN service logic. The functional entity in the IP is named Specialized Resource Function (SRF) which is controlled by the Service Control

Function (SCF). In-band collected information is transferred via the Intelligent Network Application Protocol (INAP) to the SCF.

IN Capability Set 1 (CS1) only supports in-band user interaction as described above. With IN Capability Set 2 (CS2) it will be possible to support a User to Service Information (USI) communication mechanism by using the out-of-band signalling capabilities supported in the ISDN. This mechanism will provide an information transport between end-user and IN service logic which is transparent in the ISDN network. The user terminal (ISDN Terminal Equipment (TE)) and the IN service logic run an end-to-end application protocol on top of the basic network transport mechanism. This end-to-end application protocol is service feature specific. For example, remote operation procedures Remote Operations Service Element (ROSE) may be used.

5.1 Signalling configurations

The interaction with an ISDN user should not put any requirements on the network architecture; e.g. it should not be a requirement to equip the local exchanges with Service Switching Function (SSF) or SRF. As a consequence the signalling needs to support the following possible configurations for the access of an ISDN TE to the IN entities in the network:

- Case A: The ISDN TE is connected direct to a local exchange with an SSF;

- Case B: The ISDN TE is connected to a local exchange without an SSF;

- Case C: The ISDN TE is connected to a private network (indirect TE access to the public network);

- Case D: The ISDN TE is within a VPN.

In case A only the Digital Subscriber Signalling System No. one (DSS1) protocol may be affected by the requirements to support a USI communication. In case B the ISDN User Part (ISUP) may also be affected.

In case C the SSF functionality may also be located at the local exchange (as case A).

Case D is just an example signalling configuration for VPN; there are other possible permutations for the allocation of VPN functionality but these options are not discussed here.

As an example, figures 1a and 1b illustrate these signalling configurations for one of the SRF connect physical scenarios described in ETS 300 374-1 [8], subclause 7.3.5.1.1, case i) in figure 25.

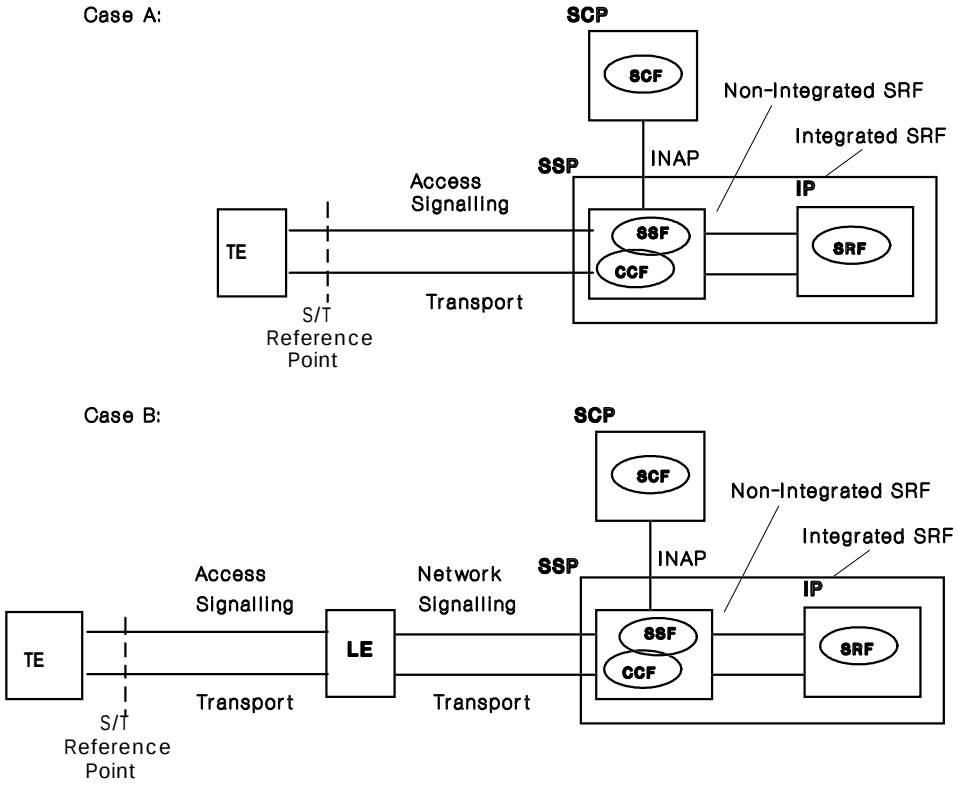


Figure 1a: Signalling configurations, Cases A and B

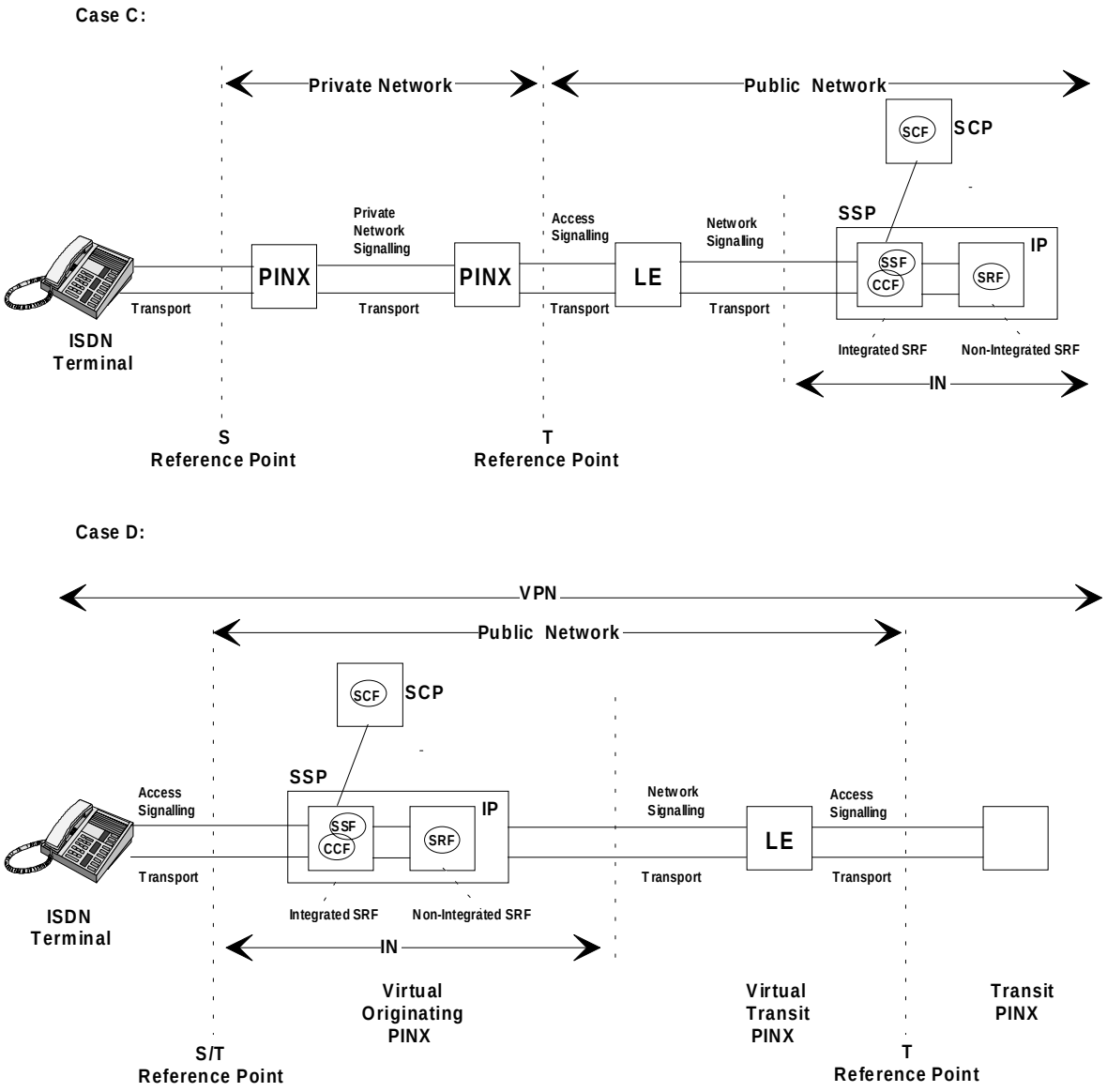


Figure 1b: Signalling configurations, Cases C and D

5.2 Terminal types

Different ISDN terminal types have to be supported. The terminal type may vary from service to service, i.e. any particular terminal may support any or all of the following categories over a set of services:

a) Terminals supporting generic keypad protocol;

b) Legacy terminals supporting fixed service logic using the generic functional protocol;

c) Future terminals supporting a service independent generic functional protocol.

5.2.1 Existing terminals

ISDN terminals are already in the market place, and the services they use need to continue to be supported, whether the network operator chooses to support them in an IN environment or in a fixed implementation environment. These terminals support a number of generic protocols, which may be used in the support of any supplementary service. These generic protocols are defined either as stimulus or functional. They support different kinds of supplementary services, according to the following definitions:

- A *stimulus supplementary service* is one where the end terminal does not have knowledge of the service being required. All protocol is transported to/from the human user with only service independent control of the presentation/coding. No service logic is present within the terminal implementation. Any service logic required to support the human user is provided in the network on behalf of the terminal. In an IN environment, this service logic will reside in the SCF with the SRF providing the user interaction under the control of the SCF. Two mechanisms of stimulus access are provided, the generic keypad protocol and the feature key protocol.

  NOTE 1: The feature key protocol, which is another stimulus protocol, is not supported in ETSI standards.

- A *functional supplementary* service is one where the peer entity has knowledge of the service being provided. The terminal therefore provides service logic in order to support that supplementary service. As a result, where the peer entity is a terminal equipment, a more intelligent man-machine interface can be provided.

  NOTE 2: The functional protocol is also the only protocol that is applicable at the T reference point to support private ISDN exchanges and networks. The procedures used at the T reference point are defined in the individual supplementary service specifications, and can be either identical to those for the coincident S and T reference point (supporting an ISDN terminal) or may be entirely different, dependent on the required functionality of the service.

