



INTERNATIONAL TELECOMMUNICATION UNION

**ITU-T**

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

**Q.730**

(12/99)

SERIES Q: SWITCHING AND SIGNALLING

Specifications of Signalling System No. 7 – ISDN  
supplementary services

---

**ISDN user part supplementary services**

ITU-T Recommendation Q.730

(Previously CCITT Recommendation)

---

ITU-T Q-SERIES RECOMMENDATIONS

**SWITCHING AND SIGNALLING**

SIGNALLING IN THE INTERNATIONAL MANUAL SERVICE	Q.1–Q.3
INTERNATIONAL AUTOMATIC AND SEMI-AUTOMATIC WORKING	Q.4–Q.59
FUNCTIONS AND INFORMATION FLOWS FOR SERVICES IN THE ISDN	Q.60–Q.99
CLAUSES APPLICABLE TO ITU-T STANDARD SYSTEMS	Q.100–Q.119
SPECIFICATIONS OF SIGNALLING SYSTEMS No. 4 AND No. 5	Q.120–Q.249
SPECIFICATIONS OF SIGNALLING SYSTEM No. 6	Q.250–Q.309
SPECIFICATIONS OF SIGNALLING SYSTEM R1	Q.310–Q.399
SPECIFICATIONS OF SIGNALLING SYSTEM R2	Q.400–Q.499
DIGITAL EXCHANGES	Q.500–Q.599
INTERWORKING OF SIGNALLING SYSTEMS	Q.600–Q.699
SPECIFICATIONS OF SIGNALLING SYSTEM No. 7	Q.700–Q.849
General	Q.700
Message transfer part (MTP)	Q.701–Q.709
Signalling connection control part (SCCP)	Q.711–Q.719
Telephone user part (TUP)	Q.720–Q.729
<b>ISDN supplementary services</b>	<b>Q.730–Q.739</b>
Data user part	Q.740–Q.749
Signalling System No. 7 management	Q.750–Q.759
ISDN user part	Q.760–Q.769
Transaction capabilities application part	Q.770–Q.779
Test specification	Q.780–Q.799
Q3 interface	Q.800–Q.849
DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1	Q.850–Q.999
PUBLIC LAND MOBILE NETWORK	Q.1000–Q.1099
INTERWORKING WITH SATELLITE MOBILE SYSTEMS	Q.1100–Q.1199
INTELLIGENT NETWORK	Q.1200–Q.1699
SIGNALLING REQUIREMENTS AND PROTOCOLS FOR IMT-2000	Q.1700–Q.1799
BROADBAND ISDN	Q.2000–Q.2999

*For further details, please refer to ITU-T List of Recommendations.*

# **ITU-T RECOMMENDATION Q.730**

## **ISDN USER PART SUPPLEMENTARY SERVICES**

### **Summary**

This Recommendation provides general information for ISDN supplementary services. It describes generic procedures, network specific facilities and end-to-end signalling methods. It also contains the generic format for the supplementary service descriptions contained in Recommendations Q.731 to Q.737, to be used in conjunction with the ISDN user part (ISUP) defined in Recommendations Q.761 to Q.764 and Recommendation Q.767 "Application of the ISDN user part of CCITT signalling system No. 7 for international ISDN connections". A listing of the currently defined supplementary services is included as well.

### **Source**

ITU-T Recommendation Q.730 was revised by ITU-T Study Group 11 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on 3 December 1999.

## FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

## NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

## INTELLECTUAL PROPERTY RIGHTS

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

As of the date of approval of this Recommendation, the ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

© ITU 2000

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the ITU.

## CONTENTS

	<b>Page</b>
1	Scope..... 1
2	References..... 1
3	Terms and definitions ..... 2
4	Abbreviations..... 2
5	General..... 3
6	Exceeding the maximum message length..... 3
7	Network specific facilities (national use) ..... 4
7.1	Sending unsolicited information (national use) ..... 4
8	Generic procedures ..... 4
8.1	Service activation..... 4
8.1.1	General description..... 4
8.1.2	Service activation procedure..... 5
8.1.3	Error procedures ..... 5
8.2	General digit transfer (national use)..... 5
8.3	Remote operations service element (ROSE) capability (national use) ..... 5
8.3.1	General description..... 5
8.3.2	Remote operations procedure in ISDN user part..... 6
8.3.3	Error performance..... 6
8.4	Generic notification procedure ..... 7
8.5	Generic number transfer ..... 8
8.6	Pivot routing ..... 8
8.6.1	Normal procedures..... 8
8.6.2	Exceptional procedures..... 14
8.6.3	Interworking considerations ..... 15
8.6.4	Pivot routing timers ..... 16
8.7	Redirection (national use)..... 16
8.7.1	Normal procedures..... 17
8.7.2	Exceptional procedures..... 20
8.7.3	Interworking considerations ..... 20
8.7.4	Redirection timers..... 22
8.8	Relay methods for non-circuit related signalling ..... 22
8.8.1	Scope ..... 22
8.8.2	Overview of relay functions ..... 22
9	End-to-end signalling..... 22
9.1	Introduction..... 22

	<b>Page</b>
9.2	Pass-along method (national use) ..... 23
9.3	SCCP method..... 23
9.3.1	Call reference (national use)..... 23
9.3.2	Coupling of connection sections..... 24
9.3.3	Connectionless service (national use)..... 24
9.3.4	Connection-oriented service ..... 24
9.4	Chaining of ISDN user part end-to-end signalling connections ..... 25
9.5	Use of the Protocol Control Indicator (PCI) ..... 25
9.6	Operation of the pass-along method (national use) ..... 25
9.7	Operation of the SCCP method – Connectionless services (national use) ..... 25
9.7.1	Successful set-up of the ISDN user part end-to-end signalling connection... 25
9.7.2	Unsuccessful set-up of a signalling connection..... 28
9.7.3	Abnormal situations..... 28
9.7.4	Release of a signalling connection ..... 29
9.7.5	End-to-end message transfer..... 30
9.8	Operation of the SCCP method – Connection-oriented service ..... 30
9.8.1	Successful set-up of the ISDN user part end-to-end signalling connection... 31
9.8.2	Unsuccessful set-up of the SCCP end-to-end connection ..... 32
9.8.3	Unsuccessful set-up of the physical connection ..... 34
9.8.4	Release of the ISDN User Part (ISUP) end-to-end signalling connection.... 34
9.8.5	End-to-end message transfer..... 36
9.9	Interface elements between ISDN user part and SCCP (embedded transfer) ..... 36
10	Layout of service Recommendations ..... 36
11	List of supplementary services..... 38
12	Association of supplementary services to bearer services and teleservices..... 39
13	Definition of supplementary services ..... 39
Appendix I – Contents of the interface elements between the ISDN user part and the SCCP..... 40	
I.1	Contents of the REQUEST type 1 ..... 40
I.2	Contents of the REQUEST type 2 ..... 40
I.3	Contents of the REPLY ..... 40

## Recommendation Q.730

### ISDN USER PART SUPPLEMENTARY SERVICES

(revised in 1999)

#### 1 Scope

This Recommendation provides general information for ISDN supplementary services. It describes generic procedures, network specific facilities and end-to-end signalling methods. It also contains the generic format for the supplementary service descriptions contained in Recommendations Q.731 to Q.737, to be used in conjunction with the ISDN user part (ISUP) defined in Recommendations Q.761 to Q.764 and Recommendation Q.767 "Application of the ISDN user part of CCITT signalling system No. 7 for international ISDN connections". A listing of the currently defined supplementary services is included as well.

#### 2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- [1] ITU-T Recommendation I.112 (1993), *Vocabulary of terms for ISDNs*.
- [2] CCITT Recommendation I.130 (1988), *Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN*.
- [3] ITU-T Recommendation I.120 (1993), *Integrated services digital networks (ISDNs)*.
- [4] CCITT Recommendation I.250 (1988), *Definition of supplementary services*.
- [5] ITU-T Recommendation Q.761 (1999), *Signalling system No. 7 – ISDN user part functional description*.
- [6] ITU-T Recommendation Q.762 (1999), *Signalling system No. 7 – ISDN user part general functions of messages and signals*.
- [7] ITU-T Recommendation Q.763 (1999), *Signalling system No. 7 – ISDN user part formats and codes*.
- [8] ITU-T Recommendation Q.764 (1999), *Signalling system No. 7 – ISDN user part signalling procedures*.
- [9] CCITT Recommendation Q.767 (1991), *Application of the ISDN user part of CCITT signalling system No. 7 for international ISDN interconnections*.
- [10] ITU-T Recommendation Q.932 (1998), *Digital subscriber signalling system No. 1 – Generic procedures for the control of ISDN supplementary services*.
- [11] CCITT Recommendation X.219 (1988), *Remote operations: Model, notation and service definition*.  
ISO/IEC 9072-1:1989, *Information processing systems – Text communication – Remote operations – Part 1: Model, notation and service definition*.

- [12] CCITT Recommendation X.229 (1988), *Remote operations: Protocol specification*.  
ISO/IEC 9072-2:1989, *Information processing systems – Text communication – Remote operations – Part 2: Protocol specification*.
- [13] ITU-T Recommendation Q.771 (1997), *Functional description of transaction capabilities*.
- [14] ITU-T Recommendation Q.772 (1997), *Transaction capabilities information element definitions*.
- [15] ITU-T Recommendation Q.773 (1997), *Transaction capabilities formats and encoding*.
- [16] ITU-T Recommendation Q.774 (1997), *Transaction capabilities procedures*.
- [17] ITU-T Recommendation Q.775 (1997), *Guidelines for using transaction capabilities*.
- [18] ITU-T Recommendation Q.711 (1996), *Functional description of the signalling connection control part*.
- [19] ITU-T Recommendation Q.712 (1996), *Definition and function of signalling connection control part messages*.
- [20] ITU-T Recommendation Q.713 (1996), *Signalling connection control part formats and codes*.
- [21] ITU-T Recommendation Q.714 (1996), *Signalling connection control part procedures*.
- [22] ITU-T Recommendation Q.715 (1996), *Signalling connection control part user guide*.
- [23] ITU-T Recommendation Q.716 (1993), *Signalling connection control part (SCCP) performance*.

### **3 Terms and definitions**

ISUP'92: 1993 publication of ISUP Recommendations.

The definition of supplementary services can be found in clause 4/I.250.

### **4 Abbreviations**

This Recommendation uses the following abbreviations.

ACM	Address Complete Message
ANM	ANswer message
AP	Application Process
ASE	Application Service Element
CCx	Connection Confirm message x
CIC	Circuit Identification Code
CON	CONnect message
CPG	Call Progress message
CREf	Connection Refused message
CRx	Connection Request message
FAC	Facility message
fbm	first backward message

IAM	Initial Address Message
INF	INformation message
INR	INformation Request message
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
LE	Local Exchange
NNI	Network-Network Interface
PAMA	Pass Along Method Available
PAMNA	Pass Along Method Not Available
PCI	Protocol Control Indicator
PSTN	Public Switched Telephone Network
REL	RElease message
RLC	ReLease Complete message
RLSD	Released message
ROSE	Remote Operations Service Element
SCCP	Signalling Connection Control Part
TC	Transaction Capabilities
UDT	Unit data message
UNI	User-Network Interface

See clause 11 for the abbreviations which identify the individual supplementary services.

## 5 General

This Recommendation describes the format for supplementary services contained in Recommendations Q.731 to Q.737, and is to be used in conjunction with the ISDN User Part (ISUP) defined in Recommendations Q.761 to Q.764, and Recommendation Q.767 "Application of the ISDN user part of CCITT signalling system No. 7 for international ISDN interconnections".

Each type of supplementary service will be defined in separate clauses of its respective Recommendation, each containing the complete procedures encompassing both the ISDN user part and the procedures to be used on the top of Transaction Capability (TC) where appropriate.

Each clause contains a general paragraph giving details of the specific service with reference to the stage 1, 2 and 3 descriptions defined in the Recommendations of the I.250-series, the Q.80-series and the Q.950-series. The call set-up procedures and the actions taken at the concerned exchanges are defined. Arrow diagrams showing the message flows for both successful and unsuccessful establishment of the service are generally included. The formats and coding aspects are not defined in this Recommendation but references are made out to the appropriate ISDN user part, TC or Signalling Connection Control Part (SCCP) Recommendations.

## 6 Exceeding the maximum message length

If for any reason the combination of basic plus supplementary service information causes the overall maximum length (e.g. ISDN user part 272 octets) of the message (e.g. initial address message) to be exceeded, then the procedures for simple segmentation given in 2.1.12/Q.764 shall be applied. If

these procedures fail to reduce the message length below the required maximum, then the procedures of 2.15/Q.764 (over-length messages) shall be applied.

## **7 Network specific facilities (national use)**

Service-related information may be transferred in the network-specific facilities parameter in both directions between the local exchange and the identified network which controls the service. Information to be included in this parameter specified nationally. Examples of the information included in this parameter are as follows.

### *a) Transfer of network-specific facilities information*

If the network-specific facilities information element specified in Recommendation Q.931 is received from the access signalling system, this information is passed unchanged to the identified network in the network-specific facilities parameter.

An exchange which controls a service may generate the network-specific facilities information. This information is passed unchanged to the relevant exchange.

### *b) Transfer of stimulus information elements*

Stimulus type of Q.932 information elements, e.g. keypad facility information, may be included in the network-specific facilities parameter in call control messages at the local exchange. In this case, the local exchange will identify the destination network of the information by an appropriate method, and generate the network identification fields.

When this option is applied to the network, the exchange which controls a service may generate Q.932 information elements, e.g. display information, and this information is passed unchanged to the relevant exchange in the network-specific facilities parameter in call control messages.

Multiple Q.932 information elements may be included in a network-specific facilities parameter.

## **7.1 Sending unsolicited information (national use)**

Information that is available at an exchange and that does not correspond to information which can be or has been requested by an information request message, can be sent in the information message with the solicited information indicator set to signify that the message has been sent unsolicited.

