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

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New presentation - see History box

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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 1 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. This ETR seeks to give guidance and clarification to the signalling requirements needed to fully support IN Capability Set 1 (CS1) services in a Narrowband ISDN (N-ISDN) environment.

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1 Scope

This ETSI Technical Report (ETR) is the first part of a multi-part ETR specifying the signalling requirements for the interaction between Intelligent Network (IN) and Integrated Services Digital Network (ISDN).

This ETR specifies the signalling requirements for the interaction between IN Capability Set 1 (CS1) services and ISDN User Part (ISUP)/Digital Subscriber Signalling System No. one (DSS1) protocol switch based services in case these interactions have to be supported by signalling. It is based on the ETSI core Intelligent Network Application Protocol (INAP) as specified in ETS 300 374-1 [1].

Signalling requirements for a service-transparent out-of-band signalling for the interaction of an ISDN user with an IN service are specified in the second part ETR 186.

2 References

This ETR incorporates by dated and undated reference, provisions from other publications. These references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETR only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

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

[2]   CCITT Recommendation E.164 (1991): "Numbering plan for the ISDN era".

[3]   ITU-T Recommendation I.112 (1993): "Vocabulary of terms for ISDNs".

[4]   ITU-T Recommendation Q.713 (1993): "Signalling System No.7 - SCCP formats and codes".

[5]   ITU-T Recommendation Q.1290 (1993): "Glossary of terms used in the definition of intelligent networks".

3 Definitions and abbreviations

For the purposes of this ETR, the definitions given in ITU-T Recommendations I.112 [3] and Q.1290 [5] apply.

4 Abbreviations

For the purposes of this ETR, the following abbreviations apply:

ACM   Address Complete Message (ISUP message)
ANM   Answer Message (ISUP message)
CCC   Credit Card Calling
CCF   Call Control Function
CFB   Call Forwarding Busy
CFNR   Call Forwarding No Reply
CFU   Call Forwarding Unconditional
COLP   Connected Line identification Presentation
COLR   Connected Line identification Restriction
CS1   Capability Set 1
DTMF   Dual Tone Multi-Frequency
DSS1   Digital Subscriber Signalling System No. one
ID   Identity
IN   Intelligent Network
INAP   Intelligent Network Application Protocol
IP   Intelligent Peripheral
ISDN   Integrated Services Digital Network

ISUP	ISDN User Part
OLE	Originating Local Exchange
PRM	Premium Rate
N-ISDN	Narrowband ISDN
SCF	Service Control Function
SCP	Service Control Point
SRF	Specialized Resource Function
SSF	Service Switching Function
SSP	Service Switching Point
TE	Terminal Equipment
TLE	Terminating Local Exchange
UAN	Universal Access Number
UPT	Universal Personal Telecommunication
VCC	Virtual Card Calling
VOT	Televoting
VPN	Virtual Private Network

5 General

The signalling requirements specified in this ETR are related to the following subjects:

- communication between an ISDN user and the IN entities in the network;

- interworking between IN and ISDN.

In the following clauses these requirements are specified in detail.

6 Communication between an ISDN user and the IN entities in the network

The communication between an ISDN user, i.e. ISDN Terminal Equipment (TE), and the IN entities in the network includes the transfer of information for the access of an ISDN user for the execution of a service or a service feature as well as the provision of specific information to the ISDN user.

It is possible, as a general mechanism in the IN architecture, to send tones and announcements to and to receive additional information in-band from a user (using Dual Tone Multi-Frequency (DTMF) signalling) by the Specialized Resource Function (SRF) on request of the Service Control Function (SCF) and to transfer this information via the INAP to the SCF.

For ISDN users this solution requires terminals with a DTMF sender and does not make use of the possible capabilities of the terminal (for example, to display information provided by the SCF at the user's terminal). Core INAP only allows the sending of display information to the user.

6.1 Sending of display information to the calling party

For user interaction with the calling party it shall be possible to send display information to the calling party's terminal. Currently this is supported only when the Service Switching Function/Specialized Resource Function (SSF/SRF) is integrated in the local exchange. If the SSF/SRF is at the transit exchange level, an envelope within ISUP is needed to transfer the Display information to the local exchange that the calling party is connected to and a mechanism to map this information onto the Display information of DSS1 is needed at the local exchange.