The generic protocols to be supported in an IN environment are as follows:

- *Generic keypad protocol* - this is a stimulus protocol which provides for the transfer of keypad facility information elements in the user to network direction, representing primarily numeric values of a keypad being keyed by the human user. In the network to user direction, the protocol provides for the transfer of display information elements, signal information elements and tones and announcements in the bearer channel. The keypad protocol has affinity with the way that supplementary services are provided in the Public Switched Telephone Network (PSTN), and network operators may require a consistent service offering between PSTN services and ISDN keypad protocol support services.

- *Generic functional protocol* - this is a functional protocol consisting of a number of procedures for control of access resources, suspend and resume, resource reservation and common information elements (the various transport mechanisms).

Unless indicated otherwise, the requirements defined in this document apply to both stimulus and functional based terminals.

5.2.2 Future terminals

From a terminal perspective, future mechanisms should be an evolution of the existing supplementary service mechanisms. For example, the keypad protocol, provides a means of supporting services using a terminal that is service independent. Therefore the existing legacy terminals supporting the keypad protocol can continue to support new services (in an IN environment or fixed implementation environment) as and when such new services are designed.

Unlike the keypad protocol, the generic functional protocol is service specific. The IN environment will be used to create services that are not standardized, and this should be matched by a terminal where all signalling information is also service independent. Therefore in an IN environment an enhanced generic functional protocol is required, where service dependence will only exist in the user application within the terminal.

5.3 Access signalling types

This clause discusses the signalling types applicable for communication between an ISDN end user and IN service logic in the context of the terminal types identified in the previous subclause.

The communication between an ISDN end-user and the IN service logic in the network is not necessarily related to the establishment of a call/bearer. Two signalling types are to be distinguished:

a) Call related signalling (bearer related): The signalling procedure is tied to the procedures for basic call control and tied to a bearer connection in progress, active or in the clearing phase. The respective IN CS2 network aspect is named *Out Channel Call Related User Interaction* (OCCRUI);

b) Call unrelated signalling (bearer unrelated): The signalling procedure is independent of a bearer connection. The respective IN CS2 network aspect is named *Call Unrelated User Interaction* (CURUI).

Both signalling types a) and b) are to be supported for the USI mechanism.

5.4 USI signalling requirements

The requirements defined in this subclause is only applicable for functional terminals, since the USI communication mechanism requires a functional protocol. According to subclause 5.2, USI requires future terminals with an enhanced generic functional protocol.

5.4.1 IN service and IN service features applicable for user to service communication

This subclause provides a non-exhaustive list of IN services and IN service features that require communication between an end-user and the IN service logic and which are applicable for USI communication.

5.4.1.1 Call related features

The following example features require an exchange of information between the end-user and the IN service logic which are associated with an IN call:

- Terminal authentication
  For the CTM service EN 301 175 [5] updating and terminal authentication may occur while the CTM user is involved in an active call. In this case the Fixed Termination (FT) and the cordless terminal are temporarily involved in an information exchange with the CTM service logic. The information between FT and CTM service logic should be exchanged out of band (refer to EG 201 096-1 [19]).

  NOTE: The USI mechanism builds the general transport mechanism for the mobility management operations between FT and SCFmm/SCFsl, i.e. via the DSS1 alpha-interface EN 301 144-1 [3] and INAP.

- Identification
  Some IN services require the identification of the service user, e.g. via Personal User Identity (PUI) for Universal Personal Telecommunication (UPT) service ETS 300 779 [4] or card number for Charge Card Calling (CCC) service. The identification information is usually collected, during user interaction phase, by the IN service logic. Based on an application residing in the terminal, the terminal itself may control the collection of the PUI and send the information to the IN service logic.

- Authentication
  Some IN services require the authentication of the service user, e.g. via Personal Identification Number (PIN) for UPT phase 2 service or the CCC service. The authentication information is usually collected, during user interaction phase, by the IN service logic. Based on an application residing in the terminal, the terminal itself may control the collection of the PIN and send the information to the IN service logic.

- Support of UPT smart card
  Support of UPT smart card is required, i.e. call related transport of respective information (e.g. an authentication request and response) is required between terminal and network (refer to ETS 300 823 [12]).

Using the USI communication mechanism would allow the inclusion of identification or authentication information in the call setup messages. When the Service Switching Point (SSP) triggers the IN service, the identification/authentication information would be included by the SSP in the first query sent to the IN service logic. This would facilitate or even avoid an user interaction phase between an end-user and an IP during service logic processing.

- Provision of information to the user
  A mechanism should be provided to allow transport of any information from the service logic to the end user as an uni-directional information transport. This may be provided by the USI communication mechanism. The treatment of this information in the ISDN TE depends on the service application protocol, e.g. information may be displayed.
  In addition, functional operation may be completed by stimulus operation, e.g. display information (see clause 10).

5.4.1.2 Call unrelated features

The following example features require an exchange of information between the end-user and the IN service logic which are not associated with an established IN call:

- Terminal location registration and authentication
  The CTM service EN 301 175 [5] may require the terminal location registration information updating and the terminal authentication while the CTM user or rather the cordless terminal is roaming without being involved in an active call (refer to EG 201 096-1 [19]). The location registration procedure is used whenever the cordless terminal roams in a new FT or when it registers without a previous registration. The respective information should be exchanged between FT and CTM service logic via a call unrelated user interaction.

  NOTE 1: The CTM user is not aware of the terminal location updating procedure since it is controlled by the logic that resides in the CTM terminal.

  NOTE 2: The USI mechanism builds the general transport mechanism for the mobility management operations between FT and SCFmm/SCFsl, i.e. via the DSS1 alpha-interface EN 301 144-1 [3] and INAP.

- UPT outgoing call registration
  Outgoing call registration is a core feature of UPT phase 2. The procedure provides that the terminal for which an UPT user has registered "becomes his own", i.e. UPT user is allowed to make outgoing calls from the registered terminal without any additional authentication. It shall be possible to perform the outgoing call registration independent from a call, i.e. call unrelated user interaction between the UPT user and the UPT service logic shall be possible (e.g. transport of the respective information for identification and registration). Outgoing call registration via call unrelated user interaction is the appropriate procedure since in UPT phase 2 the use of a smartcard and a smartcard reading terminal are considered as standard.

- Support of UPT smart card
  Support of UPT smart card is required, i.e. call unrelated transport of respective information (e.g. an authentication request and response) is required between terminal and network (refer to ETS 300 823 [12]).

5.4.2 Signalling requirements to support an user to service communication mechanism

5.4.2.1 Requirements for a call-related (bearer- related) transport mechanism

A call-related (bearer-related) and a call-unrelated (bearer-unrelated) transport mechanism is required for USI communication.

NOTE 1: The enhancements of the User to Network Interface (UNI) and Node to Node Interface (NNI) signalling procedures should be as generic as possible. Therefore other requirements than IN should be taken into account, e.g. for VPN new transport capabilities are also required.

The ISDN signalling needs to support call-related (bearer-related) USI communication according to the following requirements:

- The mechanism should provide the service independent exchange of information between end-users, i.e. ISDN TE, and IN service logic, i.e. Service Control Point (SCP).
- The mechanism should allow transparent information transport between user and SSP in the ISDN , i.e. via UNI (DSS1) and NNI ISUP.
- The information elements functionally to be conveyed from the user to the service logic are named *USI* and from the service logic to the user S*ervice to User Information (SUI).*
  The information elements should contain an indication whether they are an USI or a SUI type, a service indication and a transparent data container (annex A describes the functional structure of the USI information elements). The length of the data container has to be variable.
- Bi-directional information transport is required at any time during the call, in combination with basic call control messages and at other times, e.g. during active and alerting phases of the call.
- At the UNI (DSS1), the mechanism should be the same regardless of whether the SSP is located in the local exchange or in a transit exchange (refer to subclause 5.1, cases A and B).
- An indication of the terminal capabilities has to be conveyed to the service logic, e.g. whether DTMF is supported by the terminal. Since there are no means in DSS1 to inform the local exchange about the capabilities of a connected terminal, this information needs to be administered in the local exchange. In case the SSP is located in the transit exchange, this information shall be conveyed via NNI (ISUP). CS2 core INAP contains a parameter "terminalType" on which this information is to be mapped (refer to annex B).
- In the case where the SSP is located in the transit exchange, the mechanism at the NNI (ISUP) should allow the transparent information transport from local exchange to the SSP (refer to subclause 5.1, case B).

  NOTE 2: The USI mechanism is restricted to the ISDN network equipment (e.g. ISDN TE, smart card reading terminals) which are enhancable to support USI signalling procedures, e.g. they have to support the appropriate service feature specific application protocol.

- Security mechanisms are required:
  - In order to avoid overload in the ISDN network due to transmission of messages carrying USI communication information, it should be possible to control the maximum rate of signalling messages, i.e. the rate of USI signalling events can be limited at the Local Exchange (LE). In addition the length of the data container needs to be limited to the maximum length supported at the UNI (DSS1) or NNI (ISUP) respectively. the ISDN TE violates these limitations, the LE should ignore the USI signalling event.

  NOTE 3: It may also be applicable that USI signalling information is sent across network borders via network to network interface (ISUP). It is for further study whether additional security checks are required in an appropriate gateway exchange. In this case the USI service indicator has global significance.

The usage of the USI mechanism by unauthorized users has to be prevented at the LE. In IN CS2 only the case supported is where USI signalling is allowed according to access subscription.
The LE should ignore the USI signalling event when the security check is unsuccessful.
The LE should ignore any SUI signalling event received from an ISDN TE.

For security checks the LE has to evaluate the USI/SUI indication (refer to annex A).

5.4.2.2 Requirements for a call-unrelated (bearer-unrelated) transport mechanism

The ISDN signalling shall support a call-unrelated (bearer-unrelated) USI communication according to the following requirements:

- The mechanism should provide service independent exchange of information between end-users, i.e. ISDN TE, and IN service logic, i.e. SCP.
- The mechanism should allow transparent information transport between user and SSP in the ISDN, i.e. via UNI and NNI.
- The information elements functionally to be conveyed from the user to the service logic are named *USI* and from the service logic to the user *SUI.*
  The information elements should contain an indication whether it is an USI or a *SUI* type, a service indication and a transparent data container (refer to annex A). The length of the data container has to be variable.
- Bi-directional information transport via call-unrelated (bearer-unrelated), connection-oriented signalling is required. The call-unrelated (bearer-unrelated) transport of user to service information should be treated similarly to the call-related (bearer-related) transport in order to facilitate the procedures. Therefore the USI and *SUI* information elements should be conveyed in the messages used for a call-unrelated (bearer-unrelated) signalling connection.