An unsolicited information message can be sent in either direction in any call state (except in the awaiting release complete state).

Parameters that can be requested via an information request message should not be put in an unsolicited information message, and these parameters will be discarded by the outgoing international, incoming international or destination exchanges.

## **8 Generic procedures**

### **8.1 Service activation**

#### **8.1.1 General description**

The procedure described in this subclause gives a node in the signalling network the capability to request a simple action to be performed at another node. The procedure can also be used to report the acceptance or rejection of the requested action. The procedures described in this subclause can only be used if no additional information specific to the requested action or its acknowledgement needs to be included in the message, unless that information is provided for other purposes as well.

If additional information specific to the requested action or its acknowledgement is to be sent and if this information is not provided in the message for other purposes, other procedures such as the remote operations capability described in 8.3 should be used.

### **8.1.2 Service activation procedure**

Whenever a node in the signalling network determines that there is a need for simple supplementary service invocation at another node or to report the outcome of such a request, the node will indicate such a request or outcome of the request by including the service activation parameter in a call control message of end-to-end significance or in the facility message if no appropriate call control message is available.

The service activation parameter can be used either in a request-response node limited to one cycle or in a unidirectional node.

It is possible to include multiple feature codes in a single service activation parameter. In such a case, individual services are handled independently of each other.

The assignment of the feature code and the actual usage of the service activation parameter is up to individual supplementary service definition.

### **8.1.3 Error procedures**

The error handling procedures described in Recommendation Q.764 are also applicable to service activation procedures.

## **8.2 General digit transfer (national use)**

This capability enables supplementary services to transfer digit information, which cannot suitably be sent within any numbering address parameter, in a generic digit parameter. A generic digit parameter is transported in an initial address message. Whether or not a Generic digit parameter can be transported in other call control messages is left for further study. Multiple generic digits parameter may be transported in any one message qualified to carry this parameter.

The generic digit parameter is generated by the exchange invoking a service. This parameter is passed unchanged to the relevant exchange.

Examples of digit information in the generic digit parameter are account code and authorization code.

## **8.3 Remote operations service element (ROSE) capability (national use)**

### **8.3.1 General description**

The procedures described in this subclause give a node in the signalling network the capability to request that a particular operation be performed at a remote node; the remote node attempts to perform the operation and then reports the outcome of the attempt.

The generic structure of an operation is an elementary request/reply interaction. Remote operations provide in a structured way, interactive capability which allows nodes to request an operation and receive result or error indications depending on the outcome of the operation. Remote operations service is defined in Recommendation X.219 and the protocol in Recommendation X.229.

The remote operation procedure makes use of the remote operations parameter. The format of this parameter is provided in Recommendation Q.763. This parameter can be carried in any call control message of end-to-end significance and if there is no call control message available, the remote operations parameter can be carried in the facility message. The format of this message is provided in Recommendation Q.763.

In addition, the use of the facility message allows the actions and events related to supplementary services to be clearly separated from those associated with basic call control, hence providing improved stability to the basic call control procedures of Recommendation Q.764.

The supplementary services definition will make use of this capability along with the basic call control procedures described in Recommendation Q.764.

### 8.3.2 Remote operations procedure in ISDN user part

Whenever a node determines that there is a need to invoke an operation at the remote node, the originating node will format a remote operations parameter containing the invoke component which will include the appropriate operation code and the associated parameters. The remote operations parameter is sent in any call control message of end-to-end significance if one is available, otherwise the facility message is used.

Intermediate nodes may attempt to perform the operation upon receipt of this parameter. If the intermediate node does not understand the operation, it shall pass it to the next node. Similarly, any results or rejects not used by the intermediate nodes shall be passed to the next node.

The terminating node will attempt to perform the operation. If the operation can be successfully performed, the outcome is reported in the remote operations parameter containing a return result component and related parameters. If the operation was unsuccessful, a result error component is included in the remote operations parameter instead of the return result component. If a problem is detected in the requested operation, a reject component is sent. Table 1 provides some examples of reasons why each type of general problem defined in Recommendation Q.762 may be indicated in the reject component.

**Table 1/Q.730 – Example mapping of general problem reject scenarios to general problem reject types**

Example reasons	General problem
1) Component type tag not recognized as invoke, return result, return error or reject.	Unrecognized component (The component type is not recognized as being one of those defined in Recommendation Q.762.)
1) Missing invoke ID element. 2) Operation code element expected but not present. 3) Return error component received with no error code element. 4) The order of the received information elements within the component does not conform to Recommendation Q.763 for that component type.	Mistyped component (The elemental structure of a component does not conform to the structure of that component as defined in Recommendation Q.763.)
1) Length indicator value less than 128 octets, but not coded short form.	Badly structured component (The contents of the component do not conform to the encoding rules defined in Recommendation Q.763.)

The remote operations parameter is sent in any call control message if one is available; otherwise, the facility message is used to send this parameter to the originating node.

### 8.3.3 Error performance

When the remote operations parameter is not recognized by a node, the compatibility procedure described in Recommendation Q.764 is applicable.

If a node is unable to process a remote operations parameter included in a call control message, then the following options apply:

- a) The node may reject the call request. The call request is cleared using procedures described in Recommendation Q.764. A return error or a reject component with appropriate

parameter(s) is also sent to the originating node indicating termination node's inability to process remote operations parameter.

- b) The node may continue to process the call request according to normal call control procedures and reject the supplementary service invocation by sending a return error or a reject component with appropriate parameter(s) in the remote operations parameter. This parameter can be sent either in the facility message or in any appropriate call control message.
- c) The node may continue to process the call request according to normal call control procedures and the supplementary service invocation. In this case, the supplementary service at the originating which requested the supplementary service invocation at a remote node, will have to recover from non-receipt of a reply.

The choice of an option depends on the individual supplementary service procedures. If the node does not have knowledge of the specific supplementary service, option b) is preferred for each component that cannot be processed. Continuation of the call shall be subject to the control of the supplementary service procedures at the originating node. The originating node can either allow the call to continue or can clear the call.

If a node is unable to process a remote operations parameter included in the facility message, then the following option apply:

- a) The node may clear the call using procedures described in Recommendation Q.764. The node will also send a return error or a reject component with appropriate parameter(s) in a remote operations parameter. This parameter will be sent either in the facility message or in any appropriate call control message.
- b) The node may continue with the call but reject the supplementary service invocation. A return error or reject component with appropriate parameter(s) in the remote operations parameter is sent to the originating node. The remote operations parameter is sent either in a facility message or any appropriate call control message.
- c) The node may ignore the supplementary service invocation. In this case, the supplementary service at the originating node, which requested the supplementary service invocation at a remote node, will have to recover from the non-receipt of a reply.

The choice of an option depends on the individual supplementary service procedures. If the node does not have knowledge of the specific supplementary service, option b) is preferred for each component that cannot be processed. Continuation of the call shall be subject to the control of the supplementary service procedures at the originating node. The originating node can either allow the call to continue or can clear the call.

If a call is cleared and there is an operation pending, the operation is aborted and no response is sent to the on node. The supplementary service at the originating node will have to recover from this situation.

The supplementary service procedures will clearly describe the handling of components and error procedures specific to the service.

#### **8.4 Generic notification procedure**

This capability enables supplementary services to transfer a notification indicator indicating an event which has occurred as the result of service invocation, in a generic notification parameter, to either an originating user or a terminating user. A generic notification indicator parameter is transported in either direction in any call control message of end-to-end significance. Multiple generic notification parameters may be transported in any one message qualified to carry this parameter.

The generic notification parameter is generated either by a user or inside the network where the relevant service is invoked. The contents of the notification indicator is passed unchanged inside the network and delivered to the user.

## **8.5 Generic number transfer**

This capability enables supplementary services to transfer a numbering address information indicating a number based on either a standardized or a service-specific numbering plan. A generic number parameter is transported in either direction in an initial address message, answer message or connect message. Multiple generic number parameters may be transported in any one message qualified to carry this parameter. Whether or not a generic number parameter can be transported in other call control messages is left for further study.

The number information is generated either by a user or a local exchange. The contents of the number information may be processed and changed inside the network.

## **8.6 Pivot routing**

This procedure provides a general mechanism that can be used by an exchange that decides that the call should be set up to a called number other than that identified in the received called party number parameter. In general such an exchange can "forward" the call on to the new called number, or alternatively invoke this pivot routing mechanism to request a preceding exchange involved in the call to route the call to the new number. Forwarding should be used for services where the service-invoking exchange retains some interest in the call, e.g. for charging purposes. Pivot routing can optionally be used when it is desirable to release from the call path the service-invoking exchange and exchanges between the service-invoking exchange and the exchange performing the pivot routing.

The invoking and pivot functions may occur in the same exchange. In that case, the pivot counter shall be incremented as specified for the pivoting exchange.

Pivot routing also supports, as a national option, the ability for the invoking exchange to allow return of the call to itself after successful pivot routing and to identify the call if it is returned.

General interactions with supplementary services are for further study.

Any exchange that offers to pivot route a call should indicate at least ISUP preferred. The offer to perform pivot routing may be lost in some interworking situations with older versions of ISUP.

Echo control interaction with pivot routing requires further study.

Pivot routing may extend the time before the originating local exchange receives ACM, CON or ANM.

Since pivot routing may result in an increased number of release messages (and in particular release before answer) from specific destinations, measures may be necessary to avoid possible blocking of circuits and possible faulty generation of alarms as a result of the deployed network management functionality.

### **8.6.1 Normal procedures**

#### **8.6.1.1 Originating local exchange**

An originating local exchange that wishes to offer to perform the pivot routing function shall store the sent IAM information including the value of the pivot counter parameter, if any, and shall send the pivot capability parameter in the IAM. The pivot capability parameter shall indicate the latest call state in which a pivot request can be accepted. The setting of this indication is implementation dependent, and may depend on the services being requested by the calling subscriber. Service

applications may require additional information to be sent forward. The IAM information can be released from memory when a pivot request can no longer be acted on by this exchange.

The exchange that wishes to offer to perform pivot routing and to explicitly include with that offer one or more specific "reasons for pivot routing", shall also include in the IAM the performing pivot indicator with appropriate performing pivot reason(s) and pivot possible indicator values.

#### **8.6.1.1.1 Originating local exchange (national option)**

The originating local exchange may expect to receive the "acknowledgement of pivot routing" in a backward message as an indication that the message has reached the exchange that may invoke pivot routing. If an answer message is received and this acknowledgement has not been received, the originating local exchange will release the IAM information from memory and will not act on a subsequent pivot request.

The IAM information can be released from memory when the pivot status parameter indicating that "pivot routing will not be invoked" is received from the subsequent exchange.

The originating local exchange may include the pivot routing forward information parameter with value "return to invoking exchange possible" to indicate that it is able to receive the pivot routing backward information parameter with an invoking exchange call identifier and a duration.

If an application at the exchange requires pivot routing without interworking with redirection, it shall set the IAM pivot capability parameter interworking to redirection indicator to "not allowed". If the application does not have a requirement that prohibits pivot routing interworking with redirection, it shall set the IAM pivot capability parameter Interworking to redirection indicator to "allowed".

#### **8.6.1.2 Intermediate exchange**

An intermediate exchange that does not support pivot routing shall act as specified in Recommendation Q.764.

An intermediate exchange that supports pivot routing, but has determined not to support the mechanism for a particular call shall pass pivot routing information transparently.

An intermediate exchange that has determined to act on requests to pivot from subsequent exchanges shall store the received IAM (including the pivot capability parameter, the pivot counter parameter, if any, and the performing pivot indicator, if any). If the exchange wishes to offer to perform the pivot routing function with a higher capability (i.e. is willing to support pivot routing to a later call state) than indicated in the received pivot capability parameter, then the pivot capability parameter shall be modified to allow the higher capability (unless service applications impose other requirements or the pivot counter value equals or exceeds the network determined maximum value). Otherwise, the parameter is passed unchanged to the subsequent exchange.

An intermediate exchange may also be the first exchange to indicate that pivot routing is possible (or is possible for a particular reason), in which case it performs the actions described for the originating local exchange in 8.6.1.1.

If:

- a received performing pivot reason corresponds to a local peer application at an intermediate exchange; and
- the peer application wishes to also offer to pivot route; and
- the exchange offers a higher pivot capability than the received value,

then the exchange shall modify the performing pivot indicator to reflect the appropriate performing pivot reasons and pivot possible indicator at performing exchange values.

The IAM information can be released when a pivot request can no longer be acted on by this intermediate exchange, even if there is still a prior exchange supporting pivot routing to a later call state.

#### **8.6.1.2.1 Intermediate exchange (national option)**

The IAM information can be released when the pivot status parameter indicating that "pivot routing will not be invoked" is received from the subsequent exchange. Such an indication is also passed back to any prior exchanges willing to support pivot routing at this point in the call.

The intermediate exchange may include the pivot routing forward information parameter with value "return to invoking exchange possible" to indicate that it is able to receive the pivot routing backward information parameter with an invoking exchange call identifier and a duration.

#### **8.6.1.3 Invoking exchange**

An "invoking exchange" is an exchange in the call path that supports the service that invokes the pivot routing mechanism. The exchange can be any exchange which has received a pivot possible indicator with value other than "no indication".

An exchange that supports a service function which determines a new called number for the call and wishes to invoke the pivot routing mechanism shall examine the pivot capability parameter to determine whether pivot routing is possible in the current call state. If pivot routing is possible it shall request pivot routing by sending a backward FAC message with pivot routing indicators value of "pivot request" and the received pivot counter value to the prior exchange in the call path, and start the pivot timer. The value of the pivot timer,  $T_{piv}$ , shall be 4 to 15 seconds. The new called party number shall be included in the redirection number parameter in the backward FAC message. Service applications may require additional information to be sent in the backward direction, e.g. to indicate the reason for the pivot routing.

The pivot timer shall be stopped on the reception of REL or forward FAC with pivot routing indicators value of "pivot request failure".