6.2 Provision of information to the called user

As a general requirement it shall be possible to provide specific information only known at the SCF to a called user when an IN based service is invoked. The information should be presented to the called user at call setup time.

Called IN number presentation

For some services, e.g. Freephone, Universal Access Number (UAN), it is an option to present the originally called IN number to the called party.

6.3 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 SSF or SRF. As a consequence the signalling shall support the following two possible configurations for the access of an ISDN TE to the IN entities in the network:

Case A: The ISDN TE is connected directly to a local exchange with an SSF.

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

In case A only the DSS1 protocol may be affected by the requirements for a service-transparent signalling. In case B also the ISUP may be affected.

As an example, figure 1 illustrates these signalling configurations for one of the SRF connect physical scenarios described in ETS 300 374-1 [1], subclause 7.3.5.1.1 (figure 25, case a).
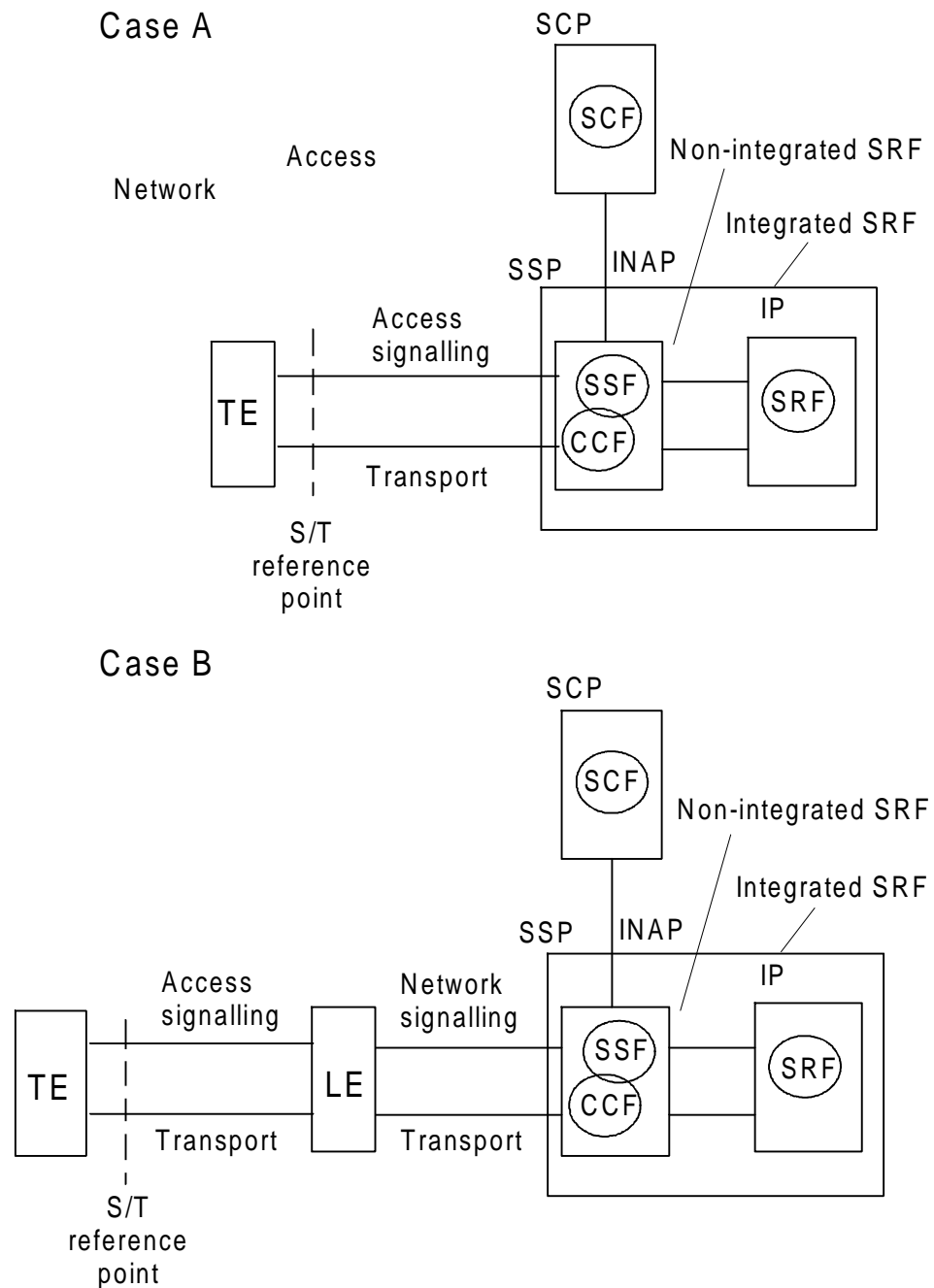
Figure 1: Signalling configurations