  NOTE 1: The enhancements of bearer-unrelated signalling messages in order to allow transport of user to service information should be considered in the context of similar activities for UNI and NNI, i.e. introduction of a bearer-unrelated ISDN basic call for the support of VPN or User Signalling Bearer Service (USBS). In principle, the USI communication should use the signalling messages of the bearer-unrelated ISDN basic call in the same way as for the bearer-related ISDN basic call.

- At the UNI (DSS1) the mechanism should be the same regardless of whether the SSP is located in the local exchange or in a transit exchange.
- Where the SSP is located in the transit exchange, the mechanism at the NNI (ISUP) should allow the transparent information transport from local exchange to the SSP.
- Security mechanisms are required:
  - In order to avoid overload in the ISDN due to transmission of messages carrying USI communication information, it should be possible to control the maximum rate of signalling messages, i.e. the rate of USI signalling events can be limited at the Local Exchanges (LEs). In addition the length of the data container needs to be limited to the maximum length supported at the UNI or NNI respectively. The ISDN TE violMSMO these limitations, the LE should ignore the USI signalling event.

  NOTE 2: It may also be applicable that USI signalling information is sent across network borders via network to network interfaces. It is for further study whether additional security checks are required in an appropriate gateway exchange. In this case the USI service indicator has global significance.

  - The usage of the USI mechanism by unauthorized users has to be prevented at the LE. In general USI signalling is only allowed according to access subscription. The LE should ignore the USI signalling event when the subscription check is unsuccessful.
  - The LE should ignore any *SUI* signalling event received from an ISDN TE.
    For security checks the LE has to evaluate the USI/*SUI* indication (refer to annex A).

5.4.3 Enhanced Call Unrelated Service Function (CUSF)-SCF operation set of CS2 core INAP

In order to support call-unrelated (bearer-unrelated) IN treatment, in IN CS2 a new functional entity was introduced in the SSP, i.e. the CUSF. Therefore also a new type of INAP interface is introduced in CS2 core INAP EN 301 140-1 [2], i.e. the CUSF-SCF interface. This interface is enhanced with respect to the CUSF-SCF interface specified in IN CS2 ITU-T Recommendation Q.1228 [17].

The CUSF-SCF interface of CS2 core INAP supports two options:

Option 1: The service Application Service Element (ASE) is located in the CUSF and the CUSF acts as a relay function between the service ASE and the SCF. The SCF can provide additional information for the connection processing.

The only interworking case with a switched based service which was studied in detail in the time frame of CS2 is the interworking with Completion of Calls to Busy Subscriber (CCBS)/Completion of Calls on No Reply (CCNR). The CUSF-SCF interface provides the capability of triggering during the processing of the CCBS/CCNR ASE in the SSP and to send some parameter to the IN service logic. In the SCF to CUSF direction the IN service logic can provide new address information to be used in the further connection establishment controlled by the CCBS/CCNR ASE.

NOTE 1: The same IN service logic controls the bearer-related call for which the busy or no answer event applied.

Option 2: The service ASE is located in the SCF and the CUSF acts as a relay function between the user and the SCF. The SCF receives and may send USI information.

The only service standardized in ETSI in the time frame of IN CS2 which will use the USI mechanism is CTM. For CTM the mobility management ASE is located in the SCP and in the FT. USI mechanism will be used to convey the mobility management operations via INAP and DSS1, EN 301 144-1 [3].

NOTE 2: The options are mutually exclusive. This means, when the bearer unrelated INAP relationship is established in order to exchange USI related information via the CUSF-SCF interface, the CUSF contains no service ASE which interworks with IN and no application specific parameters beside USI related parameter are exchanged via this interface. On the other hand, whenthe CUSF contains a service ASE which interworks with IN (e.g. a CCBS/CCNR ASE), no USI related parameters are exchanged via this interface.

Enhanced CUSF-SCF operation set of CS2 core INAP:

Enhanced CUSF-SCF operation set of CS2 core INAP	**Direction**	**Interworking with NNI/UNI**
InitialAssociationDP	CUSF→SCF	relevant
ConnectAssociation	CUSF←SCF	relevant
ContinueAssociation	CUSF←SCF	not relevant
InitiateAssociation (note 1)	CUSF←SCF	relevant
ReleaseAssociation (note 1)	CUSF←SCF	relevant
RequestReportBCUSMEvent (note 1)	CUSF←SCF	not relevant
EventReportBCUSM	CUSF→SCF	relevant
RequestReportUSI	CUSF←SCF	not relevant
ReportUSI	CUSF→SCF	relevant
Send*SUI*	CUSF←SCF	relevant
ResetTimer	CUSF←SCF	not relevant
ActivityTest (note)	CUSF←SCF	not relevant
NOTE: These operations are already supported via the CUSF-SCF interface in ITU-T Recommendation Q.1228 [17].		

Where the third column identifies an interworking with NNI/UNI, the mapping of INAP CUSF-SCF operations to NNI/UNI is described in annex B.

For the CUSF, a specific Basic Call Unrelated Service Model (BCUSM) is defined in ITU-T Recommendation Q.1224 [16]. This BCUSM with all specified DP is fully applicable for CS2 *core* INAP.

6 Support of mid-call events

Mid-call events are used as Trigger Detection Points (TDPs) to invoke an IN-service, and Event Detection Points (EDPs) to initiate certain actions during an IN call.

The following non-exhaustive list of example features require support of mid-call events via ISDN signalling:

- CPH features
  In IN CS2 the detection of midcall events is a basic requirement in order to support CPH, e.g. the user may send a request to the service logic in order to initiate the manipulation of legs during an active call.

- Follow-on calls
  This procedure allows a service user, e.g. a UPT user, when terminating an outgoing UPT call, before disconnecting completely, to initiate a new UPT outgoing call without having to repeat the identification and authentication procedures.

Two general procedures are possible for follow-on calls:

- Procedure 1: On detection of the termination of the outgoing call leg (event "Disconnect initiated by Called Party") or in case of an unsuccessful call (events "Route Select Failure" "Called Party busy", "No Answer from Called Party"), the connection between calling party and SSP is not released. The service logic prompts the user via user interaction procedures for the new address information to set up a new outgoing call.

- Procedure 2: During the alerting phase or the active call phase the calling party requests the service logic to disconnect the connection from the SSP to the called party (outgoing call leg). The follow-on request from the user is considered as a "mid-call" event. After performing the disconnection, the service logic prompts the user via user interaction procedures for the new address information to set up a new outgoing call.

Procedure 1 is well supported by IN CS1 and the existing ISDN signalling, i.e. DSS1 and ISUP. Procedure 2 based on a mid-call event is not supported in IN CS1.

In general the ISDN signalling should support mid-call events for IN CS2, for both the case where the SSF is located at a transit exchange, and where the SSF is located at a local exchange. The Basic Call State Model (BCSM) contains respective mid-call DPs which can be armed by an IN service logic similar to any other DP.

6.1 Signalling requirements

This subclause defines the requirements for mid-call processing where the SSF is located at the transit level. For the case where the SSF is located at the LE, the requirements are a subset of these, i.e. no ISUP interaction.

The SCF may dynamically request (or withdraw) the monitoring of midcall events to the SSF. The SSF/Call Control Function (CCF) therefore sends the appropriate request to the LE to carry midcall events to the SSF/CCF. To simplify the information which is to be sent to the LE only the kind of the midcall request is sent:

1) specified code;

2) withdrawal of request.

NOTE 1: Analogue terminals connected to an ISDN access (e.g. via a terminal adapter) may initiate a pure hookflash as a mid-call request.

In order to distinguish between the request to monitor for control codes and pure hook flash, the latter is identified by sending an empty list of control codes from SCF to SSF when arming a mid-call DP (in INAP "RequestReportBCSMEvent" operation).

For the case of control codes, the LE may use a pre-defined (possibly administered) list to decide whether the used code is valid for the IN (i.e. any service logic) at all.

If a mid-call event is received in the LE it is sent to the SSF/CCF including the possibly received control code.

The following general requirements need to be fulfilled for the handling of midcall EDPs when the SSF/CCF is located at transit level:

1) The request for a midcall EDP (including DP specific control information) may dynamically be performed by the service logic in the SCF by sending an appropriate operation to the SSF/CCF. This request has to be conveyed from the SSF/CCF to the originating or destination local exchange using the basic network signalling to be processed there.
See annex D for a proposal to enhance the ISUP for conveying this request. In this proposal a distinction between the request of a hookflash and of control codes is made. Which concrete control codes the SCF has requested is not conveyed to the local exchange.

2) The request for specific midcall events may be sent to the OLE during call set-up (at the earliest with the first backward message) and the active call, to the DLE during active call.
The request for specific midcall events received by the LE is valid until the call for which the EDP was armed is released or if a withdrawal is received from the SCF.

3) The request for specific midcall events may be withdrawn by the service logic. The withdrawal has to be conveyed in the underlying basic network from the SSF/CCF to the LE and to be processed there. See annex D for a proposal to enhance the ISUP for conveying this withdrawal.

4) The underlying network must be able to process multiple requests for arming/disarming of EDPs during one call resulting from either different SCFs (see clause 8) or the same SCF. If the LE receives new requests for specific midcall events the previously received information will be overwritten (i.e. it is no longer valid).

5) At a given time, a local exchange may either watch hook flash or control codes.

6) If the service user causes a midcall event the LE must check if the midcall event from the service user matches the midcall event actually enabled by the SCF. If so, the underlying basic network has to convey this event from the local exchange to the SSF/CCF at the transit exchange.
For the case of control codes, the LE may use a pre-defined (possibly administered) list to decide whether the used code is valid for the IN (i.e. any service logic) at all. Nevertheless, a control code may be conveyed from the LE to the CCF/SSF which is not requested by the SCF. Events carrying such control codes should be ignored by the CCF/SSF.