It should be noted that the backward facility message may be sent before ACM. The sending of backward FAC message with pivot routing indicators parameter value of "pivot request" after the sending of the answer message may affect ISDN services for the call. The service function using the pivot routing mechanism at this exchange should take this into account when deciding whether to invoke the pivot routing mechanism.

When one of the reasons indicated in the received performing pivot reason corresponds to the application invoking pivot routing, the value of the invoking pivot reason sent in the backward direction shall indicate this one reason. If the current call state is beyond the state indicated by the corresponding pivot possible indicator at performing exchange, pivot routing shall not be invoked by this application. Note that if no performing pivot reasons are received, the application may still invoke pivot routing.

#### **8.6.1.3.1 Invoking exchange (national option)**

The service function at the invoking exchange may, at some point in the call, determine that pivot routing will not be invoked for that call. At that point in the call, the exchange may send a message (ACM, ANM, CON, FAC, or CPG) in the backward direction with the pivot status parameter set to indicate "pivot routing will not be invoked".

The invoking exchange may be required to send one of:

- 1) the "acknowledgement of pivot routing"; or
- 2) the "pivot routing will not be invoked" indication

in a backward message following the receipt of a pivot capability parameter in an IAM and no later than the answer message, unless:

- 1) the backward message invokes pivot routing; or
- 2) the backward message releases the call.

Note that if the invoking exchange elects to forward route the call with an offer to pivot following receipt of "pivot request failure", it will already have sent the "acknowledgement of pivot routing". If the original destination exchange for the call declines to invoke pivot routing, but forward routes the call, it should (if the mechanism is active at the exchange) send the "acknowledgement of pivot routing" if the outgoing IAM includes an offer to pivot route, but should send "pivot routing will not be invoked" if the outgoing IAM does not include an offer to pivot route.

The invoking exchange which receives a pivot routing forward information parameter may, based on service logic at the exchange, wish to retain sufficient information to determine that a subsequent call delivered to the exchange is a continuation of this call. In this case, the invoking exchange will send the pivot routing backward information parameter along with the redirection number parameter in the backward FAC message. The pivot routing backward information parameter shall include the return to invoking exchange call identifier (containing a value specified by the invoking exchange) and the return to invoking exchange duration (containing a value of the integer number of seconds the call information will be retained at the invoking exchange). The return to invoking exchange call identifier may be encoded by the invoking exchange either:

- 1) as the call reference value received; or
- 2) with the call identity subfield as a pure binary representation of the identification number allocated to the call at the invoking exchange and the code of the signalling point in which the call identity is relevant (i.e. the invoking exchange).

The return to invoking exchange call identifier value should not be used by this invoking exchange for another call for the number of seconds indicated by the return to invoking exchange duration.

The exchange sending the return to invoking exchange duration shall start a timer, the return to invoking exchange timer,  $T_{RIE-I}$ , to run for the indicated duration with the addition of an implementation-dependent time to account for message transfer time in the backward and forward direction all the way to the originating exchange.

On receipt of another IAM with pivot routing forward information parameter with value "return to invoking exchange call identifier", the invoking exchange shall pass the stored information and the call identifier to the service for proper call handling. If the call identifier value is not currently in use, the information should be discarded and the call processed normally as a new call.

On expiration of the return to invoking exchange timer, the exchange may release the stored information from memory.

If the invoking application requires pivot routing without interworking with redirection, it shall set the pivot routing indicators to "interworking to redirection prohibited (backward)". If the application does not have a requirement that prohibits pivot routing interworking with redirection, it shall set the pivot routing indicators to "no indication".

#### **8.6.1.4 Exchange receiving a pivot request**

The actions at an exchange having determined to support pivot routing on this call and receiving a backward FAC message with pivot routing indicators value of "pivot request" and redirection number parameter will depend on whether the IAM received from the previous exchange, if any, had included a pivot capability parameter and on the service logic at that exchange. In particular:

- 1) If a previous exchange had indicated "pivot possible", the call has not progressed beyond the state indicated in the sent pivot capability parameter and service logic determines that this exchange should pivot route the call, in which case it should pivot route the call as described for the pivoting exchange.
- 2) If a previous exchange had indicated "pivot possible" and the call has not yet progressed beyond the state indicated in the pivot capability parameter received from the previous exchange, the backward FAC message is passed back unchanged.

- 3) If at least one of the following three conditions is true:
  - a) the previous exchange had not indicated "pivot possible"; or
  - b) there is no previous exchange; or
  - c) the call has progressed beyond the state indicated in the pivot capability parameter received from the previous exchange;and if:
  - d) the (national option) "pivot routing will not be invoked" indication has not been received; and
  - e) if the call has not progressed beyond the state indicated in the pivot capability parameter sent from this exchange;

then the exchange should progress the call toward the new called number as described below for the pivoting exchange, and immediately invoke the release of the connection toward the invoking exchange. Otherwise, the pivot routing exchange shall send a forward FAC message with pivot routing indicators value of "pivot request failure" and redirection number parameter towards the pivot invoking exchange.

The exchange shall perform the pivot routing if:

- 1) the application corresponding to the invoking pivot reason wishes to perform the pivot routing; or
- 2) the invoking pivot reason received in the FAC message:
  - a) corresponds to one of the performing pivot reasons sent in the forward direction by this exchange; and
  - b) does not correspond to the performing pivot reason(s) received from the preceding exchange.

If the pivot capable exchange passes the backward FAC message with pivot routing indicators value of "pivot request" and receives a forward FAC message with pivot routing indicators value of "pivot request failure" and redirection number parameter, the actions at the exchange are determined as follows:

- 1) if:
  - there is no invoking pivot reason in the forward FAC message; or
  - the invoking pivot reason corresponds to an application at this exchange,then the exchange will initiate the call setup to the new called number in the redirection number parameter as described below for the pivoting exchange (unless service applications impose other requirements).
- 2) if the invoking pivot reason does not correspond to an application at this exchange, the exchange shall not initiate the call setup to the new called number and shall send the FAC message forward unchanged.

The incoming and outgoing international gateway exchanges must each assure that the redirection number in a redirection number parameter in a facility (FAC) message is encoded as an international number.

#### **8.6.1.4.1 Exchange receiving a pivot request (national option)**

If no "acknowledgement of pivot routing" indication has been received when an answer message is received, the exchange will release the IAM information from memory and will follow the procedures above for the case when the "pivot routing will not be invoked" indication has been received.

Note that the exchange receiving a pivot request may receive multiple copies of the "acknowledgement of pivot routing" if the first invocation of pivot routing results in an IAM with an offer to pivot route from an exchange later in the call path. Such subsequent copies are discarded by the pivoting exchange.

The exchange receiving a pivot request with pivot routing backward information parameter with return to invoking exchange call identifier and return to invoking exchange duration will store the call identifier for the time indicated by the return to invoking exchange duration. If the exchange becomes a pivoting exchange, the procedures in that subclause apply.

On expiration of the return to invoking exchange timer, the exchange shall release the stored information from memory.

#### **8.6.1.5 Pivoting exchange**

The "pivoting exchange" is an exchange in the call path which supports the service that requires the pivot routing mechanism and is able to pivot the call to a new destination called address. This exchange is any exchange in the call path except the invoking exchange or the destination local exchange.

The pivoting exchange shall construct a new IAM as follows:

- 1) The called party number parameter is populated from the relevant fields of the redirection number received in the forward or backward FAC message.
- 2) The value of the pivot counter shall be one more than the larger of the stored value and the value in the received forward (invoking) or backward (failure) FAC message. If this would lead to a counter value above the network determined maximum (up to 31), the forward FAC message with pivot routing indicators value of "pivot request failure" and redirection number parameter is sent toward the invoking exchange.
- 3) Additional parameters are populated as required by the applicable service application(s).
- 4) The rest of the IAM shall be constructed from the stored IAM information.

The pivoting exchange makes sure that a route is available to the next exchange, and then releases the old call leg [with cause value "normal, unspecified" (Cause 31)] to the invoking exchange before this newly built IAM is sent towards the new destination exchange. If the route is not available, it will:

- 1) send a forward FAC message with:
  - redirection number;
  - pivot routing indicators value of "pivot request failure"; and
  - the received invoking pivot reason; if anytoward the invoking exchange;
- 2) abandon the pivot routing process; and
- 3) re-enter the call state prior to the reception of backward FAC message with pivot routing indicators value of "pivot request".

If a backward FAC message with pivot routing indicators value of "cancel pivot request" is received from the invoking exchange, and this new IAM is not yet sent, the pivoting exchange abandons the pivot routing process and re-enters the call state prior to the reception of backward FAC message with pivot routing indicators value of "pivot request".

If a backward FAC message with pivot routing indicators value of "cancel pivot request" is received from the invoking exchange, and this new IAM is already sent, the pivoting exchange discards the message.

If pivot routing is used after the sending of the address complete message, the exchange that performs the pivot routing will receive an address complete message from the new leg of the call. This second address complete message shall be mapped by the pivot routing exchange to a call progress message, according to Recommendation Q.732. Similarly for the answer message, if pivot routing is done after the call is answered, the pivot routing exchange shall not pass on the answer message received from the new leg of the call, but shall map the answer to a call progress message.

#### **8.6.1.5.1 Pivoting exchange (national option)**

If no "acknowledgement of pivot routing" indication has been received when an answer message is received, the exchange will release the IAM information from memory and will follow the procedures above for the case when the "pivot routing will not be invoked" indication has been received.

Note that the pivoting exchange may receive multiple copies of the "acknowledgement of pivot routing" if the first invocation of pivot routing results in an IAM with an offer to pivot route from an exchange later in the call path. Such subsequent copies are discarded by the pivoting exchange.

If, after offering pivot routing in the forward direction, an exchange receives a message in the backward direction with the pivot status parameter set to indicate "pivot routing will not be invoked", then the stored IAM information may be released from memory if the ACM (or the ANM instead of ACM) message has been received (see 2.1.11/Q.764) and:

- 1) If a previous exchange had indicated "pivot possible" and the call has not yet progressed beyond the state indicated in the pivot capability parameter received from the previous exchange, the indication is passed back unchanged unless service logic determines otherwise.
- 2) If there is no prior pivot active exchange, the "pivot routing will not be invoked" is the only value in the pivot status parameter, the pivot status parameter may be discarded. If this is the only functionality in a FAC message, the message may be discarded.

After pivot routing initiates the call to the new destination, service logic at the pivoting exchange may wish to return the call to the invoking exchange. If the return to invoking exchange timer has not expired, the exchange should send the IAM with pivot routing forward information parameter with the "return to invoking exchange call identifier" set to the received value. If the pivot capability parameter indicates that pivot routing is possible after this IAM, the IAM may optionally also indicate "return to invoking exchange possible". Other options for populating other pivot routing information remain under the control of the international procedures.

#### **8.6.2 Exceptional procedures**

- 1) If the pivot timer expires or a forward FAC message with pivot routing indicators value of "pivot request failure" arrives at the invoking exchange, the invoking exchange can either fail the call or proceed with the forward routing of the call depending on the service that is invoking the pivot routing mechanism.
- 2) On expiration of the pivot timer, the invoking exchange will increment the pivot counter and cancel its previous request to pivot route the call by sending a backward FAC message with pivot routing indicators value of "cancel pivot request".
- 3) If a backward FAC message with pivot routing indicators value of "pivot request" is received and the exchange had sent the pivot capability parameter in the IAM but had not indicated that pivot routing was possible in the current call state, a forward FAC message with redirection number and pivot routing indicators value of "pivot request failure" is sent toward the invoking exchange.
- 4) The pivot routing procedure would lead to the sending of an IAM with pivot counter value above the network determined maximum (up to 31), the forward FAC message with pivot routing indicators value of "pivot request failure" is sent toward the invoking exchange.

- 5) If a invoking pivot reason is received which does not correspond to an application at the exchange, but there is no prior offer to pivot route the call, normal release procedures apply.
- 6) As a network option, if the pivot counter is received with a value less than the sent value (in FAC or IAM) the call is released in both directions with cause value "network out of order" (cause 38).
- 7) As a network option, if a backward FAC message with pivot routing indicators value of "pivot request" or forward FAC with "pivot request failure" is received without a redirection number in an exchange that is prepared to perform pivot routing, the call is released in both directions with cause value "normal, unspecified" (cause 31).

The exceptional procedures above apply to the exchanges in the call path as follows:

Exchange	Applicable procedures
Invoking	1, 2
Receiving a pivot request	5,7
Pivoting	3, 4, 5, 6, 7

### 8.6.2.1 Exceptional procedures (national option)

If neither the "acknowledgement of pivot routing" indication nor the "pivot routing will not be invoked" indication are received when expected, the IAM information may be released and a subsequent invocation of pivot routing will result in a forward FAC message with redirection number and pivot routing indicators value of "pivot request failure", as in exceptional procedure 2.

Unexpected pivot forward routing information or unexpected pivot backward routing information is discarded. If an IAM is received with invalid invoking exchange call identifier, the call should be treated as a new call (i.e. as if the return to invoking exchange timer has expired and the stored information has been released from memory). If a pivot routing backward information parameter is received with no return to invoking exchange duration and no default duration has been specified, the call should not be returned to the invoking exchange with the invoking exchange call identifier.

### 8.6.3 Interworking considerations

The flow of information from the NNI to the UNI when pivot routing has been invoked must be described in the invoking service specification and is therefore outside the scope of this Recommendation.

Private network interactions may require that the pivot counter be conveyed and pivot routing procedures observed when entering or exiting a private network. The mechanism for this is outside the scope of this Recommendation.