7 Interworking between IN and ISDN

7.1 Interworking between IN and basic call

7.1.1 General

7.1.1.1 Suspend/Resume

Via a Suspend message ("network initiated") the ISUP call processing may be temporarily interrupted until a Resume message is received. The time between Suspend/Resume messages is controlled by an associated ISUP supervision timer in the controlling exchange. The service logic may specify a time value or the suppression of Suspend/Resume. Therefore, it shall be possible to control this supervision timer via INAP (SSF is in the controlling exchange).

7.1.1.2 Preventing of call offering for certain calls

Many IN services are usually implemented by a number translation of numbers in a specific number series into CCITT Recommendation E.164 [2] numbers. The translated numbers are used to route the calls to the installations of the service subscriber.

For some of these services there may be a requirement, that the service provider should be able to prevent other calls than those controlled by the Service Control Point (SCP) to be offered at the access of the service subscriber.

7.1.2 Interworking between IN and basic call in case of user interaction

This subclause identifies the requirements for charging, through-connection and time supervision in case of an IN based service with user interaction.

7.1.2.1 Modify charging

If an IN based service includes user interaction with the calling party prior to call establishment, it should be a service option to define whether or not and how the calling party shall be charged for the user interaction. The ISUP signalling shall support the possibility to modify charging in the Originating Local Exchange (OLE) on request of the SCF.

7.1.2.2 Through-connection

In case in-band information is to be collected from the user the transmission path needs to be through-connected in both directions.

7.1.2.3 Manipulation on basic call timer supervision

The originating exchange supervises the receipt of Address Complete Message (ACM) and Answer Message (ANM) by means of timers. As there should not be any restrictions on how long a user interaction prior to call establishment may last and only the service logic at the SCF has this information, it shall be possible to send an indication via INAP to the SSF that the user interaction may last a long time. On receipt of this indication the SSF shall take the appropriate actions to ensure that network timers do not expire.

7.1.2.4 Support of the assist/hand-off procedures - transport of SCF identity and correlation identity

To support the assist/handoff procedures some information is to be transferred via ISUP from the initiating Service Switching Point (SSP) to the assisting SSP. In particular, transport of the SCF Identity (ID) and a correlation ID is required.

Dependent on the network configuration, the SCF ID may contain different information, e.g. a Global title using CCITT Recommendation E.164 [2] numbers or a Signalling point code with Subsystem number. It is assumed that the SCF ID is encoded according to the SCCP Called party address parameter as specified in ITU-T Recommendation Q.713 [4].

7.2 Interworking between IN services and switch based services

One of the main objectives of IN is that the introduction of a new IN based service shall not cause any change in the network, i.e. the objective is to have no impact on the existing exchanges. An overview on the interactions between IN services and ISDN supplementary services is given in table 1.