7) A "temporary withdrawal" of a midcall EDP by the CCF/SSF (e.g. in PIC O/T_Mid_Call itself or after a regress in the BCSM) should not be propagated to the LE for load reasons. In such situations (and in rare cases with a "normal" withdrawal) it may happen that unexpected midcall events are received by the CCF/SSF. Such events should be ignored.

8) In the case of IN-IN service interworking it may happen that more than one SCF request specific midcall events occur simultaneously. In the following, a proposal how to handle these cases is made for the CCFs/SSFs residing at transit level in different SSPs. For other cases the handling should be analogue.

   – A CCF/SSF receiving a request/withdrawal for a midcall DP from another CCF/SSF will register it but only pass through if its own SCF has not caused a request for a midcall DP before.

- A CCF/SSF receiving a request for a midcall DP from its own SCF will send it to the LE regardless of a previous received request/withdrawal from another CCF/SSF.

- A CCF/SSF receiving a withdrawal for a midcall DP from its own SCF will send it to the LE only if no request from another CCF/SSF has been received before.Otherwise, the request from the other CCF/SSF will now be sent to the LE.

- A CCF/SSF releasing a leg or receiving a release indication from a leg will treat this like an implicit withdrawal for a midcall DP from another CCF/SSF if a previous request for a midcall DP was received on this leg.

NOTE 2: Superfluous orders of a CCF/SSF to an LE (e.g. request/withdrawal identical with the previous one) may be suppressed of course.

- If a CCF/SSF receives a midcall event (provided the event is possible according to the BCSM) which its own SCF has not requested, it will forward the event to the next CCF/SSF if it has received a request for this midcall event from that CCF/SSF before.

Following these rules, a midcall event will be processed (i.e. EDP O/T_Mid_Call is encountered) by the first reached CCF/SSF which has armed this DP with the matching criteria.

This enables several SCFs active in the same call to use midcall EDPs provided they use different sets of feature codes.

NOTE 3: It is assumed that the functionality of the detection of midcall events received from the user (e.g. hookflash or specific code) is already available. Therefore no requirement exists in this point.

7 Interworking between IN services/features and ISDN supplementary services

7.1 Interworking with CCBS/CCNR

For the IN services Universal Access Number (UAN) ETS 300 710 [9] and Premium Rate (PRM) ETS 300 712 [10] interworking with the call completion supplementary services (CCBS/CCNR) is allowed. Nevertheless, for some optional features of the UAN and PRM services, e.g. Call Distribution (CD) or Queuing (QUE) the interworking with CCBS/CCNR has to be rejected in order to avoid degradation of the call completion supplementary services. Therefore, based on a respective indication setup by an UAN or PRM service logic and transferred to the SSP by means of the serviceInteractionIndicators, CCBS/CCNR has to be rejected in the ISDN.

7.2 Limitations in case of follow-on

IN CS2 provides additional options for follow-on calls, i.e. mid-call detection point processing (refer to clause 6). However, this only works if the calling user indicates that a follow-on call is required before the called party release is detected. If the mid-call event is not detected this means that CS1 method of handling follow-on calls will continue to be used. For CS1 several limitations for ISUP in supporting follow-on calls exist (refer to EN 301 070-1 [6]). For IN CS2 support, it is required that solutions to these problems should be found, e.g. Charging/No_Charging Indicators and indicators for the support of supplementary service information (e.g. connected line identification, Closed User Group (CUG) etc.) and control of echo suppresser devices when the call is established to consecutive called parties should also be resolved.

7.3 COnnected Line idendification Restriction (COLR) support for called IN number

It is required by IN to support that a called number can, on request from the SCF, be presented towards the calling party as the connected number with the "address presentation restricted indicator" set either to "presentation allowed" or "presentation restricted".

The service driver for this requirement is CTM EN 301 175 [5]. In this case the called IN number is the CTM number.

It should be possible for the SCF to indicate that the called IN number is inserted as connected number in ISDN with "address presentation restricted indicator" as defined in ISUP set to "presentation allowed" (but not with the indication "presentation restricted"). This is supported in INAP by the "connectedNumberTreatmentInd" in the INAP parameter "ServiceInteractionIndicatorsTwo" (refer to annex C).

Support for "presentation restricted" is required when permanent mode of COLR is to be supported by the CTM service (refer to EN 301 175 [5]). In this case the called IN number (CTM number) is to be applied as connected number with "address presentation restricted indicator" set to "presentation restricted". This is supported in INAP by the value "connectedNumberTreatmentInd=presentCalledINNumberRestricted" in the INAP parameter "ServiceInteractionIndicatorsTwo" (refer to annex C).

7.4 UID capability / UID action indicators

ISUP version 3 allows flexible control of through connection of the signalling path and T9 timer by means of the "UID capability indicators" (sent in forward direction) and "UID action indicators" (sent in backward direction) respectively (refer to EN 301 070-1[6]).

The appropriate parameters in INAP allowing an IN service logic to control these capabilities are the "bothwayThroughConnectionInd" and "userDialogueDurationInd" in the INAP parameter "ServiceInteractionIndicatorsTwo" (refer to annex C).

According the IN service logic programme, both indicators can be set and sent from the SCF to the SSF. Following the general principles for interworking, the SSP has to handle the interworking procedures based on generic indicators set by the SCP. Therefore only the indication whether through connection is required or not or whether the user interaction will be long or short is provided from the SCF to the SSF via INAP. The capabilities supported in the signalling network which are indicated in the "UID capability indicators" are not sent via INAP from SSF to SCF. This means the mapping of the information received from the SCF to the respective ISUP "UID action indicators" has to be done in the SSP.

Tables 1 and 2 show the mapping of the INAP "ServiceInteractionIndicatorsTwo" parameter on the ISUP.

Table 1: Relation between ISUP:Through-connection instruction indicator and INAP:ServiceInteractionIndicatorTwo

ISUP forward direction UID capability indicators: Through-connection indicator	Core INAP: SCF→SSF ServiceInteraction IndicatorsTwo: BothwayThrough ConnectionInd	ISUP backward direction UID action indicators: Through-connection instruction indicator	ISUP backward message
not exist	bothwayPath NotRequired	not exist	-
not exist	bothwayPathRequired	not exist	ANS
no indication	bothwayPath NotRequired	not exist	-
no indication	bothwayPathRequired	not exist	ANS
through-connection modification possible	bothwayPath NotRequired	not exist	-
through-connection modification possible	bothwayPathRequired	through connect in both directions	ACM/CPG

Table 2: Interaction between ISUP:T9 instruction indicator and INAP:ServiceInteractionIndicatorTwo

ISUP forward direction UID capability indicators: T9 timer indicator	Core INAP: SCF→SSF ServiceInteraction IndicatorsTwo: UserDialogue DurationInd	ISUP backward direction UID action indicators: T9 instruction indicator	ISUP backward message
not exist	FALSE	not exist	-
not exist	TRUE	not exist	ANS
no indication	FALSE	not exist	-
no indication	TRUE	not exist	ANS
stopping of timer possible	FALSE	not exist	-
stopping of timer possible	TRUE	stop or do not start T9	ACM/CPG

8 Support of service/feature interaction handling IN-based to IN-based

8.1 Transport of service compatibility indicator

With IN CS2 enhanced procedures in order to support service/feature interaction handling IN-based to IN-based are introduced. In general the interaction of simultaneously active service logics is restricted to two. As a basic network functionality a service compatibility check will be added to the triggering mechanisms in the SSF. This check will be based on a "Service Compatibility Indicator". It is setup by the SSF when the first service logic is triggered. When triggering, the second SSF will perform a generic compatibility check for the received "Service Compatibility Id", using an exclusion matrix.

If these SSFs are located in different SSPs, transport of the "Service Compatibility Indicator" via NNI (ISUP) is required in the forward direction and in the backward direction. For the time being, this indicator is only of relevance for IN services, there is no impact on existing ISDN supplementary services.

Annex B summarizes the ISUP requirements for the transport of the service compatibility indicator. Structure and content of the INAP parameter "iNServiceCompatibilityIndicator" is shown in annex C.

9 Signalling requirements from CTM

Refer to subclause 7.3 for the COLR support for the CTM Number.

No additional specific signalling requirements are identified for CTM Phase 1.

10 Transport of display information

In general the use of display information represents the stimulus approach.

CS1 core INAP already includes the capability of sending a display information, i.e. IA5 string, to the calling party. These operations and the respective procedures are still valid for IN CS2.

- In case of call gapping (CallGap operation) or service filtering (ActivateServiceFiltering operation), the calling party should receive an indication before the filtered or gapped call is released. This

indication may be a text information to be displayed to the calling party. CallGap and ActivateServiceFiltering are SSF-SCF operations. The SSF is located at a transit exchange, the displayInformation parameter may be mapped to the ISUP display information parameter (EN 301 070-1 [6]). At the local exchange, and also when the SSF is located at the local exchange, the information may be mapped to the DSS1 display information element.

- In the case of an announcement to the calling party (PlayAnnouncement (PA) operation), the announcement may be accompanied by display information. PA is an SRF-SCF operation. In general the SRF requires a bearer connection established to the resources managed by the SRF. Dependent on the interface used for the bearer connection, i.e. UNI or NNI, the SRF may map the displayInformation parameter to the ISUP display information parameter or to the DSS1 display information element.

- In the case of user interaction (PromptAndCollectUserInformation (PAC) and PlayAnnouncement (PA) operation), the announcement may be accompanied by a display information. PAC and PA are SRF-SCF operations. In general the SRF requires a bearer connection established to the resources managed by the SRF. Similar to the case of an simple announcement as described above, in the case of user interaction, prompting has to be done with PAC via an in-band announcement accompanied by a PA with display information. Mapping of the displayInformation parameter is the same as described above for PA. The calling party may provide the requested information in-band, e.g. as spoken text. In addition a stimulus approach in the direction user to SRF is not supported, i.e. a DSS1 keypad facility information element cannot be sent to an SRF attached to/collocated with an SSF on the transit level.

For IN CS2, display information can also be sent to the called party; therefore the display parameter has been introduced into the connect operation. It has also been assumed that the display has the capability of a standard ISDN UNI, although the IN is not explicitly aware of the terminal capabilities.

Annex B summarizes the ISUP requirements for the transport of the display information.

NOTE: At the access, multiple display information elements may be received in rapid succession and overwrite the previous displayed information. It is for further study whether a co-ordination function for display information should be introduced, e.g. in the local exchange.