### 8.6.4 Pivot routing timers

Timer	Time out value	Cause for initiation	Normal termination	At expiry
T <sub>PIV</sub>	4-15 s	When FAC invoking pivot routing is sent	At receipt of REL, or FAC with pivot routing indicators value "pivot routing failure"	Start T <sub>guard</sub>
T <sub>guard</sub>	Implementation dependent	Expiration of T <sub>PIV</sub>	At receipt of REL	Send FAC with pivot routing indicators value "pivot routing cancel"
T <sub>RIE-I</sub>	Sent return to invoking exchange duration, plus implementation-dependent time	Supplementary service dependent	At receipt of IAM with Return to Invoking Exchange Call Identifier"	Discard stored information
T <sub>RIE-P</sub>	Value received from invoking exchange	Receipt of invocation of pivot routing with "return to invoking exchange possible"	Invocation of supplementary service to return to the invoking exchange	Discard stored information

### 8.7 Redirection (national use)

This procedure provides a general mechanism that can be used by an exchange that decides that the call should be set up to a called number other than that identified in the received called party number parameter. In general such an exchange can "forward" the call on to the new called number, or alternatively invoke this redirection mechanism to request a preceding exchange involved in the call to route the call to the new number. Forwarding should be used for services where the service-invoking exchange retains some interest in the call, e.g. for charging purposes. Redirection can optionally be used when it is desirable to release from the call path the service-invoking exchange and exchanges between this exchange and the exchange performing the redirection.

The invoking and redirecting functions may occur in the same exchange. In that case the redirect counter shall be incremented as specified for the exchange receiving a redirection request.

Redirection also supports the ability for the invoking exchange to allow return of the call to itself after successful redirection and to identify the call if it is returned.

General interactions with supplementary services are for further study.

Any exchange that offers to redirect a call should indicate at least ISUP preferred. The offer to perform redirection may be lost in some interworking situations with older versions of ISUP.

Echo control interaction with redirection requires further study.

Redirection may extend the time before the originating local exchange receives ACM, CON or ANM.

NOTE – The procedure described here may not provide redirection through ISUP'92 Type A exchanges. In particular, if the compatibility mechanism is not used to prevent it, an offer to redirect would pass through an ISUP'92 exchange, but the release message accepting the offer would lose its redirection information in transiting the exchange. Since the offer in the forward direction does not, by itself, invoke redirection, discarding the offer at an ISUP'92 exchange is regarded as a normal procedure.

Since redirection may result in an increased number of release messages (and in particular release before answer) from specific destinations, measures may be necessary to avoid possible blocking of

circuits and possible faulty generation of alarms as a result of the deployed network management functionality.

## **8.7.1 Normal procedures**

### **8.7.1.1 Originating local exchange**

An originating local exchange that wishes to offer to perform the redirecting function shall store the sent IAM information and the value of the redirect counter and shall send the redirect capability parameter in the IAM. The redirect capability parameter shall indicate the latest call state in which a redirection request can be accepted. The setting of this indication is implementation dependent, and may depend on the services being requested by the calling subscriber. Service applications may require additional information to be sent forward. The IAM information can be released from memory when a redirection request can no longer be acted on by this exchange.

As a network option, the exchange may expect to receive the "acknowledgement of redirection" in a backward message as an indication that the message has reached the exchange that may invoke redirection. If an answer message is received and this acknowledgement has not been received, the exchange will release the IAM information from memory and will not act on a subsequent redirection request.

The exchange that wishes to offer redirection and to explicitly include with that offer one or more specific "reasons for redirection", shall also include in the IAM the "performing redirect indicator" with appropriate performing redirect reason(s) and redirect possible indicator values.

The originating local exchange may include the redirect forward information parameter with value "return to invoking exchange possible" to indicate that it is able to receive the redirect backward information parameter with an invoking exchange call identifier and a duration.

### **8.7.1.2 Intermediate exchange**

An intermediate exchange that does not support redirection shall act as specified in Recommendation Q.764.

An intermediate exchange that supports redirection, but has determined not to support the mechanism for a particular call shall pass redirection information transparently.

An intermediate exchange that has determined to act on requests to redirect from subsequent exchanges shall store the received IAM (including the redirect capability parameter, redirect counter parameter, if any, and performing redirect indicator, if any). If the exchange wishes to offer to perform the redirection function with a higher capability (i.e. is willing to support redirection to a later call state) than indicated in the received redirect capability parameter or in the performing redirect indicator, then the information shall be modified to allow the higher capability (unless service applications impose other requirements or the redirect counter value equals or exceeds the network determined maximum value). Otherwise, the parameter is passed unchanged to the subsequent exchange.

An intermediate exchange may also be the first exchange to indicate that redirection is possible, in which case it performs the actions described for the originating local exchange in 8.7.1.1.

The IAM information can be released from memory when a redirection request can no longer be acted on by this intermediate exchange, even if there is still a prior exchange supporting redirection to a later call state.

As a network option, the exchange may expect to receive the "acknowledgement of redirection" in a backward message as an indication that the message has reached the exchange that may invoke redirection. If an answer message is received and this acknowledgement has not been received, the exchange will release the IAM information from memory and will not act on a subsequent redirection request.

The exchange may include the redirect forward information parameter with value "return to invoking exchange possible" to indicate that it is able to receive the redirect backward information parameter with an invoking exchange call identifier and a duration.

### **8.7.1.3 Invoking exchange**

An exchange that supports a service function which determines a new called number for the call and wishes to invoke the redirection procedure shall examine the redirect capability parameter to determine whether redirection is possible in the current call state. If redirection is possible it shall release the call (optionally, using cause 23). The redirection number parameter (containing the new called party number) and the redirect counter parameter (set to the value received in the IAM, or set to zero if no redirect counter was received) shall be included in the release message. Service applications may require additional information to be sent back in the release message, e.g. to indicate the reason for the redirection.

The sending of a release message with redirection number parameter after the sending of the answer message may affect ISDN services for the call. The service function using redirection at this exchange should take this into account when deciding whether to invoke this redirection procedure.

When one of the reasons indicated in the received performing redirect reason corresponds to the application invoking redirection, the value of the redirect possible indicator sent in the backward direction shall indicate this one reason. If the current call state is beyond the state indicated by the corresponding redirect possible indicator at performing exchange, redirection shall not be invoked by this application. Note that if no performing redirect reasons are received, the application may still invoke redirection.

The service function at the invoking exchange may, at some point in the call, determine that redirection will not be invoked for that call. At that point in the call, the exchange may send a message (ACM, ANM, CON, FAC, or CPG) in the backward direction with the redirect status parameter set to indicate "redirection will not be invoked".

As a network option, the invoking exchange may be required to send one of:

- 1) the "acknowledgement of redirection"; or
- 2) the "redirection will not be invoked" indication

in a backward message following the receipt of a redirect capability parameter in an IAM and no later than the answer message, unless:

- 1) the first backward message invokes redirection; or
- 2) the first backward message releases the call.

Note that if the invoking exchange sends "acknowledgement of redirection" and redirection is invoked, and an exchange other than the earliest capable exchange in the call path performs the redirection, then it is possible for another "acknowledgement of redirection" to be sent from the new destination. The originating local exchange should disregard this indication.

The invoking exchange which receives a redirect forward information parameter may, based on service logic at the exchange, wish to retain sufficient information to determine that a subsequent call delivered to the exchange is a continuation of this call. In this case, the invoking exchange will send the redirect backward information parameter along with the redirection number parameter in the release message. The redirect backward information parameter shall include the return to invoking exchange call identifier (containing a value specified by the invoking exchange) and the return to invoking exchange duration (containing a value of the integer number of seconds the call information will be retained at the invoking exchange). The return to invoking exchange call identifier may be encoded by the invoking exchange either:

- 1) as the call reference value received; or

- 2) with the call identity subfield as a pure binary representation of the identification number allocated to the call at the invoking exchange and the code of the signalling point in which the call identity is relevant (i.e. the invoking exchange).

The return to invoking exchange call identifier value should not be used by this invoking exchange for another call for the number of seconds indicated by the return to invoking exchange duration.

The exchange sending the return to invoking exchange duration shall start a timer, the return to invoking exchange timer,  $T_{RIE}$ , to run for the indicated duration with the addition of an implementation-dependent time to account for message transfer time in the backward and forward direction all the way to the originating exchange.

On receipt of another IAM with redirect forward information parameter with value "return to invoking exchange call identifier", the invoking exchange shall pass the stored information and the call identifier to the service for proper call handling. If the call identifier value is not currently in use, the information should be discarded and the call processed normally as a new call.

On expiration of the return to invoking exchange timer, the exchange may release the stored information from memory.

#### **8.7.1.4 Exchange receiving a redirection request**

The actions at an exchange having the redirection capability and receiving a release message with redirection number parameter will depend on whether the IAM received from the previous exchange, if any, had included a redirect capability parameter and on the service logic at that exchange. In particular:

- 1) If a previous exchange had indicated "redirect possible" (for the reason indicated in the invoking redirect reason, if any), the call has not progressed beyond the state indicated in the sent redirect capability parameter and service logic determines that this exchange should redirect the call, in which case it should redirect the call as described below for the redirecting exchange.
- 2) If a previous exchange had indicated "redirect possible" (for the reason indicated in the invoking redirect reason, if any) and the call has not yet progressed beyond the state indicated in the redirect capability parameter received from the previous exchange, the release message is passed back unchanged.
- 3) If at least one of the following three conditions is true:
  - a) the previous exchange had not indicated "redirect possible" (for the reason indicated in the invoking redirect reason, if any); or
  - b) there is no previous exchange; or
  - c) the call has progressed beyond the state indicated in the redirect capability parameter (or performing redirection reason) received from the previous exchange;and if:
  - d) the "redirection will not be invoked" indication has not been received; or
  - e) the call has not progressed beyond the state indicated in the sent redirect capability parameter,

then the exchange should progress the call toward the new called number as described below for the redirecting exchange. Otherwise, normal release procedures apply and the release message will be passed to the previous exchange, if applicable.

The redirecting exchange shall construct a new IAM as follows:

- 1) The called party number parameter is populated with the relevant fields of the redirection number received in the release message.

- 2) The value of the redirect counter shall be incremented by one from the value in the received release message. If this would lead to a counter value above the network determined maximum (up to 31), the call shall fail and exceptional procedures apply.
- 3) Additional parameters are populated as required by the applicable service application(s).
- 4) The rest of the IAM shall be constructed from the stored IAM information.

If redirection is used after the sending of the address complete message, the exchange that performs the redirection will receive an address complete message from the new leg of the call. This second address complete message shall be mapped by the redirecting exchange to a call progress message, according to Recommendation Q.732. Similarly for the answer message, if redirection is done after the call is answered the redirecting exchange shall not pass on the Answer message received from the new leg of the call, but shall map the answer to a call progress message.

### 8.7.2 Exceptional procedures

- 1) If a release message with redirection number parameter is received and the exchange had not sent the redirect capability parameter in the IAM, normal release procedures apply.
- 2) If a release message with redirection number parameter is received and the exchange had sent the redirect capability parameter in the IAM, but had not indicated that redirection was possible in the current call state, normal release procedures apply. The release message is passed back unchanged.
- 3) If the redirection procedure would lead to the sending of an IAM with value above the network determined maximum (up to 31), the call is released with cause value "network out of order" (cause 38).
- 4) If a invoking redirect reason is received which does not correspond to an application at the exchange, but there is no prior offer to redirect the call, normal release procedures apply.
- 5) As an option, if a release message with cause 23 is received without a redirection number in an exchange that is prepared to perform redirection, the call is released with cause value "normal, unspecified" (cause 31).
- 6) As an option, the originating local exchange may expect to receive the "acknowledgement of redirection" in a backward message as an indication that the message has reached the exchange that may invoke redirection. If an answer message is received and this acknowledgement has not been received, the originating local exchange will release the IAM information from memory and will not act on a subsequent redirection request.

The exceptional procedures above apply to the exchanges in the call path as follows:

Exchange	Applicable procedures
Originating	1, 2, 6
Intermediate	1, 2, 6
Invoking	
Receiving a request	3, 4, 5

### 8.7.3 Interworking considerations

The flow of information from the NNI to the UNI when redirection has been invoked must be described in the invoking service specification and is therefore outside the scope of this Recommendation.

Private network interactions require that the redirect counter be conveyed and redirection procedures observed when entering or exiting a private network. The mechanism for this is for further study.

### 8.7.3.1 Interworking with pivot routing

Note that pivot routing includes the capability to indicate that interworking to redirection should not be performed. If an exchange does not interwork from pivot routing to redirection, received pivot routing information will be passed transparently through a redirection-capable exchange. Redirection may be converted to pivot routing (and back again) using the information below with no loss of functionality.

Received from pivot routing	Sent
IAM with pivot capability and interworking to redirection not allowed	no change due to pivot routing (Note 1)
IAM with pivot capability and interworking to redirection allowed	IAM with redirect capability
Facility with redirection number (Note 2)	Release with redirection number backward Release forward (cause "normal, unspecified")
Facility with "cancel pivot request"	Not applicable (message is discarded since Release has been sent forward)
Facility with "pivot routing failure" (Note 3)	Release backward (cause "normal, unspecified") Release forward (cause "normal, unspecified")
Any message type with "pivot routing will not be invoked"	Same message type with "redirection will not be invoked"
Any message type with "pivot routing acknowledgement"	Same message type with "redirection acknowledgement"
NOTE 1 – Redirect capability may be sent as a network option from this exchange in addition to the pivot capability.	
NOTE 2 – Assuming the pivot routing is not performed at this exchange.	
NOTE 3 – Assuming the pivot attempt also fails at this exchange.	

Note that if an exchange does not interwork from redirection to pivot routing, the redirection information will typically transfer transparently through the exchange. Acceptance of an offer to redirect will not pass through an ISUP'92 exchange. Therefore, the compatibility mechanism should be used to assure the initial offer is not passed forward in this case.

Received from redirection	Sent
IAM with redirect capability	IAM with pivot capability
Release with redirection number	Facility backward Release complete forward
Any message type with "redirection will not be invoked"	Same message type with "pivot routing will not be invoked"
Any message type with "redirection acknowledgement"	Same message type with "pivot routing acknowledgement"
NOTE – When replacing a facility message with a release with redirection number or vice versa, the counter value should be passed unchanged.	