Table 1: Interactions between IN services and ISDN supplementary services

Supplementary service	Impacted by IN service	Affected entity
Advice of charge	Yes, see subclause 7.2.4.4	OLE [(note)], SSP
Call waiting	No impact	
Call hold	No impact	
Explicit call transfer	Yes, see subclause 7.2.2.3	SSP only
Calling line identification presentation	Yes, see subclause 7.2.2.1	SSP only
Calling line identification restriction	Yes, see subclause 7.2.2.1	SSP only
Connected Line identification Presentation (COLP)	Yes, see subclause 7.2.2.2	SSP only
Connected Line identification Restriction (COLR)	Yes, see subclause 7.2.2.2	SSP only
Closed user group	No impact	
Call completion services	For further study	
Conference services	Yes, see subclauses 7.2.3.1.4 and 7.2.4.1	OLE [(note)], TLE [(note)], SSP
Direct dialling in	No impact	
Diversion services: Call Forwarding Unconditional (CFU) Call Forwarding Busy (CFB) Call Forwarding No Reply (CFNR) Call deflection Selective call forwarding Call forwarding to a service centre	 Yes, see subclauses 7.2.3.1.1 and 7.2.2.4 Yes, see subclauses 7.2.3.1.2 and 7.2.2.4 Yes, see subclauses 7.2.3.1.3 and 7.2.2.4 Same as CFU Same as CFU Same as CFU	 SSP, TLE [(note)] SSP, TLE [(note)] SSP, TLE [(note)] SSP, TLE [(note)] SSP, TLE [(note)] SSP, TLE [(note)]
Freephone	No impact	
Malicious call identification	Yes, see subclauses 7.2.3.2 and 7.2.4.3	OLE [(note)], TLE [(note)], SSP
Multiple subscriber number	No impact	
Subaddressing	No impact	
Terminal Portability	No impact	
Three party service	Yes, see subclauses 7.2.3.1.5 and 7.2.4.2	OLE [(note)], TLE [(note)], SSP
User-to-user signalling	No impact	
In-call modification	No impact	
Hunting service	No impact	
Support of private numbering planes	No impact	
Call barring services	No impact	
Remote control of supplementary services	No impact	
NOTE: In case the SSF is not integrated into OLE/TLE.		

7.2.1 General aspects

In order to provide interworking between switch based services and IN services, a set of indicators (IN service interaction indicators) are to be specified which control the interactions to be handled by the originating or terminating exchange or at the SSP.

In addition, for some services (e.g. Premium Rate (PRM) service) there may be a requirement to prevent other calls than those provided via IN to be offered at an access.

For an IN service it is possible to transfer a set of IN service interaction indicators in the core INAP to Service Switching Function/Call Control Function (SSF/CCF) on a per call basis. In addition it is possible to transfer these indicators from SSF/CCF to the SCF when initiating a relationship. The associated core INAP parameter is called "serviceInteractionIndicators".

In case the SSF/CCF is not integrated into the terminating or originating exchange, respectively, the IN service interaction indicators need to be passed to the terminating/originating exchange via ISUP.

7.2.2 Interworking at the SSP only

The interworking with the following supplementary services is only handled by the SSF on instruction from the SCF.

7.2.2.1 Calling line identification presentation/restriction

For services like Universal Personal Telecommunication (UPT) or Virtual Private Network (VPN) it shall be possible to present a calling party number determined by the SCP to the called party instead of the calling party number provided by the network. The service logic dependent calling party number is transferred to the SSP in the INAP operation Connect.

The calling party number provided by the network is a CCITT Recommendation E.164 [2] number and related to the physical access. For VPN the calling party number to be presented to another member of the same VPN will be a number within a private numbering plan which is different to the CCITT Recommendation E.164 [2] number related to the access. A UPT subscriber may want to present the telephone number of his/her telephone at home or at his/her office instead of the number of the telephone he/she uses as a visitor.

7.2.2.2 Connected line identification presentation/restriction

The following possible interactions between an IN based service and COLP have been identified:

a)   no interaction:

-        the connected number(s) provided by the destination user/exchange shall not be manipulated by IN;

b)   in case IN interacts with COLP, two different approaches may be possible:

-        the SCF instructs the SSF that the originally dialled IN number (e.g. a Freephone number) shall be presented to the calling user as connected number and that further address information such as called party subaddress shall not be sent to the calling party;

-        the SCF instructs the SSF to suppress all address information concerning the connected line, i.e. the SSF shall act as if COLR is active.

To meet this interaction requirement an indication should be included in INAP to indicate to the SSF whether or not the connected number received from the destination user/exchange should be presented as connected number to the calling user.

7.2.2.3 Explicit call transfer

For some services the "explicit call transfer indication" and the transferred-to number should be suppressed. Therefore, a call transfer notification treatment indicator shall be provided by the SCP to the SSP by means of the serviceInteractionIndicators.

7.2.2.4 Call diversion services

For some services the "call diversion indication" and the forwarded-to number should be suppressed. Therefore a call diversion notification treatment indicator shall be provided by the SCP to the SSP by means of the serviceInteractionIndicators.

7.2.3 Interworking at the terminating exchange

7.2.3.1 Suppression of ISDN supplementary services

An IN based service cannot be seen independently of the ISDN supplementary services controlled by the terminating exchange.