11 Transport of called IN number

In general the called IN Number shall be available and registered for the ISDN supplementary service MCID. That is why the ISUP parameter Called IN Number (CdINNo) as specified in ETR 164 [7] is always generated by the SSF, independent from the SCF. The calledPartyNumber parameter sent in the InitialDP operation is transferred via ISUP in the CdINNo parameter to the succeeding exchange.

NOTE: Format and coding of the called IN number corresponds to the original called party number parameter according to ITU-T Recommendation Q.763 [15]. The default value of the presentation restricted indicator included shall be set to "presentation not allowed".

For some services, as a special service feature, the SCF may want to specifically indicate whether the CdINNo shall be presented to the called party or not. As an example the UAN service ETS 300 710 [1] includes display of the called universal access number as an optional service requirement.

It IS possible that the IN service logic may control the presentation restricted indicator, e.g. set "presentation allowed" in order to allow the presentation to the called party. In any case, the called IN number as available in the SSP needs to be transferred to the called party and may be registered for MCID. The INAP ServiceInteractionIndicator parameter is enhanced with the "allowCdINNoPresentationIndicator" (refer to annex C).

12 Signalling requirements from CPH

No specific signalling requirements are identified for CPH.

13 IN support of GVNS configuration #3

The GVNS is a multi-network international service which provides private network functions to users at geographically dispersed international locations while minimizing the need for dedicated network resources. It may be offered to customers over the PSTN and/or ISDN. In principle it is based on VPN interworking at the service providers' international gateways.

The ISUP procedures for GVNS configuration #3 are specified in ITU-T Recommendation Q.735 [14], clause 2:GVNS stage 3 description. ITU-T Recommendation Q.735 [14], specifies two new ISUP parameters for GVNS:

- *Forward GVNS parameter*, contained in the ISUP message IAM

  The format of the GVNS Forward parameter includes following subfields:

  - Originating Participating Service Provider (OPSP);
  - GVNS User Group (GUG);
  - Terminating Network Routing Number (TNRN).

  Backward GVNS parameter, contained in the ISUP messages CON and Answer Message (ANM)
  The format of the GVNS Backward parameter includes following subfields:

  - terminating access indicator.

Where GVNS configuration #3 is supported in a network with IN based VPN, these GVNS specific parameters have to be conveyed to/from the VPN service logic. Therefore the GVNS Forward and GVNS Backward parameter are included in following INAP messages:

```
InitialDP enhancements:
    InitialDPArg:           forwardGVNS         [xx] ForwardGVNS    OPTIONAL,

ConnectArg enhancements:
    ConnectArg:             forwardGVNS         [xx] ForwardGVNS    OPTIONAL,
                            backwardGVNS        [xx] BackwardGVNS   OPTIONAL,

Data Types enhancements:
    BackwardGVNS            ::= OCTET STRING (SIZE (minBackwardGVNSLength..
                                                    maxBackwardGVNSLength))
    -- Indicates the GVNS Backward information. Refer to Q.735, §6 for encoding.
    ForwardGVNS             ::= OCTET STRING (SIZE (minForwardGVNSLength..
                                                    maxForwardGVNSLength))
    -- Indicates the GVNS Forward information. Refer to Q.735, §6 for encoding.
      minForwardGVNSLength      INTEGER ::=   -- to be specified
      maxForwardGVNSLength      INTEGER ::=   -- to be specified
      minBackwardGVNSLength     INTEGER ::=   -- to be specified
      maxBackwardGVNSLength     INTEGER ::=   -- to be specified
    EventSpecificInformationBCSM    ::=     CHOICE  {  ....
      oAnswerSpecificInfo   [4]     SEQUENCE                                {
                    backwardGVNS        [1]     BackwardGVNS        OPTIONAL
                                ...
                                },
```

Two message sequence charts in annex E show an applicable information flow for an incoming and outgoing GVNS call.

14 Support of calling user number

14.1 Introduction of calling user number in INAP and ISUP

For IN CS2 there is no standardized interworking specified for how an IN provided calling party number can be mapped to an appropriate ISUP parameter. According the ISUP-INAP interworking standard EN 301 070-1 [6] this mapping is left open as a network operator specific mapping. EN 301 070-1 [6] only indicates that this network operator specific mapping should not jeopardise ISDN supplementary services like MCID or Calling Line Identification Presentation (CLIP)/Calling Line Identification Restriction (CLIR). However this will be the case, since the IN provided calling party number can only mapped to existing ISUP parameters, like "Generic number" or "Calling party number", which are used for these ISDN supplementary services.

Therefore a new number parameter "callingUserNumber" is introduced in CS2 core INAP allowing the provision of calling party number by IN without misusing existing ISUP number parameters. This INAP parameter should be mapped to an appropriate new ISUP parameter "Calling user number". Mapping of the INAP parameter "callingUserNumber" shall not affect the ISUP parameters "Generic number" or "Calling party number".

Introduction of this number parameter is required in order to fulfil following IN CS2 service requirements:

- The requirement (of Q.7 ITU-T SG11) to display the UPT calling party number independently of the already transmitted calling party number to the called party.

- The functionality of the MCID supplementary service needs to be ensured. The current stage 3 description of this service only requests registration of the calling party number. But as the calling party number (in case of UPT calling user) definitely does not identify the UPT calling user, but only the physical equipment used by the UPT subscriber, there is need for an enhancement. Therefore, in order to distinguish between the calling UPT subscriber and the equipment currently used by the UPT subscriber, other parameter needs to be introduced. This is also required by EN 301 175 [5] and ETS 300 779 [11] subclause "8.4 MCID" where it is said "Both the CTM number and the number of the CTM user's currently registered location shall be registered".

- According to ETS 300 779 [11] subclause 7.5.1 "calling line identification presentation" the following requirement is given: "The called user shall not receive information pertaining to the UPT user's registered location but the UPT number of the calling user".

- Also according to EN 301 175 [5] subclause 8.1.1 "calling line identification presentation" the same requirement is given with regard to CTM since it is stated "The called user shall not receive information pertaining to the CTM user's registered location, but the CTM number of the calling user"

Refer to annex B for mapping of INAP on ISUP for this parameter.

14.2 Presentation of the calling party number to the called user

According to the requirements given in ETS 300 779 [11] and EN 301 175 [5] it has to be possible for the service logic to change the restrictions of the presentation restriction indicator of the calling party number.

Therefore a new sub-indicator to the ForwardServiceInteractionInd of the INAP parameter "ServiceInteractionIndicatorsTwo" is added (refer to annex C).

15 Support of DP: Not_Reachable

In general CS2 core INAP supports all DPs specified in the O-BCSM and T-BCSM in IN CS2 according ITU-T Recommendation Q.1224 [16].

In addition, a new DP for "Not_Reachable" will be supported in O-BCSM and T-BSCM by CS2 core INAP, i.e. as "o_Not_Reachable" and "t_Not_Reachable". These additional DPs will be specified in EN 301 144-1 [3]. The new DP for "Not_Reachable" will be supported in order to meet the requirements for CTM EG 201 096-1 [19] and CAMEL Phase 2.

Mobile subscriber "Not_Reachable" indication will be sent if:

- the mobile subscriber is detached;

- no page response is received;

- there is a congestion in radio resources (e.g. between the Mobile Switching Centre (MSC)/Visited Location Register (VLR) and the mobile station).

For mobile applications it is possible to have both an early determined or a late determined "Not_Reachable" event. The first event can be detected by a Home Location Register (HLR) before the call is routed to the final destination. The latter event can be received by SSF/CCF via signalling as a release event as response to the call connection setup request.

The DP can be either armed as static DP (TDP) or dynamic DP (EDP). The event to trigger the DP via signalling (late determined event) is the receipt of a release cause "Subscriber_Absent" (refer also to annex B).

Annex A (informative): Functional structure of the USI information element

The USI information element should be functionally defined as follows:

USI/SUI indication:

Transparent transport of the USI information element from the ISDN TE to the IN service logic and vice versa is required. This is achieved by two different types of information elements:

- in the user to service direction: USI User to Service Information;

- in the service to user direction: SUI Service to User Information.

The USI/SUI indication represents network knowledge, i.e. the LE has to evaluate this indication for security checks.

Service indication:

The service indication represents SSF knowledge. It is evaluated in the IN capable exchanges (the SSPs). Based on the service indication, an SSF, prior to sending a USI information element to an SCF, checks whether the SCF is prepared to receive a USI information element with that particular service indication. If the USI information element is sent across a network boundary, the value of the service indication has to be standardized or bilaterally agreed and may need to be checked by the gateway exchanges. The detailed handling of the service indication by an SSP is different for the call-related transport mechanism and for the call-unrelated transport mechanism.

Data container:

The data container is evaluated only by the ISDN TE and by the IN service logic. It represents service logic and user knowledge, i.e. the content is service dependent. The length of the container is variable. The maximum length is limited according to the maximum value which is supported on the UNI signalling (DSS1) and on the NNI signalling (ISUP).

Annex B (informative): Parameters mapping

Table B.1: Modifications to IN CS1 (core INAP) operations: SSF-SCF

Operation	Parameter Added	Signalling Interworking Requirements
Connect	displayInformation	**a) displayInformation** **ISUP:** The ISUP requirements are just to transport the parameter and can be summarized as follows: Phase of Call: Call establishment Messages to carry information : IAM Action at SSP: map parameter to appropriate ISUP message Action at Local exchange: Sent to the terminal for display Action at Transit exchange: pass information on unchanged **DSS1:** Display information shall be supported when received at the terminating exchange with the IAM. It is to be sent to the terminal in order to display the information. At the access multiple display information elements may be received immediately one after the other and overwrite the previous displayed information. It is for further study whether a co-ordination function for display information should be introduced, e.g. in the local exchange.