## 8.7.4 Redirection timers

Timer	Time out value	Cause for initiation	Normal termination	At expiry
T <sub>RIE-I</sub>	Sent return to invoking exchange duration, plus implementation-dependent time	Supplementary service dependent	At receipt of IAM with "return to invoking exchange call identifier"	Discard stored information
T <sub>RIE-P</sub>	Value received from invoking exchange	Receipt of invocation of redirection with "return to invoking exchange possible"	Invocation of supplementary service to return to the invoking exchange	Discard stored information

## 8.8 Relay methods for non-circuit related signalling

### 8.8.1 Scope

This subclause describes different nodal relay functions for the support of non-circuit related signalling for specialized routing and/or service interaction handling. This might occur in a number portability environment or in relation to ISDN supplementary services such as CCBS.

### 8.8.2 Overview of relay functions

A relay function is a mechanism at a node that provides for the end-to-end message transport between two application entities. The following relay function types have been identified:

- 1) **SCCP relay** performs relay functions that might or might not be, depending on the implementation, an extension of the existing SCCP GT translation function. This relay function type may be used where the appropriate destination is derivable by existing SCCP routing control functionality.
- 2) **TC relay**, as a TC user, performs relay functions invoked either via the SCCP GT translation or via functions in the application process. The TC relay function type terminates the incoming TC transaction and establishes a new outgoing TC transaction. Both TC transactions will be linked and further messages are passed without application involvement.
- 3) **AP relay** performs relay functions making use of the service logic of, and information from, the supplementary service ASE(s). The AP relay function type terminates the incoming TC dialogue and establishes a new outgoing TC dialogue. Both TC dialogues will be linked on behalf of the involved ASEs.

This list should not be considered exhaustive. It is left to operator and implementation decisions which relay type(s) is used, taking into account the regulatory and architectural constraints that may prevail.

Details of the relay functions are for further study.

## 9 End-to-end signalling

### 9.1 Introduction

End-to-end messages contain only information which is relevant for the "endpoints" of a circuit-switched connection. Endpoints are signalling points such as local exchanges, international gateway exchanges and possibly exchanges at other network boundaries, e.g. gateway exchanges within the signalling system No. 7 network. Two methods are available for ISDN end-to-end signalling:

- the pass-along method; and

- the Signalling Connection Control Part (SCCP) method.

The choice of method is, to some extent, dependent on the size and architecture of the signalling network. Both methods may coexist in a given network.

The pass-along method and the SCCP method are specified for circuit-switched connections.

An end-to-end signalling connection established for end-to-end signalling is called an "ISDN user part end-to-end signalling connection" in this subclause.

## **9.2 Pass-along method (national use)**

In the pass-along method, use is made of an ISDN user part end-to-end signalling connection which is set up whenever a physical connection between two endpoints is established.

The ISDN user part end-to-end signalling connection in this case consists of a number of connection sections in tandem which run in parallel with and use the same Circuit Identification Code (CIC) as the circuits in the physical connection.

The pass-along method defines, section by section, the appropriate routing label for the message to be passed along via ISDN user part connection, but the content of pass-along messages is only evaluated and possibly changed at the endpoints. The pass-along message is characterized by a special message type code as specified in Recommendation Q.763. One ISDN user part message to be passed along may be embedded in one pass-along message.

In a signalling connection for which pass-along method is available, pass-along messages may be sent in either the forward or backward direction.

A forward pass-along message may not be sent until either a backward pass-along or a backward set-up message indicating pass-along method available has been received, or after the physical connection is released.

Call control path information (see 9.5) included in the initial address and backward set-up messages is used to indicate to the connection endpoints whether or not the call control path can support pass-along message transfer.

A pass-along message that has been received at a transit exchange and cannot be transferred to the subsequent exchange is discarded without affecting call states and timers in that exchange.

## **9.3 SCCP method**

In the SCCP method, the ISDN user part employs the services of the Signalling Connection Control Part (SCCP) for the transfer of end-to-end signalling information.

### **9.3.1 Call reference (national use)**

The call reference is a circuit-independent information identifying a particular call. It is needed when end-to-end signalling information associated with the call is to be transferred by a connectionless SCCP service. If a SCCP connection request for a connection-oriented SCCP service is carried embedded in an ISDN-UP message, the call reference is omitted.

References for a given call are allocated independently in the two concerned signalling points and are subsequently exchanged. The allocation of call references may be initiated by either side. The call reference consists of a call identity and the point code where the call identity is established. If, e.g. signalling point A initiates the exchange of call references, it selects a call identity CIA and transfers it together with the point code of A, PCA, to signalling point B.

Signalling point B then allocates its own identity CIB to the call and returns it together with the signalling point code of B, PCB, to signalling point A. Subsequent call-related end-to-end messages transferred from signalling point A to signalling point B contain call identity CIB and are routed directly using destination point code PCB. Conversely, end-to-end messages transferred from

signalling point B to signalling point A contain call identity CIA and are routed using destination point code PCA.

A linkage of call references at network boundaries has to be provided.

### **9.3.2 Coupling of connection sections**

An ISDN user part end-to-end signalling connection may consist of a number of connection sections in tandem. In order to couple two connection sections at the SCCP relay point, linkage of call references, e.g. call as in Figure 2 (ref. 3), is performed by ISDN user part for connectionless SCCP service and linkage of local references is performed by SCCP for connection-oriented SCCP service.

An SCCP relay point where linkage of call references is performed by the ISDN user part is called an "intermediate relay node" in this section.

### **9.3.3 Connectionless service (national use)**

For connectionless service, the ISDN user part transfers the data to be transmitted to the SCCP together with a request for the appropriate protocol class of service. For call reference signalling information, transfer and delivery of this data to the distant ISDN user part is controlled entirely by the SCCP. The association between the transferred information and a call is made by the ISDN user part, which transfers the call reference as part of signalling information for this purpose.

The protocol class of service is assumed to be 0. Individual networks may choose class 1 based on the predetermined arrangement.

### **9.3.4 Connection-oriented service**

#### **9.3.4.1 Connection request embedded in an ISDN user part message**

At the exchange initiating the establishment of an ISDN user part end-to-end signalling connection based on connection-oriented SCCP service, the ISDN user part requests the SCCP to provide the necessary information for a connection request for an SCCP end-to-end connection. This connection request is then carried embedded in an ISDN user part message. At the destination exchange the connection request is passed to the SCCP by the ISDN user part. The SCCP at the destination exchange then behaves as if the connection request had been sent directly by the SCCP from the originating exchange: it indicates the connection request to the ISDN user part and upon response from the ISDN user part it returns a connection confirm message to the SCCP at the originating exchange. The SCCP at the originating exchange confirms the set-up of the end-to-end connection to the ISDN user part. The contents in the embedded connection request is not evaluated by the ISDN user part at any exchange.

#### **9.3.4.2 Protocol class of service**

The protocol class of service is assumed to be 2. If the connection request is of protocol class 3, the ISDN user part connection request parameter must include explicit protocol class and credit indications in addition to the SCCP source local reference.

#### **9.3.4.3 Mechanism of coupling**

Although coupling of connection sections may not be appropriate in combination with the embedded method, coupling is necessary at network boundaries. In this case the ISDN user part at the intermediate point has knowledge that a coupling of end-to-end connection sections has to be performed, and therefore, connection requests received embedded in an ISDN user part message are passed to the SCCP. The SCCP, in turn, furnishes the ISDN user part with a connection request for the new connection section in order to have it included in the outgoing ISDN user part message.

After the coupling of the connection sections has been successfully initiated by the ISDN user part, end-to-end signalling information passing through an intermediate point is not passed to the ISDN user part.

#### **9.3.4.4 Release of ISDN user part end-to-end signalling connection**

The SCCP end-to-end connection is released according to the procedures described in Recommendation Q.714.

The physical connection and the ISDN user part end-to-end signalling connection can be released independently of each other.

Generally, both the ISDN user part end-to-end signalling connection and the physical connection are released simultaneously. However, for certain applications it is possible to maintain the SCCP end-to-end connection although the physical connection has already been released.

#### **9.4 Chaining of ISDN user part end-to-end signalling connections**

At an exchange where the contents of end-to-end signalling information may need to be evaluated by the ISDN user part, ISDN user part end-to-end signalling connections are chained. Chaining of two ISDN user part end-to-end signalling connections means that one ISDN user part end-to-end signalling connection terminates and another ISDN user part signalling connection associated with it originates with all end-to-end signalling information passing through the ISDN user part. The new ISDN user part signalling connection may have different characteristics from the previous one. See Figure 12.

If chaining is not appropriate for the associated call when the service requirements cannot be satisfied because of it, the call may be released. In addition, if any of the ISDN user part end-to-end signalling connections under chaining cannot be established or is abnormally disconnected, the associated call may be released if the required service cannot be completed without it.

#### **9.5 Use of the Protocol Control Indicator (PCI)**

The protocol control indicator is control information concerning the end-to-end signalling procedures. It is contained in the forward call indicators parameter and the backward call indicators parameter respectively, and has to be examined to determine which end-to-end signalling method should be used if any for the end-to-end transfer of messages.

The indications given by the PCI are given in Recommendation Q.763.

#### **9.6 Operation of the pass-along method (national use)**

Figure 1 illustrates the operation of the pass-along protocol. In this figure the PCI is the protocol control indicator in the IAM.

#### **9.7 Operation of the SCCP method – Connectionless services (national use)**

##### **9.7.1 Successful set-up of the ISDN user part end-to-end signalling connection**

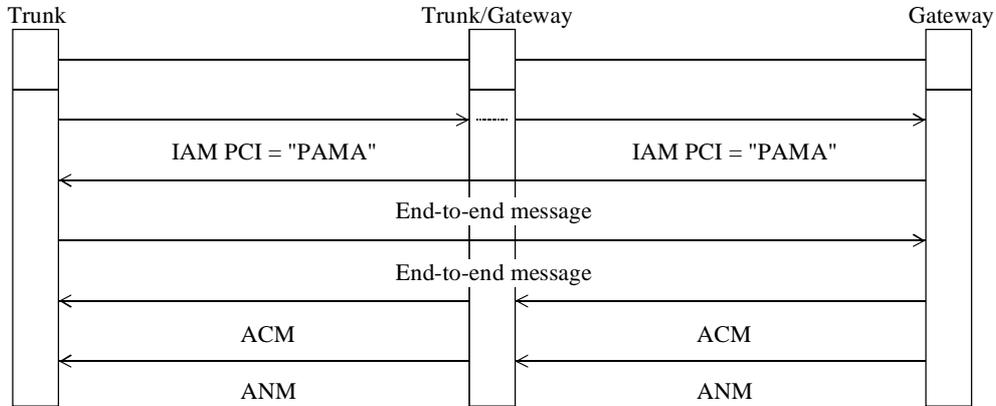
###### **9.7.1.1 Simultaneous establishment of an ISDN user part end-to-end signalling connection and a physical connection**

In the case of simultaneous establishment of a signalling connection with a physical connection, the initial address message from the originating exchange of a call contains the call reference consisting of the point code of the originating exchange and the call identity. The inclusion of the call reference implicitly indicates that the establishment of a signalling connection is requested. When the terminating exchange receives an IAM with a call reference, a signalling connection can be established. It then responds with its own call reference included in the first backward message (e.g. an address complete message).

At an intermediate relay node where SCCP is terminated, its own call reference is allocated to the signalling connection and the coupling of call references is made. When the first backward message

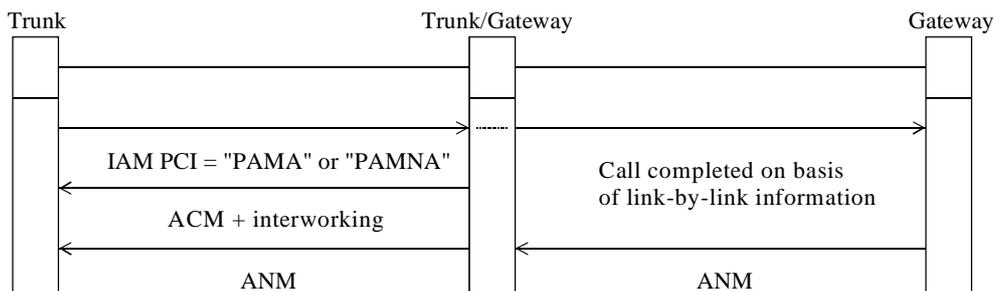
contains a call reference, an intermediate relay node replaces that with its own call reference and relays this message towards the originating exchange.

When the originating exchange receives the destination call reference from the exchange at the other end of the connection section, the signalling connection is regarded as in a ready state and end-to-end signalling information can be transferred over this connection.



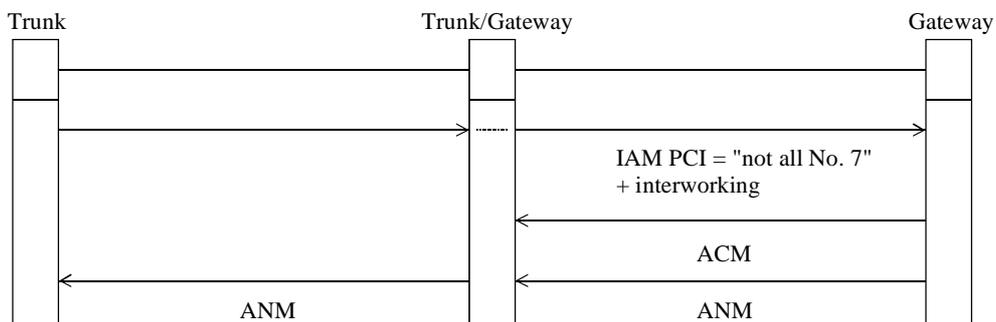
Either end is free to initiate further end-to-end interchanges subsequently.

**a) PAMA between endpoints**



Origin informed that end-to-end interchange cannot be supported.