The interactions which are relevant for an IN based service should be defined in the SCF on a per service basis or on a per service subscriber basis. The result of these interaction may be, that for a given service or service subscriber certain ISDN supplementary services are not allowed.

7.2.3.1.1 Call forwarding unconditional

The CFU supplementary service permits a served user to have the network send all incoming calls, or just those associated with a specific basic service, addressed to the served user's ISDN number to another number. If this service is activated, calls are forwarded independent of the condition of the termination.

CFU may cause problems if an IN service does not want the call to be diverted. For example, an incoming UPT call shall in general not be subject to the ISDN call diversion supplementary service activated by the owner of the visited ISDN terminal.

The call diversion procedures at the TLE can be controlled by a "Call to be diverted" indicator. This indicator shall be provided by the SCP to the SSP by means of the serviceInteractionIndicators. In case the SSF is not integrated into the TLE this indicator has to be passed to the terminating exchange via ISUP.

7.2.3.1.2 Call forwarding busy

The CFB supplementary service permits a served user to have the network send all incoming calls, or just those associated with a specific basic service, which meet Busy and are addressed to the served user's ISDN number to another number.

CFB may cause problems if an IN service does not want the call to be diverted. The same procedure for call diversion control as for CFU shall apply.

7.2.3.1.3 Call forwarding no reply

The CFNR supplementary service permits a served user to have the network send all incoming calls, or just those associated with a specific basic service, which meet No Reply and are addressed to the served user's ISDN number to another number.

CFNR may cause problems if an IN service does not want the call to be diverted. The same procedure for call diversion control as for CFU shall apply.

7.2.3.1.4 Conference calling

The conference calling supplementary service allows a user to communicate simultaneously with multiple parties, which may also communicate among themselves.

The IN service logic may not want conference calling to be used. The SCP instructs the SSP to reject the ISDN user request to add a call to a conference by means of a "eject conference request" in the serviceInteractionIndicators. In case the SSF is not integrated into the TLE this indicator has to be passed to the terminating exchange via ISUP.

7.2.3.1.5 Three party

The three party supplementary service enables the user to establish a three-way conversation, i.e. a simultaneous communication between the served user and two other parties.

The IN service logic may not want three party to be used. The SCP instructs the SSP to reject the ISDN user request to add a call to a three way conference by means of a "reject conference request" in the serviceInteractionIndicators. In case the SSF is not integrated into the TLE this indicator has to be passed to the terminating exchange via ISUP.

7.2.3.2 Malicious call identification

For IN services such as UAN, Credit Card Calling (CCC), Virtual Card Calling (VCC), PRM and Televoting (VOT), additional information may need to be registered on the invocation of the malicious call identification supplementary service.

7.2.4   Interworking at the originating exchange

7.2.4.1   Conference calling

The conference calling supplementary service allows a user to communicate simultaneously with multiple parties, which may also communicate among themselves.

The IN service logic may not want conference calling to be used. The SCP instructs the SSP to reject the ISDN user request to add a call to a conference by means of a "reject conference request" in the serviceInteractionIndicators. In case the SSF is not integrated into the OLE this indicator has to be passed to the originating exchange via ISUP.

7.2.4.2   Three party

The three party supplementary service enables the user to establish a three-way conversation, i.e. a simultaneous communication between the served user and two other parties.

The IN service logic may not want three party to be used. The SCP instructs the SSP to reject the ISDN user request to add a call to a three way conference by means of a "reject conference request" in the serviceInteractionIndicators. In case the SSF is not integrated into the OLE this indicator has to be passed to the originating exchange via ISUP.

7.2.4.3   Malicious call identification

For IN services such as UAN, CCC, VCC, PRM and VOT, additional information may need to be registered on the invocation of the malicious call identification supplementary service.

7.2.4.4   Advice of charge

If charging of an IN call is to be determined in the SSP or the SCP (see ETS 300 374-1 [1], annex B), charging information may need to be sent to the OLE (without SSF functionality) for advice of charge purposes or for local charge record generation. Therefore, it shall be possible to send an advice of charge request indication or a charge information request indication from the local exchange to the SSP/SCP. Once the charge information is determined in the SSP or the SCP, it will be sent back to the local exchange as network signalling information or in the form of charge pulses generated in the SSP (see ETS 300 374-1 [1], annex B, figure B.1).