(continued)

Table B.1 (continued): Modifications to IN CS1 (core INAP) operations: SSF-SCF

Operation	Parameter Added	Signalling Interworking Requirements
Connect	forwardCallIndicators	**b) forwardCallIndicators** **ISUP:** ForwardCallIndicators are a mandatory part of the IAM and carried in the forward direction only. Should the information be returned in the backward direction also, if this parameter is changed by IN since there may be a problem with end to end consistency? Guidance from SPS1 is sought on this point. Currently only one service specific requirement is identified: a VPN service logic may require the explicit setting of "ISUP all the way". However it is proposed to sent the complete forwardCallIndicators parameter from SCF to SSF in order to have the possibility on controlling other subfields. **DSS1**: no additional requirements **c) genericNumber** **ISUP:** Each GenericNumber shall be mapped unchanged, to the ISUP Generic Number parameter. **DSS1**: no additional requirements **d) iSDNAccessRelatedInformation** **ISUP:** This parameter shall be mapped on the ISUP parameter "Access transport". Note: Since the ISUP parameter "Access transport" includes some sub-parameters which have only end-to-end significance, some of these sub-parameters shall not be modified by IN. Thus, as part of the ISUP/INAP interworking procedures an explicit indication shall be provided which sub-parameters shall not be modified when mapping the INAP "iSDNAccessRelatedInformation" parameter on the ISUP parameter "Access transport". **DSS1**: No additional requirements. This parameter maybe changed by IN.
	genericNumber	
	iSDNAccessRelatedInformation	

(continued)

Table B.1 (continued): Modifications to IN CS1 (core INAP) operations: SSF-SCF

Operation	Parameter Added	Signalling Interworking Requirements
Connect	carrier	**d) carrier** The INAP parameter "carrier" shall be mapped on the INAP parameter "Transit Network Selection" (TNS). The INAP parameter is of type OCTET STRING and allows a flexible length.
	forwardGVNS backwardGVNS	**e) forwardGVNS / backwardGVNS** **ISUP:** INAP parameters "forwardGVNS" and "backwardGVNS" is mapped unchanged to the equivalent ISUP parameters. **DSS1**: No impact.
	iNServiceCompatibilityResponse	**d) iNServiceCompatibilityResponse** See InitiateCallAttempt operation.
	serviceInteractionIndicatorsTwo	**e) serviceInteractionIndicatorsTwo** See clause 7 and annex C.
	locationNumber	**f) locationNumber** **ISUP:** INAP parameter "locationNumber" is mapped unchanged to the equivalent ISUP parameter. **DSS1**: No impact.
	callingUserNumber	**g) callingUserNumber** **ISUP:** INAP parameter "callingUserNumber" is mapped unchanged to the equivalent ISUP parameter. **DSS1**: No impact.

(continued)

Table B.1 (continued): Modifications to IN CS1 (core INAP) operations: SSF-SCF

Operation	Parameter Added	Signalling Interworking Requirements
	bearerCapability	**h) bearer capability** **ISUP:** If a bearer capabilities is already assigned to an existing party in the call then this bearer capability will be used and any bearer capability provided by IN If a bearer capabilities is already assigned to an existing party in the call then this bearer capability will be used and any bearer capability provided by IN will be ignored; If a bearer capability has not been assigned (i.e there is no party yet) and a bearer capability is provided by INAP then this bearer capability should be used; If neither the signalling or INAP provides a bearer capabilities value then the default of 3,1kHz audio should be used. **DSS1**: No impact

(continued)

Table B.1 (continued): Modifications to IN CS1 (core INAP) operations: SSF-SCF

Operation	Parameter Added	Signalling Interworking Requirements
InitialDP	cause	**a) cause** **ISUP:** No additional requirements. Cause parameter is already supported by ISUP in the Release Message (ISUP message) (REL) message, this just needs to be mapped to the InitialDP when it is provided. **DSS1**: No additional requirements
	iSDNAccessRelatedInformation	**b) iSDNAccessRelatedInformation** **ISUP:** This parameter can be mapped from the ATP in the IAM. **DSS1**: No additional requirements
	forwardGVNS	**c) forwardGVNS** **ISUP:** Equivalent ISUP parameter shall be mapped unchanged to the INAP parameter "forwardGVNS". **DSS1**: No impact.
	iNServiceCompatibilityIndication	**c) iNServiceCompatibilityIndication** **ISUP:** The ISUP requirements are summarized as follows: Phase of Call: Call establishment and active Messages to carry information: IAM, CPG, ACM, CON Action at SSP: map parameter, store information and generate parameter Action at Local exchange: ignore information (if LE not an SSP) Action at Transit exchange: pass information on unchanged (if transit exchange is not an SSP) **DSS1**: No impact. This parameter will not be passed to the terminal, the information should just be stored at the SSP.

(continued)

Table B.1 (continued): Modifications to IN CS1 (core INAP) operations: SSF-SCF

Operation	Parameter Added	Signalling Interworking Requirements
InitialDP	genericNumbers terminalType serviceInteractionIndicatorsTwo carrier	**d) genericNumbers** **ISUP:** If this parameter is present in the SSF it should be mapped unchanged to the INAP GenericNumbers parameter. If the Generic Number parameter just contains an additional Calling Party number the INAP Additional Call Party number parameter shall be used. Note that the INAP parameter GenericNumbers may convey several Generic Numbers. **DSS1:** No additional requirements. **e) terminalType** **ISUP:** The ISUP requirements are summarized as follows: Phase of Call: Call establishment Messages to carry information: IAM forward direction only Action at SSP: map parameter to InitialDP Action at Local exchange: retrieve information Action at Transit exchange: pass information on unchanged **DSS1:** No additional requirements. Note: The values supported in "terminalType" are: unknown, dialPulse, dtmf, isdn, isdnNoDtmf. **d) serviceInteractionIndicatorsTwo** See clause 7 and annex C. **e) carrier** See connect operation.

(continued)

Table B.1 (continued): Modifications to IN CS1 (core INAP) operations: SSF-SCF

Operation	Parameter Added	Signalling Interworking Requirements
InitiateCallAttempt	carrier alertingPattern iNServiceCompatibilityResponse iSDNAccessRelatedInformation locationNumber serviceInteractionIndicatorsTwo	**a) carrier** See connect operation. **b) alertingPattern** See connect operation in table 3. **c) iNServiceCompatibilityResponse** **ISUP:** The ISUP requirements are summarized as follows: Phase of Call: Call establishment and active Messages to carry information: IAM Action at SSP: map parameter on a new ISUP parameter (same as for "iNServiceCompatibilityID"), store information and generate parameter Action at Local exchange: ignore information (if LE not an SSP) Action at Transit exchange: pass information on unchanged (if transit exchange is not an SSP) **DSS1**: No impact. This parameter will not be passed to the terminal, the information should just be stored at the SSP. **d) iSDNAccessRelatedInformation** **ISUP:** This parameter shall be mapped on the ISUP parameter "Access transport". Note: Since the ISUP parameter "Access transport" includes some sub-parameters which have only end-to-end significance, some of these sub-parameters shall not be modified by IN. Thus, the SCP can provide only some sub-parameters for the ISUP parameter "Access transport" in this INAP parameter. As part of the ISUP/INAP interworking procedures it is necessary to describe which default setting of the other sub-parameters not provided by the SCP is to be supported by the SSP in the outgoing IAM message (see also the note for this INAP parameter in the connect operation). **DSS1**: No additional requirements. This parameter maybe changed by IN. **e) locationNumber** **ISUP:** INAP parameter "locationNumber" shall be mapped unchanged to the equivalent ISUP parameter. **DSS1**: No impact. **f) serviceInteractionIndicatorsTwo** See clause 7 and annex C.

(continued)

Table B.1 (concluded): Modifications to IN CS1 (core INAP) operations: SSF-SCF

Operation	Parameter Added	Signalling Interworking Requirements
	bearerCapability	**g) bearer capability** **ISUP:** If a bearer capabilities is already assigned to an existing party in the call then this bearer capability will be used and any bearer capability provided by IN If a bearer capabilities is already assigned to an existing party in the call then this bearer capability will be used and any bearer capability provided by IN will be ignored; If a bearer capability has not been assigned (i.e there is no party yet) and a bearer capability is provided by INAP then this bearer capability should be used; If neither the signalling or INAP provides a bearer capabilities value then the default of 3,1kHz audio should be used. **DSS1**: No impact
EventReportBCSM	backwardGVNS (in: EventSpecificInformationBCSM: oAnswerSpecificInfo)	**a) backwardGVNS** **ISUP:** When the ISUP message ANM (or CON) are received from the terminating GVNS network at the SSP, the "Backward GVNS" parameter is to be mapped on the INAP parameter "EventSpecificInformationBCSM: oAnswerSpecificInfo" (Prerequisite: The DP:oAnswer has been previously armed by the SCF). **DSS1**: No impact.
ConnectToResource	serviceInteractionIndicatorsTwo	**a) serviceInteractionIndicatorsTwo** See clause 7 and annex C.
EstablishTemporaryConnection	serviceInteractionIndicatorsTwo	**a) serviceInteractionIndicatorsTwo** See clause 7 and annex C.

Table B.2: Parameters of CS1 (core INAP) operations which are not supported by ISUP, support required for IN CS2: SSF-SCF

Operation	Parameter	Signalling Interworking Requirements
Connect	alertingPattern	**a) alertingPattern** **ISUP:** The ISUP requirements are summarized as follows: Phase of Call: Call establishment Messages to carry information: IAM forward direction only Action at SSP: map parameter to appropriate ISUP message Action at Local exchange: pass information to DSS1 Action at Transit exchange: pass information on unchanged **DSS1:** No additional requirements. Note: This parameter is of type OCTET STRING with a length of three bytes. Only the trailing OCTET is used for carrying the alerting pattern information, i.e. only the trailing OCTET is to be mapped to the appropriate ISUP parameter.

Table B.3: New IN CS2 (core INAP) operations: SSF-SCF

Operation	Parameter	Signalling Interworking Requirements
ReportUSI	uSIServiceIndicator legId uSIInformation	**ISUP, DSS1:** The requirements are described in detail in subclause 5.4.
SendUSI	uSIServiceIndicator legId uSIInformation	**ISUP, DSS1:** The requirements are described in detail in subclause 5.4.
ContinueWith Argument	alertingPattern genericName	**a) alertingPattern** See connect operation in table 3. **b) genericName** **ISUP:** The ISUP requirements are summarized as follows: Phase of Call: Call establishment Messages to carry information: IAM forward direction only (backwards direction is for further study) Action at SSP: Carry information in the appropriate ISUP message Action at Local exchange: pass information to end user or access interface Action at Transit exchange: pass information on unchanged **DSS1:** The information in the INAP "genericName" parameter is coded as IA5 string. The parameter is of type OCTET STRING. The parameter is used to convey the calling party name and is forwarded to the terminal for display to the called party.
ContinueWith Argument	iNServiceCompatibilityResponse forwardGVNS backwardGVNS serviceInteractionIndicatorsTwo locationNumber	**c) iNServiceCompatibilityResponse** See InitiateCallAttempt operation in table 2. **d) forwardGVNS / backwardGVNS** See connect operation in table 2. **e) serviceInteractionIndicatorsTwo** See clause 7 and annex C. **f) locationNumber** **ISUP:** INAP parameter "locationNumber" is be mapped unchanged to the equivalent ISUP parameter. **DSS1**: No impact.