**b) PAMNA interworking towards destination**



Destination informed that end-to-end interchange cannot be supported.

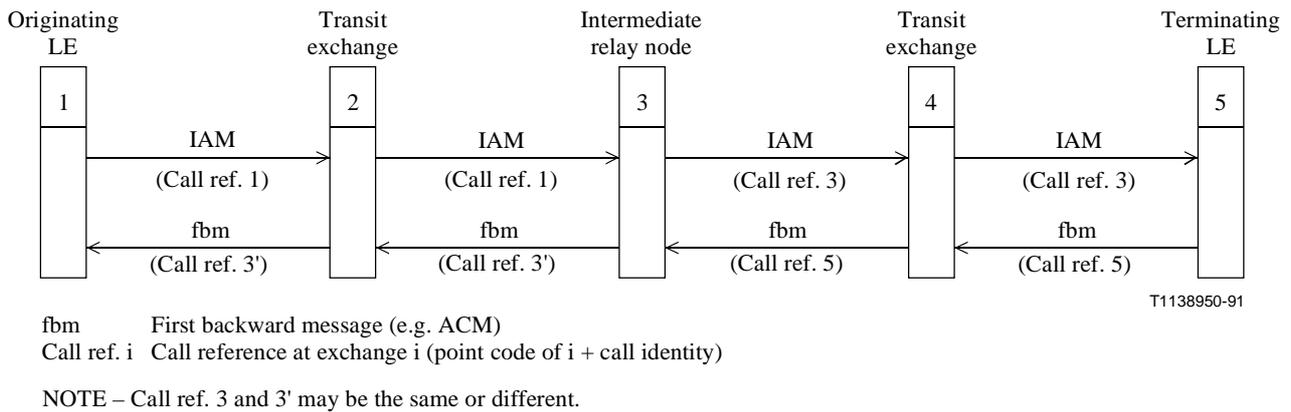
T1138940-91

**c) PAMNA interworking from origin**

PAMA Pass-along Method Available  
PAMNA Pass-along Method Not Available

**Figure 1/Q.730 – Operation of end-to-end protocol (pass-along method)**

Figure 2 shows the procedure for this case.



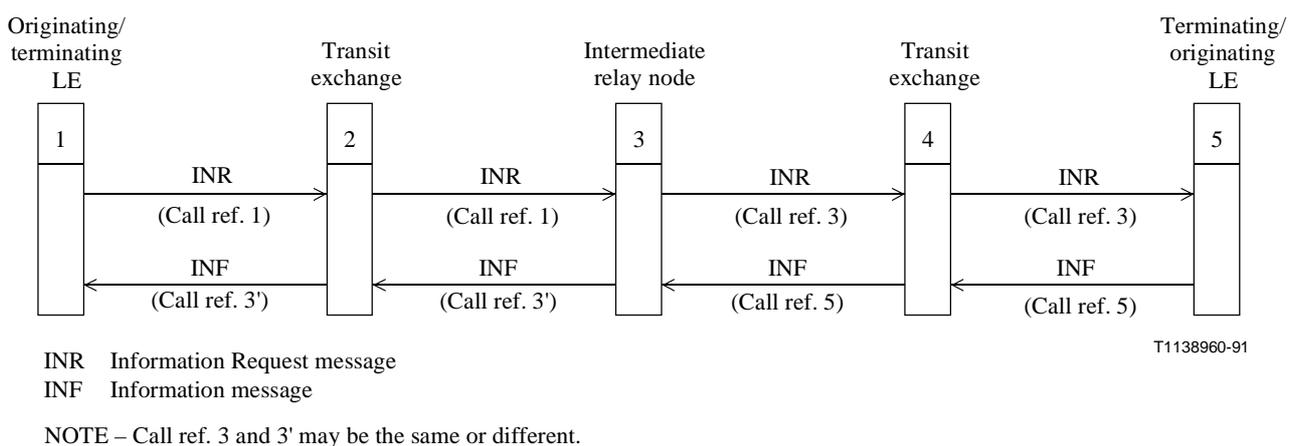
**Figure 2/Q.730 – Simultaneous establishment of a bearer connection and an ISDN user part end-to-end signalling connection, based on SCCP connectionless data**

### 9.7.1.2 Establishment of a signalling connection when the circuit-associated signalling path has been established

When the circuit-associated signalling path has already been established, the establishment of a signalling connection can be initiated either by the originating or the terminating exchange of a call. In this case, an Information Request message (INR) is transferred from the initiating exchange to the other end. This INR message contains a call reference as in the case of an IAM as described in 9.7.1.1 above.

An Information message (INF) containing a call reference as in the case of the first backward message in 9.7.1.1 is returned to the initiating exchange and a signalling connection is successfully established.

Figure 3 shows the procedure for this case.



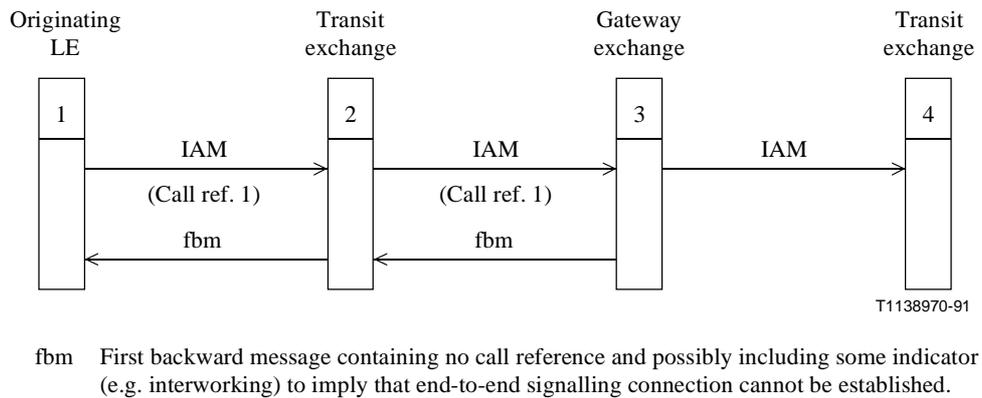
**Figure 3/Q.730 – Establishment of an ISDN signalling connection based on SCCP connectionless class, after the establishment of a circuit-associated signalling path**

### 9.7.2 Unsuccessful set-up of a signalling connection

In a case where a signalling connection cannot be established, e.g. due to interworking with a PSTN, the first backward message in response to the initial address message containing the originating call reference includes no call reference.

The procedure for this case is shown in Figure 4.

In a case where the establishment for a signalling connection is requested by an INR message as shown in Figure 3, the initiating exchange usually knows the end-to-end signalling capability for the call concerned and a signalling connection can successfully be established. However, if a signalling connection cannot be established for some reason, an INF message containing no call reference is returned to the initiating exchange. In these situations, the call may be released if the ISDN user part end-to-end signalling connection is essential to satisfy the service requirements of the call.



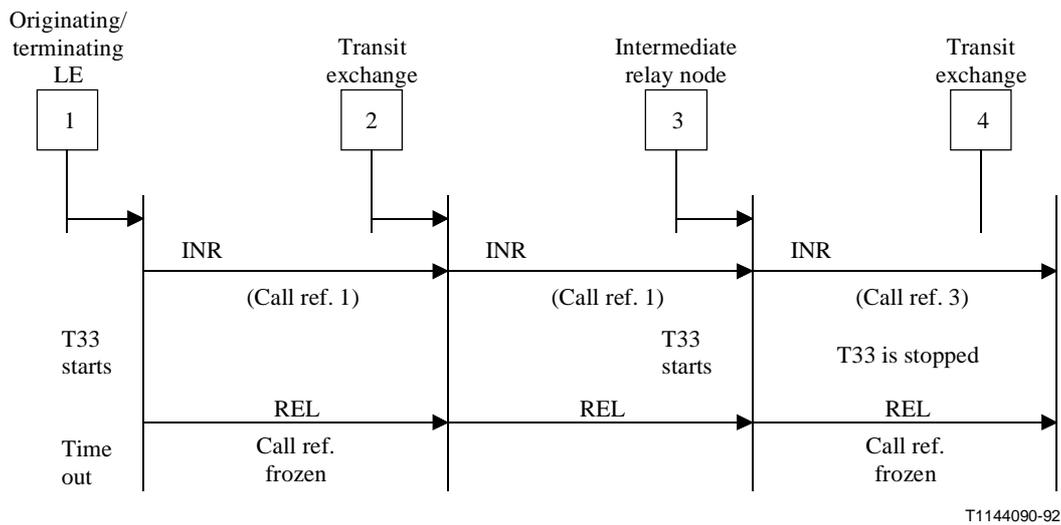
**Figure 4/Q.730 – Unsuccessful establishment of an ISDN user part end-to-end signalling connection, SCCP connectionless class, e.g. due to interworking with a PSTN**

### 9.7.3 Abnormal situations

If no response to the INR message containing the originating call reference is received for the time T33 at the initiating exchange and if necessary (e.g. in the case of an interworking exchange of different end-to-end signalling schemes) at an intermediate relay node, the call is released (see 2.9.7/Q.764).

The procedure for this case is shown in Figure 5.

In this case, the call reference(s) is frozen for the time T31 as described in 9.7.4.2.



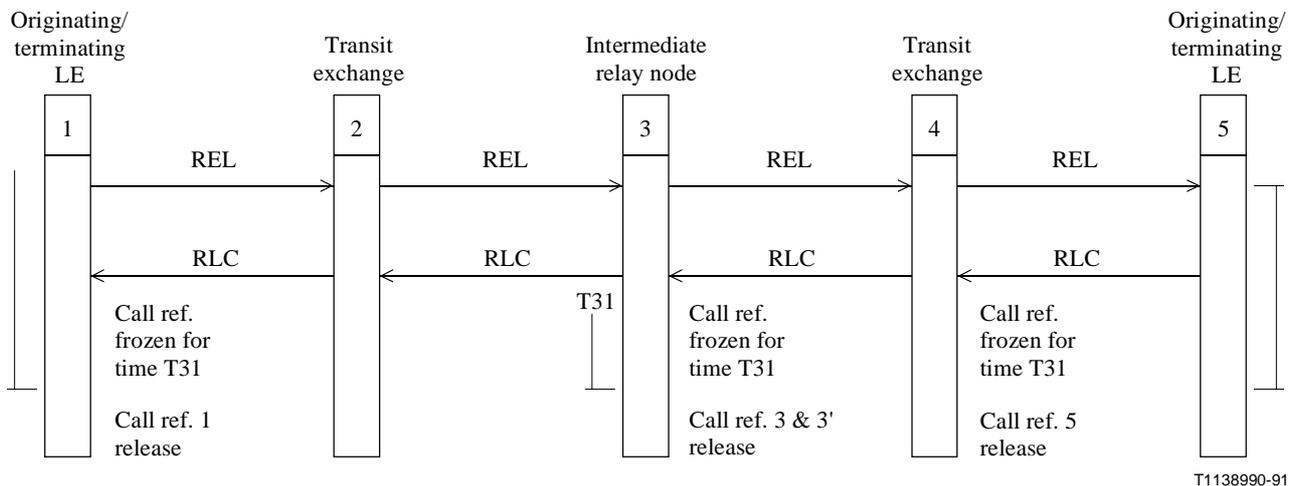
**Figure 5/Q.730 – No response from SCCP after time T33 after the transmission of the originating call reference, during the establishment of an ISDN user part end-to-end signalling connection based on SCCP connectionless class**

## 9.7.4 Release of a signalling connection

### 9.7.4.1 Simultaneous release of a physical connection and a signalling connection

When the call is released, the ISDN user part end-to-end signalling connection is considered to be released simultaneously. Call references allocated at local exchanges and intermediate relay node(s) are frozen for time T31 as described in 9.7.4.2 below.

The procedure for this case is shown in Figure 6.



**Figure 6/Q.730 – Simultaneous release of a bearer connection and ISDN user part end-to-end signalling connection based on connectionless class**

### 9.7.4.2 Frozen call reference

When an ISDN user part end-to-end signalling connection is released, call references allocated for this signalling connection are frozen for time T31. These references will not be used for another signalling connection during the frozen period. T31 is chosen to sufficiently reduce the probability of

erroneously associating a message with the previously used call reference. Optionally, call identities may be allocated to individual signalling connections in a cyclic manner so that a previously used call identity is not to be used again for a sufficient amount of time.

If an end-to-end message containing a frozen call reference is received, it is discarded.

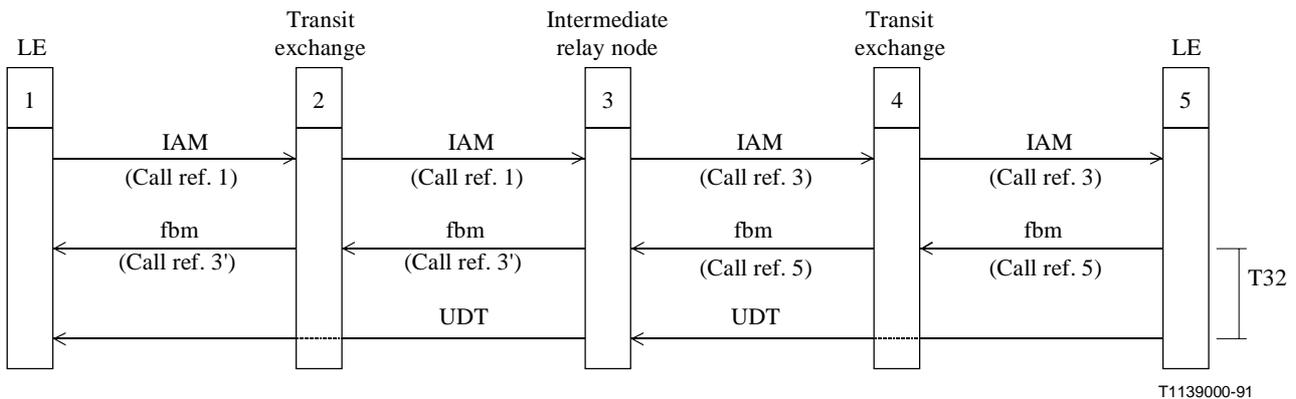
### 9.7.5 End-to-end message transfer

An end-to-end message is transferred in an SCCP Unit Data (UDT) message according to the procedures defined in Recommendation Q.714. ISDN user part interfaces with SCCP via the primitives are defined in Recommendation Q.711 for this transfer. The UNIT-DATA request/indication primitive includes in its user data parameter an ISDN user part message beginning with the message type and ending with the parameters.