Annex A: Contents of the INAP "serviceInteractionIndicators" parameter

This ETR specifies the signalling requirements for the interaction between IN and ISDN. These interactions require a SCF control. Therefore, a set of respective IN service interaction indicators are identified, which are to be sent from the SCF to the SSF. These indicators control the interaction handling in the SSP, the originating or terminating exchange.

The core INAP standard (ETS 300 374-1 [1]) already includes a parameter which allows the transport of such indicators, i.e. the "serviceInteractionIndicators" parameter. This parameter is specified with the type OCTET STRING. The contents are indicated as network specific and identified as a subject for further study.

For the handling of the interaction cases identified in this ETR, the following interaction indicators shall be transported in the INAP "serviceInteractionIndicators" parameter:

Call to be offered indicator:
Values: -   call offering allowed/not allowed.
It indicates whether the call offering procedure shall be applied in the TLE.

Suspend treatment indicator:
Values: -   no IN Impact;
            -     apply Special Timer;
            -     immediate Release.
It indicates how the Suspend message should be treated. The value "apply Special Timer" denotes a network specific value for ISUP timer.

Bothway throughconnect indicator:
Values: -   required/not required.
It indicates whether the user interaction phase needs a forward through connected speech path to the Intelligent Peripheral (IP), i.e. for the collection of in-band information.
This indicator may also be used to indicate the SSP, that the user interaction may last a long time.

Call to be diverted indicator:
Values: -   call diversion allowed/not allowed.
It indicates whether the call diversion procedures in the TLE shall be suppressed.

Call diversion notification treatment indicator:
Values: -   no impact;
            -     suppress information.
It indicates whether the sending of the call diversion notification and the forwarded-to number to the calling user shall be suppressed at the SSP.

Call transfer notification treatment indicator:
Values: -   no impact;
            -     suppress information.
It indicates whether the sending of the call transfer notification and the transferred-to number to the calling user shall be suppressed at the SSP.

Conference acceptance forward indicator:
Values: -   accept conference/three party call request;
            -     reject conference/three party call request.
It indicates whether a conference/three party call request from the called party shall be rejected in the TLE.

Conference acceptance backward indicator:
Values: -   accept conference/three party call request;
            -     reject conference/three party call request.
It indicates whether a conference/three party call request from the calling party shall be rejected in the OLE.

Connected number treatment indicator:
Values: - no IN impact;
                  - presentation restricted;
                  - present called IN number.
It indicates whether the connected line presentation supplementary service shall be influenced.

> NOTE 1:   The contents of the "serviceInteractionIndicators" parameter is specified in the core
> INAP as network specific. Therefore the supported contents of this parameter in a
> specific network may include only a subset of the indicators listed above and/or
> additional network specific indicators.

> NOTE 2:   In the core INAP, the "serviceInteractionIndicators" parameter is specified to allow the
> transport of indicators to resolve interactions between IN based services and switched
> based services, respectively between different IN based services. The latter case is
> not covered in this ETR.

Several INAP operations contain the "serviceInteractionIndicators" parameter (refer to ETS 300 374-1 [1]).
Table A.1 indicates the IN service interaction indicators which are applicable for the respective INAP
operations.

Table A.1: Mapping of IN service interaction indicators on INAP operations

	IDP	CON	CTR	ETC	ICA
Call to be offered indicator	-	X	-	X	X
Suspend treatment indicator (note)	-	X	-	X	X
Bothway throughconnect indicator	-	-	X	X	-
Call to be diverted indicator	-	X	-	X	X
Call diversion notification treatment indicator	-	X	-	X	X
Call transfer notification treatment indicator	-	X	-	X	X
Conference acceptance forward indicator	-	X	-	X	X
Conference acceptance backward indicator	-	X	-	X	X
Connected number treatment indicator	-	X	-	X	X
Legend: IDP: InitialDP CON: Connect CTR: ConnectToResource ETC: EstablishTemporaryConnection ICA: InitiateCallAttempt					
NOTE: For the operation "EstablishTemporaryConnection" which is only applicable for the SRF connection scenario "assist without relay", i.e. direct SCF-SRF interface (refer to ETS 300 374-1 [1]).					

History

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