Table B.4: New IN CS2 (core INAP) operations: CUSF-SCF

Operation	Parameter	Signalling Interworking Requirements
InitialAssociationDP	cUApplicationInd calledPartyNumber callingPartyNumber callingPartySubAddress highLayerCompatibility bearerCapability uSIServiceIndicator uSIInformation	**NNI, UNI:** Parameters are mapped on INAP according the supported option (refer to subclause 5.4). For Option 2 (USI ASE in SCF) only uSIServiceIndicator and uSIInformation are applicable. For Option 1 (ASE in CUSF) all other parameters are applicable. Interworking with CCBS/CCNR (only option 1): Parameters calledPartyNumber, callingPartyNumber, callingPartySubAddress, highLayerCompatibility and bearerCapability are mapped on INAP from the appropriate parameter in the "cCBS_request". Parameter cUApplicationInd shall identify the object identifier of CCBS/CCNR.
ConnectAssociation	address	**NNI, UNI:** This parameter contains a new called party number provided by the SCF. The parameter is to be mapped on the appropriate NNI/UNI parameter used in the application running in the SSP. Interworking with CCBS/CCNR: The called party number provided in the "address" parameter shall be mapped on the appropriate parameter in the "cCBS_request".
EventReportBCUSM	EventSpecificInformationBCUSM: - for DP:"Component_Received": componentReceivedSpecificInfo: - componentReceivedInfo - for DP:"Association_Release_Requested": associationReleaseRequestedSpecificInfo: - associationReleaseInfo - releaseCause	**NNI, UNI:** Dependent on the armed DP, the appropriate parameters are mapped to INAP. For DP:"Component_Received" any type of application specific information may be mapped to the INAP parameter componentReceivedInfo which is of type OCTET STRING. For DP: "Association_Release_Requested" any type of application specific information may be mapped to the INAP parameter associationReleaseInfo which is of type OCTET STRING. In addition, a release cause shall be mapped to the INAP parameter releaseCause - if available. Note: The INAP parameters componentReceivedInfo and associationReleaseInfo may contain explicit application specific parameters. They will not contain the complete application specific message. Since the ASEs which may be supported in the CUSF are beyond the scope of CS2 **core** INAP, the detailed content of these parameters is network operator specific.
ReleaseAssociation	cause	**NNI, UNI:** This parameter is mapped on the appropriate cause parameter of the NNI or UNI.

(continued)

Table B.4 (concluded): New IN CS2 (core INAP) operations: CUSF-SCF

Operation	Parameter	Signalling Interworking Requirements
InitiateAssociation	calledPartyNumber uSIServiceIndicator uSIInformation	**NNI, UNI:** Parameters are mapped to NNI/UNI according the supported option (refer to subclause 5.4). For Option 2 (USI ASE in SCF) only uSIServiceIndicator and uSIInformation are applicable. For Option 1 (ASE in CUSF) all other parameters are applicable.
ReportUSI	uSIServiceIndicator legId uSIInformation	**NNI, UNI:** The requirements are described in detail in subclause 5.4.
SendUSI	uSIServiceIndicator legId uSIInformation	**NNI, UNI:** The requirements are described in detail in subclause 5.4.

Table B.5: New IN CS2 (core INAP) DP

DP	INAP support	Signalling Interworking Requirements
o_Not_Reachable	TDP: InitialDP, or EDP: EventReportBCSM	**ISUP:** The receipt of ISUP release cause "Subscriber Absent" will trigger the armed DP in the SSP (late determined event). **DSS1:** Not applicable.
t_Not_Reachable	TDP: InitialDP, or EDP: EventReportBCSM	**ISUP:** The receipt of ISUP release cause "Subscriber Absent" will trigger the armed DP in the SSP (late determined event). **DSS1:** Not applicable.

Annex C (informative): Content and structure of the IN CS2 core INAP parameters

C.1 Content of the "ServiceInteractionIndicators" parameter

The service interaction indicator is provided as a generic means for all IN services to allow/deny or modify ISDN supplementary service execution. Below is the definition of the INAP "ServiceInteractionIndicatorsTwo" parameter of IN CS2 core INAP EN 301 140-1 [2].

```
    ServiceInteractionIndicatorsTwo  ::=  SEQUENCE {
        forwardServiceInteractionInd    [0] ForwardServiceInteractionInd       OPTIONAL,
            -- applicable to operations IDP, CON, ICA
        backwardServiceInteractionInd   [1] BackwardServiceInteractionInd      OPTIONAL,
            -- applicable to operations IDP, CON, CTR, ETC
        bothwayThroughConectionInd  [2] BothwayThroughConnectionInd     OPTIONAL,
            -- applicable to operations CTR, ETC
        suspendTimer            [3] SuspendTimer               OPTIONAL,
            -- applicable to operations CON, ICA
        connectedNumberTreatmentInd [4] ConnectedNumberTreatmentInd OPTIONAL,
            -- applicable to operations CON, CTR, ETC
        suppressCallDiversionNotification [5]   BOOLEAN                OPTIONAL,
            -- applicable to operations CON, ICA
        suppressCallTransferNotification [6]    BOOLEAN                OPTIONAL,
            -- applicable to operations CON, ICA
        allowCdINNoPresentationInd  [7]     BOOLEAN            OPTIONAL,
            -- applicable to CON, ICA
            -- indicates whether the Number Presentation not allowed indicator of the
ISUP
            -- "called IN number" shall be set to presentation allowed (TRUE) or
presentation
            -- not allowed (FALSE). Network default is presentation not allowed.
        userDialogueDurationInd [8]  BOOLEAN        DEFAULT TRUE
            -- applicable when interaction with the user is required, if the
interaction
            -- TRUE means the user interaction may last longer than 90 seconds.
Otherwise the
            -- indicator should be set to FALSE.
            -- used for delaying ISUP T9 timer.
        ...}
    ForwardServiceInteractionInd ::= SEQUENCE {
        conferenceTreatmentIndicator [1]    OCTET STRING (SIZE(1))      OPTIONAL,
          -- acceptConferenceRequest 'xxxx xx01',B
          -- rejectConferenceRequest 'xxxx xx10'B
          -- network default is accept conference request
        callDiversionTreatmentIndicator [2] OCTET STRING (SIZE(1))      OPTIONAL,
          -- callDiversionAllowed       'xxxx xx01'B
          -- callDiversionNotAllowed 'xxxx xx10'B
          -- network default is Call Diversion allowed
        callOfferingTreatmentIndicator  [3] OCTET STRING (SIZE(1))      OPTIONAL,
          -- callOfferingNotAllowed  'xxxx xx01'B
          -- callOfferingAllowed     'xxxx xx10'B
          -- network default is Call Offering Not Allowed
        callingPartyRestrictionIndicator  [4]   OCTET STRING (SIZE(1))      OPTIONAL
          -- noINImpact   'xxxx xx01'B
          -- presentationRestricted     'xxxx xx10'B
          -- network default is noINImpact
}
    BackwardServiceInteractionInd  ::= SEQUENCE {
        conferenceTreatmentIndicator    [1] OCTET STRING     (SIZE (1)) OPTIONAL,
          -- acceptConferenceRequest 'xxxx xx01'B
          -- rejectConferenceRequest 'xxxx xx10'B
          -- network default is accept conference request,
        callCompletionTreatmentIndicator    [2] OCTET STRING (SIZE(1))  OPTIONAL
          -- acceptCallCompletionServiceRequest 'xxxx xx01'B
          -- rejectCallCompletionServiceRequest 'xxxx xx10'B
          -- network default is accept call completion service request
        }
    BothwayThroughConnectionInd  ::= ENUMERATED {
        bothwayPathRequired        (0),
        bothwayPathNotRequired     (1)
        }
    SuspendTimer ::=  INTEGER (1..120)      -- value in seconds
    ConnectedNumberTreatmentInd  ::=  ENUMERATED  {
```

```
        noINImpact          (0),
        presentationRestricted      (1),
        presentCalledINNumber   (2),
        presentCalledINNumberRestricted (3)
        }
```

C.2 Content of the "INServiceCompatibilityIndication" parameter

The IN CS2 core INAP coding of the indicator is planned as follows:

```
        INServiceCompatibilityIndication ::=  SEQUENCE
            Size (1 .. maxINServiceCompatibilityIndLength) of SEQUENCE
             {
            agreements      [0] SEQUENCE
                Size (1 .. maxAgreementslength) of Entry OPTIONAL,
            networkSpecific     [1] SEQUENCE
                Size (1 .. maxNetworkSpecificlength) of Entry OPTIONAL
              }

    Entry ::= INTEGER

    One entry denotes one ServiceCompatibilityID. There may be more than one
ServiceCompatibilityID carried within a message, the maximum number is for further study.
```

Annex D (informative): Proposal for mid-call processing

D.1 Coding proposal for IE to request/withdrawal of the specific midcall events

A new "IN Service Control Request Indicators" is proposed to be introduced for request/ withdrawal of the specific mid-call events. This information element can be sent backward in a CPG, ACM, ANM, CON message and in forward direction in an IAM and CPG (or new?) message to the local exchange. It is used to transfer information concerning ISDN Basic Rate Interface (BRI), Premary Rate Interface (PRI) as well as analogue user.