At the local exchange which has responded to the request of establishment of an ISDN user part end-to-end signalling connection from the other local exchange, an end-to-end message cannot be transferred for time T32 or until the first end-to-end message has been received from the other end. T32 is chosen to sufficiently reduce the probability that an end-to-end message from the responding local exchange is received at the initiating local exchange or the intermediate relay node, before the ISDN user part message which contains the response to the signalling connection establishment request.

If a relay exchange receives an end-to-end message in a UDT, in any case the UDT will be forwarded to the succeeding exchange if possible.

The procedure for this case is shown in Figure 7.



**Figure 7/Q.730 – Transfer of UDT message from the local exchange which has responded to the ISDN user part signalling connection establishment request**

### 9.8 Operation of the SCCP method – Connection-oriented service

The initial address message, the facility request message and (as for national option) the information message may be used for the embedded transfer of the connection request. The procedures described and the figures refer to the case where the connection request is sent in the forward direction. In principle, they also apply when the connection request is sent in the backward direction in the facility request or (as for national option) the information message.

For the connection request embedded in an ISDN user part message, an additional interface is used. This functional interface is described in Recommendations Q.711 and Q.714 (signalling connection control part of signalling system No. 7). The interface elements are listed in 9.9.

Procedures concerning the SCCP are in accordance with those described in Recommendation Q.714 (signalling connection control part of Signalling System No. 7) and are described here only for illustrative purposes.

The SCCP may not be implemented at all international gateway exchanges. An embedded connection request will be handled as an unrecognized parameter at such an exchange and the information returned in the PCI shall indicate "no end-to-end method available (only link-by-link method available)". No further action is taken. This information is then evaluated by the exchange that has sent the information request (see 9.5).

### **9.8.1 Successful set-up of the ISDN user part end-to-end signalling connection**

The following actions are performed at the originating exchange and at the destination exchange for the set-up of an SCCP end-to-end connection using embedded transfer of the connection request in an ISDN user part message (the numbers in the text correspond to the numbers in Figure 8):

- 1) The ISDN User Part (ISUP) at the originating exchange requests the SCCP to provide the necessary information for a connection request to the called address using the REQUEST type 1 interface element.
- 2) The SCCP at the originating exchange generates a connection request and transfers it to the ISDN user part using the REPLY interface element.
- 3) The ISDN user part at the originating exchange transmits the connection request embedded in an ISDN user part message to the ISDN user part at the destination exchange.
- 7) Upon receiving an embedded connection request in an ISDN user part message, the ISDN user part at the destination exchange transmits the received connection request to the SCCP using the REQUEST type 2 interface element.
- 8) The SCCP at the destination exchange informs the ISDN user part of a request to establish an end-to-end connection using the N-CONNECT indication primitive.
- 9) The ISDN user part responds to the request using the N-CONNECT response primitive.
- 10) Upon receiving the N-CONNECT response primitive from the ISDN user part, the SCCP at the destination exchange sends a connection confirm message into the backward direction.
- 12) Upon receiving a connection confirm message, the SCCP at the originating exchange informs the ISDN user part using the N-CONNECT confirmation primitive.

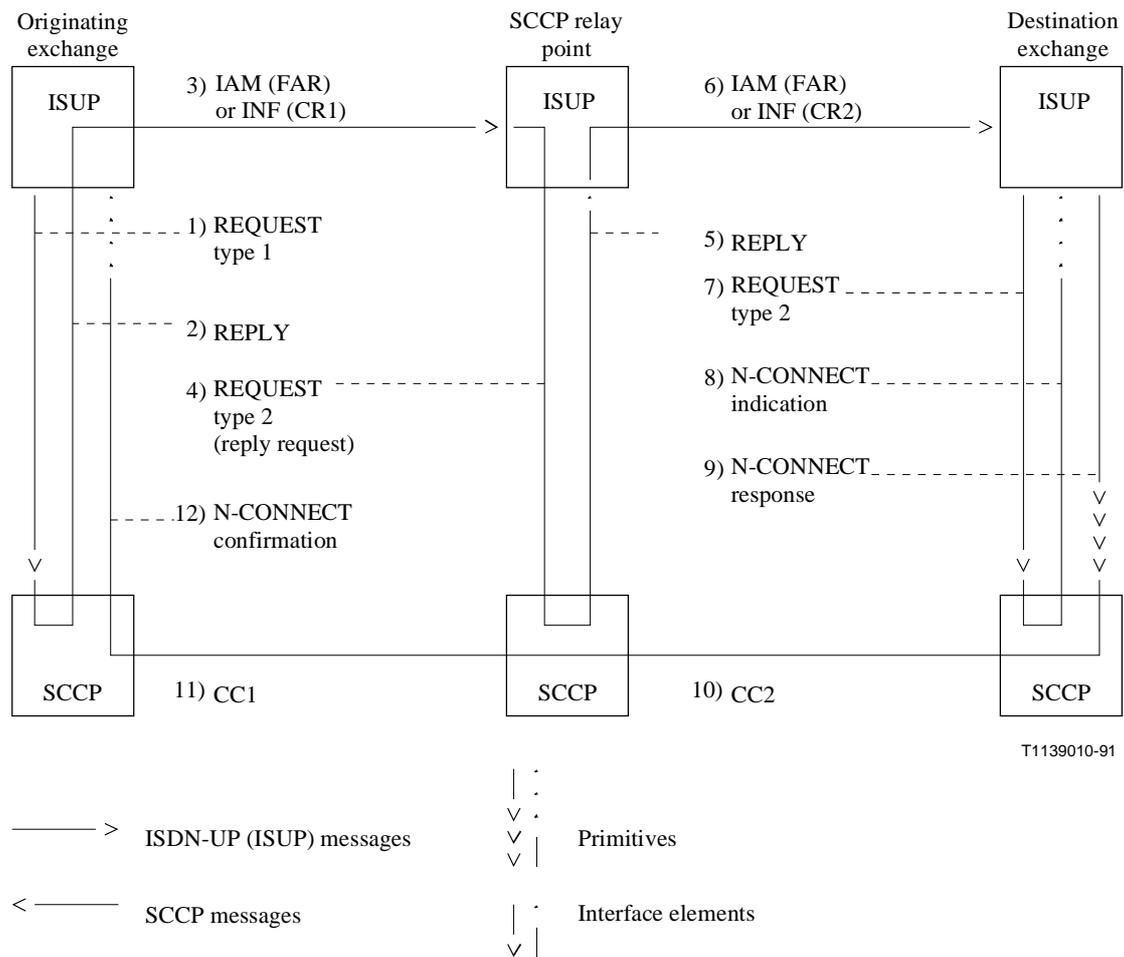
At those transit exchanges which are not SCCP relay points, the connection request embedded in an ISDN user part message is left unchanged by the ISDN user part and transferred into the forward direction.

An SCCP relay point is an exchange where two connection sections belonging to the same end-to-end connection are coupled.

The following actions are performed at an SCCP relay point for the coupling of two connection sections (the numbers in the text correspond to the numbers in Figure 8):

- 4) Upon receiving an embedded connection request in an ISDN user part (ISUP) message, the ISDN user part at the SCCP relay point transfers the received connection request to the SCCP using the REQUEST type 2 interface element with the reply request set.
- 5) The reply request in the REQUEST type 2 interface element causes the SCCP at the SCCP relay point to provide a connection request for a new connection section. The new connection request is provided to the ISDN user part using the REPLY interface element.  
NOTE – The SCCP allocates an outgoing local reference and associates the incoming and outgoing local references and their corresponding point codes.
- 6) The ISDN user part at the SCCP relay point transmits the connection request embedded in an ISDN user part message.

- 11) Upon receiving a connection confirm message, the SCCP at the SCCP relay point sends a connection confirm message into the backward direction.



**Figure 8/Q.730 – Embedded transfer of the connection request actions under successful set-up of the SCCP end-to-end connection**

### 9.8.2 Unsuccessful set-up of the SCCP end-to-end connection

If the ISDN user part end-to-end signalling connection cannot be extended beyond a transit exchange because (for instance) interworking occurs, the ISDN user part at this transit exchange initiates the refusal of the connection request which is then performed by the SCCP. The set-up of the physical connection may be continued.

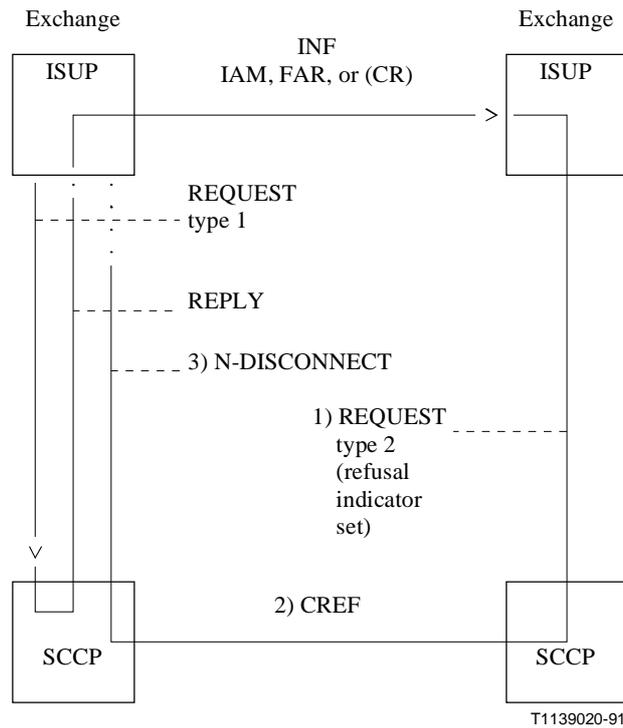
If the ISDN user part initiates the refusal of a connection request received embedded in the initial address message, in general the following actions are performed. The numbers in the text correspond to the numbers in Figure 9:

- 1) Upon receiving an embedded connection request, the ISDN user part transfers the received connection request to the SCCP using the REQUEST type 2 interface element with the refusal indicator set.
- 2) Upon receiving the REQUEST type 2 interface element with the refusal indicator set, the SCCP sends a Connection Refused message (CREF) into the backward direction.
- 3) Upon receiving a connection refused message, the SCCP at the originating exchange informs the ISDN user part using the N-DISCONNECT indication primitive.

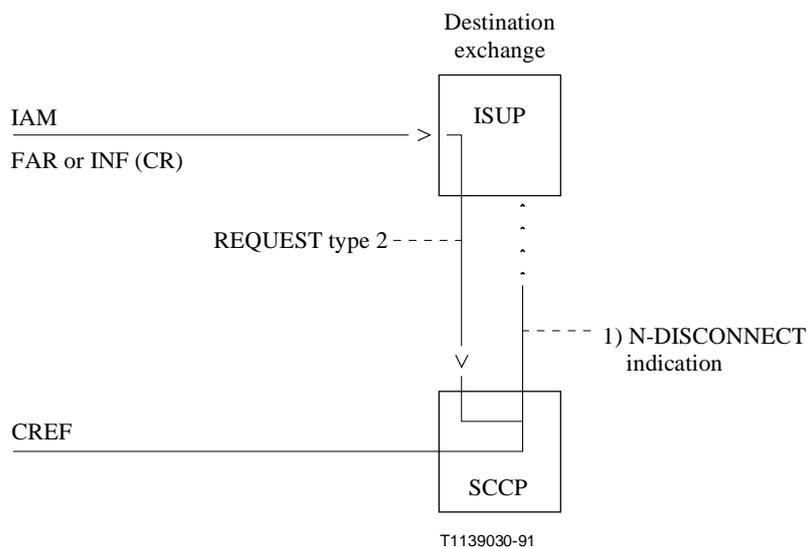
If the SCCP at an SCCP relay point receives a connection refused message instead of a connection confirm message, the incoming connection section is also released by sending a connection refused message into the backward direction.

If the SCCP at the destination exchange fails to set up the requested end-to-end connection, the following actions are performed to refuse the connection request received in a REQUEST type 2 interface element (the numbers in the text correspond to the numbers in Figure 10):

- 1) The SCCP at the destination exchange sends an N-DISCONNECT indication primitive to the ISDN user part.
- 2) At the same time the SCCP sends a connection refused message into the backward direction. In these situations, the call may be released if the ISDN user part end-to-end signalling connection is essential to satisfy the service requirements of the call.



**Figure 9/Q.730 – Embedded transfer of the connection request and refusal of the connection request initiated by the ISDN user part**



**Figure 10/Q.730 – Embedded transfer of the connection request failure of the SCCP at the destination exchange in setting up the requested end-to-end connect**

**9.8.3 Unsuccessful set-up of the physical connection**

If the physical connection cannot be set up at a transit exchange, in addition to releasing the physical connection so far established, the ISDN user part initiates the refusal of the connection request. The same actions are performed as at a transit exchange beyond which a logical connection cannot be extended.