Coding proposal for "IN Service Control Request Indicators":

Byte	Bits	Explanation
00	0-7	Parameter Name value = ??H
01	0-7	Length Indicator (=1)
02	0-1	IN Service Control Information 0 - do not monitor midcall events 1 - monitor hook-flash event 2 - monitor control codes 3 - spare
	2-6	spare
	7	extension bit

D.2 Coding proposal for IE to transfer the detected midcall information

A new "IN Service Control Information Indicators" is introduced to transfer the detected mid-call information, if previously requested. This information element should be transferred in a CPG (or new?) message. Midcall events are initiated by keypad for BRI/PRI or hookflash for analogue users followed by additional input of digits.

Coding proposal of "IN Service Control Information Indicators":

Byte	Bits	Explanation
00	0-7	Parameter Name value = ??H
02	0-7	Length Indicator (variable)
03		IN Service Control Code Information
	0-2	Number of control code digits Range (0:6)
	3-7	spare
04		IN Service Control Code
	0-3	1st digit (Range 0:15)
	4-7	2nd digit (Range 0:15)
.....		
k	0-3	nth digit (Range 0:15)
	4-7	Filler

The coding of the compatibility information for the new information elements is proposed as follows:

a) Nth upgraded parameter name

xxxx xxxx IN Service Control Information Indicators

or

xxxx xxxx IN Service Control Request Indicators

b) Instruction indicators

bit A: Transit at intermediate exchange indicator
0 transit interpretation

bit B: Release Call Indicator
0 do not release call

bit C: Send notification indicator
0 do not send notification

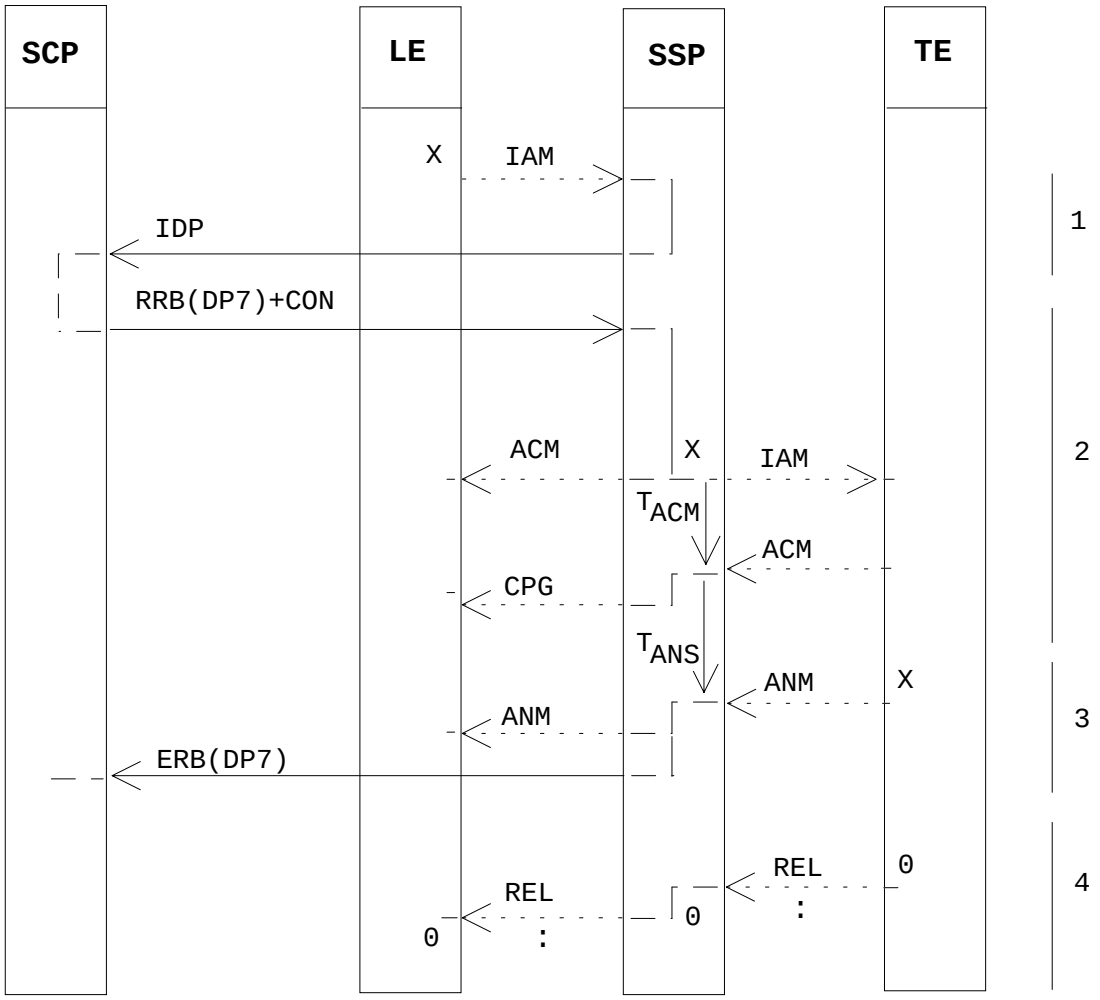
bit D: Discard message indicator
0 do not discard message (pass on)

bit E: Discard parameter indicator
0 do not discard parameter (pass on)

bit GF: Pass on not possible indicator
10 discard parameter

Annex E (informative): Message sequence charts for GVNS calls

E.1 GVNS: Outgoing call



1) Call setup from local exchange (LE) and establishment of IN control relationship;

2) Response from SCP and continuation of call setup to transit exchange (TE, i.e. gateway exchange):

   - outgoing ISUP:IAM contains *Forward GVNS* parameter as received in INAP:CON;

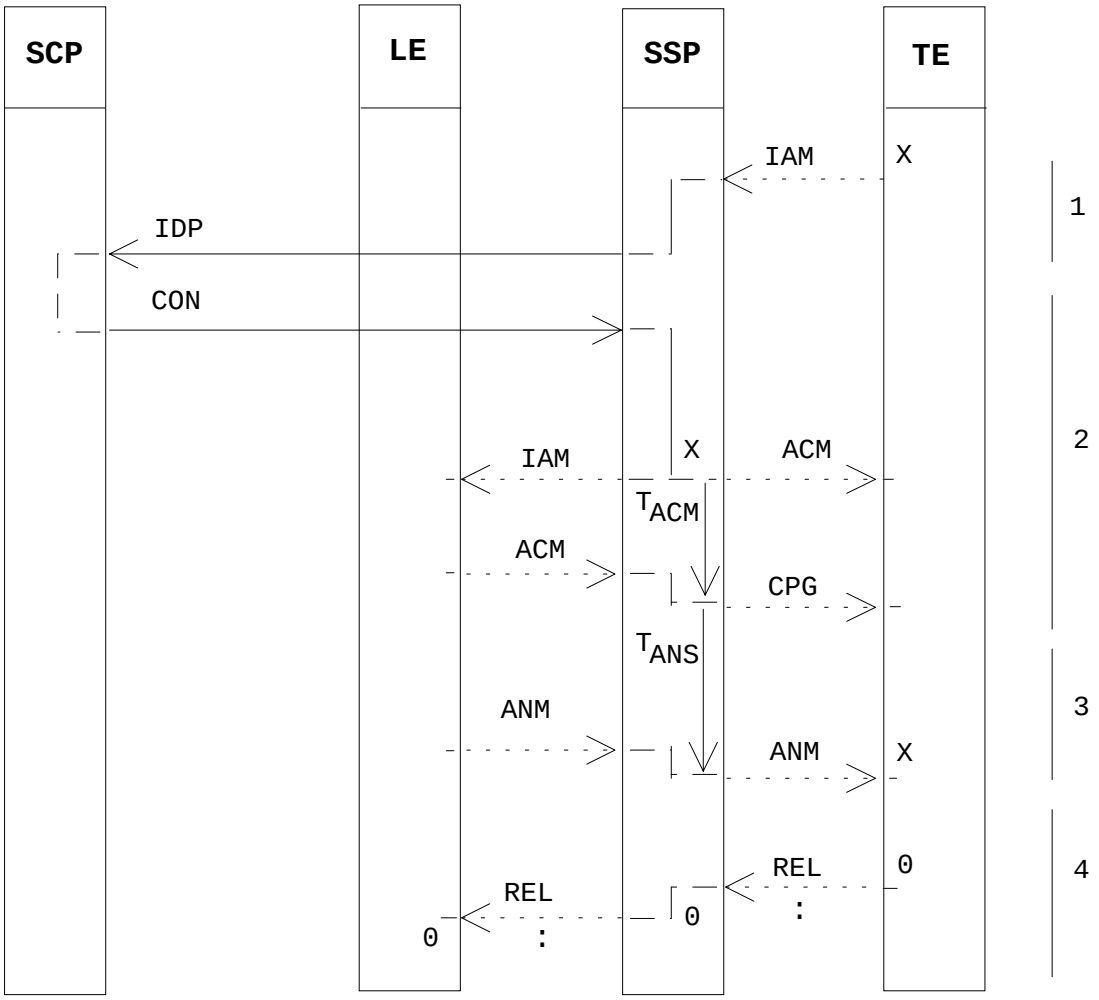
   - DP7: o_Answer is armed (EDP-N) in the SSP in order to monitor the receipt of ISUP:ANM (and ISUP:CON respectively);

3) On receipt of ISUP:ANM (and ISUP:CON respectively) the service logic is informed via INAP:ERB. The ERB contains the *Backward GVNS* parameter as received in ISUP:ANM (and ISUP:CON respectively);

4) Call release.

   NOTE: Charging aspects are not considered in the information flow. Also arming of additional EDPs or requests for reports (e.g. CIR) is not considered.

E.2 GVNS: Incoming call



1) Call setup from transit exchange (TE, i.e. gateway exchange) and establishment of IN control relationship:

   INAP:IDP contains the *Forward GVNS* parameter as received in the incoming ISUP:IAM;

2) Response from SCP and continuation of call setup to local exchange (LE):

   - INAP:CON contains the *Backward GVNS* parameter which is to be transferred to the originating network in the ISUP:ANM (and ISUP:CON respectively);

   - outgoing ISUP:IAM contains no GVNS specific parameter;

3) SSP relays the ISUP:ANM (and ISUP:CON respectively) received from the LE to the TE including the *Backward GVNS* parameter as received from the service logic;

4) Call release.

   NOTE: Charging aspects are not considered in the information flow. Also arming of additional EDPs or requests for reports (e.g. CIR) is not considered.

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