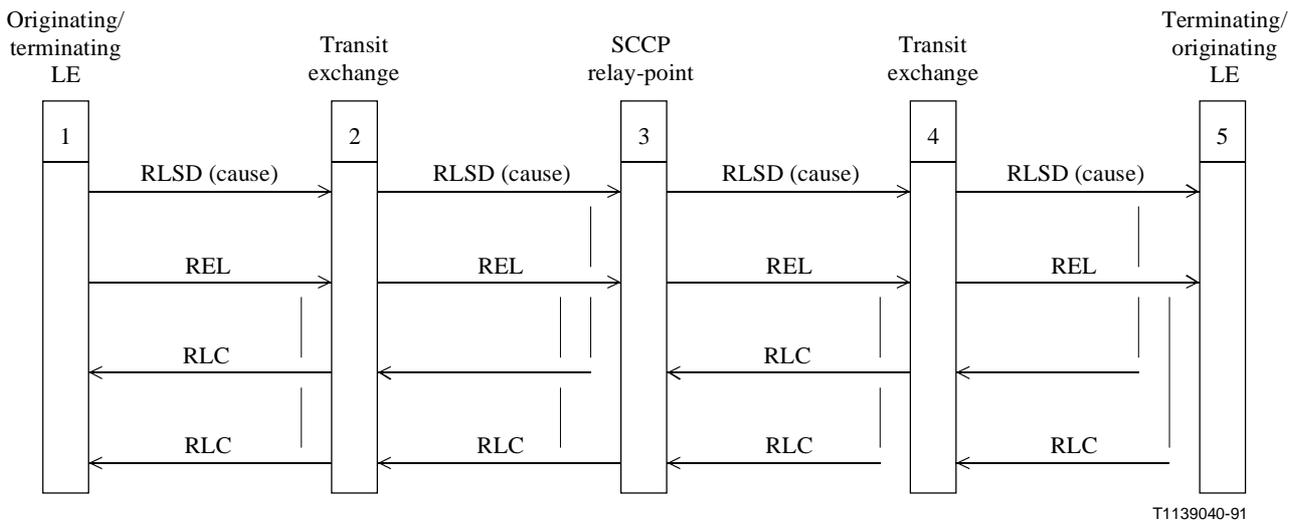
If the physical connection cannot be set up at the destination exchange, the ISDN user part can initiate either the refusal or the confirmation of the connection request depending on supplementary services. It may be preferred to always confirm the connection request to allow for the initiation of supplementary services by the calling subscriber.

**9.8.4 Release of the ISDN User Part (ISUP) end-to-end signalling connection**

**9.8.4.1 Simultaneous release of the physical and ISUP signalling connections**

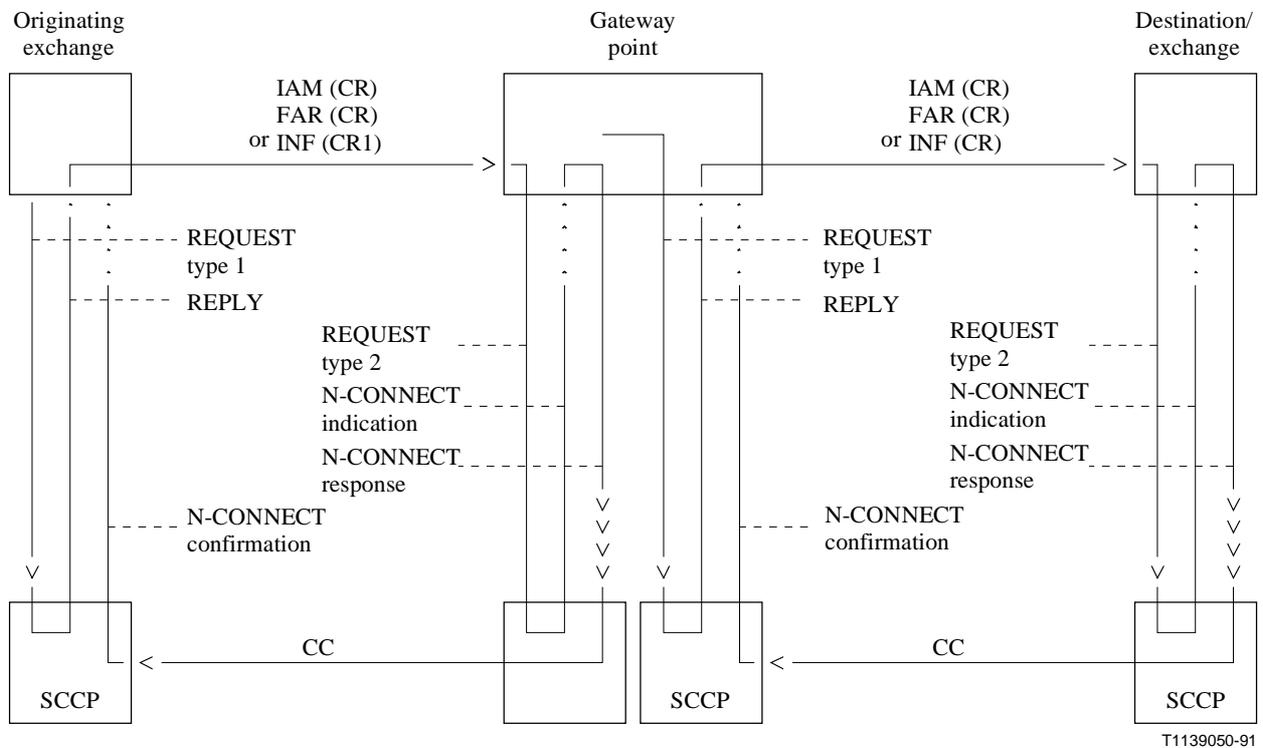
The release of the ISDN user part end-to-end signalling connection is initiated from the exchange which initiates the release of the call concerned. At the initiating exchange of call release, when the ISDN user part Release message (REL) is transmitted, ISDN user part requests SCCP to transmit a Released message (RLSD). This RLSD message contains a cause value of "end user originated" in its cause parameter, if a normal call release initiated by a user is taking place.

Figure 11 shows the procedure for this case.



**Figure 11/Q.730 – Simultaneous release of a bearer connection and an ISDN user part end-to-end signalling connection based on SCCP connection oriented class**

In the case where no application requires the ISDN user part end-to-end signalling connection to be maintained, the ISDN user part at a local exchange, or an exchange performing chaining, requests the SCCP to release the SCCP end-to-end connection if it receives a Release message (REL) and the SCCP has not yet received a Released (RLSD) message at that time (see Figure 12).



**Figure 12/Q.730 – Chaining of end-to-end connections (the outgoing end-to-end connection is assumed to be of the same type as the incoming end-to-end connection)**

#### **9.8.4.2 Non-simultaneous release of the physical and the ISDN user part end-to-end signalling connections**

Procedures for non-simultaneous release of the physical and the ISDN user part end-to-end signalling connections are to be defined in appropriate supplementary service procedures.

#### **9.8.5 End-to-end message transfer**

An end-to-end message is transferred in an SCCP data (DT1/DT2) message according to the procedures defined in Recommendation Q.714. ISDN user part interfaces with SCCP via the primitives as defined in Recommendation Q.711 for this transfer. The data request/indication primitive includes in its user data parameter an ISDN user part message beginning with the message type code and ending with the parameters.

#### **9.9 Interface elements between ISDN user part and SCCP (embedded transfer)**

The ISDN user part may use the functional interface as defined in Recommendation Q.711. Three interface elements are defined for this functional interface:

- a) the REQUEST type 1;
- b) the REQUEST type 2;
- c) the REPLY.

The contents of these three interface elements is shown in Appendix I.

Figures 8, 9 and 11 indicate the usage of the interface elements during the set-up of a circuit-switched connection together with an SCCP connection.

### **10 Layout of service Recommendations**

Each type of supplementary service will be defined in separate clauses of its respective Recommendation, each containing the complete procedures encompassing both the ISDN user part and the procedures to be used on the top Transaction Capability (TC) where appropriate.

Each service Recommendation contains a general paragraph giving details of the specific service with reference to the stages 1/2 and descriptions defined in the Recommendations of the I.250-series, the Q.80-series and the Q.950-series. The call set-up procedures and the actions taken at the concerned exchanges are defined. Arrow diagrams showing the message flow for both successful and unsuccessful establishment of the service are generally included. The formats and coding aspects are not defined in this Recommendation but references are made out to the appropriate ISDN user part, TC or Signalling Connection Control Part (SCCP) Recommendations.

The agreed format for each supplementary service is indicated below:

- 1 Introduction
- 1.1 Scope
- 1.2 References
- 1.3 Terms and definitions
- 1.4 Abbreviations
- 2 Description
- 2.1 General description
- 2.2 Specific terminology (contains reference to 1.3)
- 2.3 Qualifications on the applicability to telecommunication services

- 2.4 State definitions
- 3 Operational requirements
  - 3.1 Provision/withdrawal
  - 3.2 Requirements on the originating network side
  - 3.3 Requirements in the network
  - 3.4 Requirements on the terminating network side
- 4 Coding requirements
- 5 Signalling requirements
  - 5.1 Activation/deactivation/registration
  - 5.2 Invocation and operation
    - 5.2.1 Actions at the originating local exchange
      - 5.2.1.1 Normal operation
      - 5.2.1.2 Exceptional procedures
    - 5.2.2 Actions at the transit exchange
      - 5.2.2.1 Normal operation
      - 5.2.2.2 Exceptional procedures
    - 5.2.3 Actions at the outgoing international gateway exchange
      - 5.2.3.1 Normal operation
      - 5.2.3.2 Exceptional procedures
    - 5.2.4 Actions at the incoming international gateway exchange
      - 5.2.4.1 Normal operation
      - 5.2.4.2 Exceptional procedures
    - 5.2.5 Actions at the destination local exchange
      - 5.2.5.1 Normal operation
      - 5.2.5.2 Exceptional procedures
- 6 Interaction with other supplementary services
  - 6.1 Call Waiting (CW)
  - 6.2 Call transfer services
  - 6.3 Connected Line Identification Presentation (COLP)
  - 6.4 Connected Line Identification Restriction (COLR)
  - 6.5 Calling Line Identification Presentation (CLIP)
  - 6.6 Calling Line Identification Restriction (CLIR)
  - 6.7 Closed User Group (CUG)
  - 6.8 Conference Calling (CONF)
  - 6.9 Direct-Dialling-In (DDI)
  - 6.10 Call Diversion Services (CDIV)
    - 6.10.1 Call Forwarding Busy (CFB)
    - 6.10.2 Call Forwarding No Reply (CFNR)
    - 6.10.3 Call Forwarding Unconditional (CFU)
    - 6.10.4 Call Deflection (CD)
  - 6.11 Line Hunting (LH)

6.12	Three-Party Service (3PTY)
6.13	User-to-User Signalling (UUS)
6.13.1	User-to-User Signalling, service 1 (UUS1)
6.13.2	User-to-User Signalling, service 2 (UUS2)
6.13.3	User-to-User Signalling, service 3 (UUS3)
6.14	Multiple Subscriber Number (MSN)
6.15	Call Hold (HOLD)
6.16	Advice of Charge (AOC)
6.17	Sub-addressing (SUB)
6.18	Terminal Portability (TP)
6.19	Completion of Calls to Busy Subscribers (CCBS)
6.20	Malicious Call Identification (MCID)
6.21	Reverse charging (REV) (for national use)
6.22	Multi-Level Precedence and Preemption (MLPP)
6.23	Private Numbering Plan (PNP) (for further study)
6.24	International Telecommunication Charge Card (ITCC)
6.25	Global Virtual Network Services (GVNS)
6.26	Completion of Calls on No Reply
7	Interaction with other networks
8	Signalling flows
9	Parameter values (timers)
10	Dynamic description

## 11 List of supplementary services

The following set of supplementary services is currently identified and more may be identified in the future:

### Recommendation Q.731 – Number identification supplementary services

Q.731.1	Direct-Dialling-In (DDI)
Q.731.2	Reserved for Multiple Subscriber Number (MSN)
Q.731.3	Calling Line Identification Presentation (CLIP)
Q.731.4	Calling Line Identification Restriction (CLIR)
Q.731.5	Connected Line Identification Presentation (COLP)
Q.731.6	Connected Line Identification Restriction (COLR)
Q.731.7	Malicious Call Identification (MCID)
Q.731.8	Sub-addressing (SUB)

### Recommendation Q.732 – Call offering supplementary services

Q.732.1	Reserved for Call Transfer (CT)
Q.732.2-5	Call Diversion Services
Q.732.2	Call Forwarding Busy (CFB)

- Q.732.3 Call Forwarding No Reply (CFNR)
- Q.732.4 Call Forwarding Unconditional (CFU)
- Q.732.5 Call Deflection (CD)
- Q.732.6 Reserved for Line Hunting (LH)
- Q.732.7 Explicit Call Transfer (ECT)
- Q.732.8 Reserved for Single Step Call Transfer (SCT)

**Recommendation Q.733 – Call completion supplementary services**

- Q.733.1 Call Waiting (CW)
- Q.733.2 Call Hold (HOLD)
- Q.733.3 Completion of Calls to Busy Subscribers (CCBS)
- Q.733.4 Terminal Portability (TP)

**Recommendation Q.734 – Multiparty supplementary services**

- Q.734.1 Conference Calling (CONF)
- Q.734.2 Three-Party Service (3PTY)

**Recommendation Q.735 – Community of interest supplementary services**

- Q.735.1 Closed User Group (CUG)
- Q.735.2 Reserved for Private Numbering Plan (PNP)
- Q.735.3 Multi-Level Precedence and Preemption (MLPP)
- Q.735.4 Reserved
- Q.735.5 Reserved
- Q.735.6 Global Virtual Network Services (GVNS)

**Recommendation Q.736 – Charging supplementary services**

- Q.736.1 International Telecommunication Charge Card (ITCC)
- Q.736.2 Reserved for Advice of Charge (AOC)
- Q.736.3 Reverse Charge (REV)

**Recommendation Q.737 – Additional information transfer supplementary service**

- Q.737.1 User-to-User Signalling (UUS)

**12 Association of supplementary services to bearer services and teleservices**

See clause 3/I.250.

**13 Definition of supplementary services**

See clause 4/I.250.

## APPENDIX I

### **Contents of the interface elements between the ISDN user part and the SCCP**

These interface elements are defined in SCCP Recommendations (Q.711 to Q.716) and are included here for information.

#### **I.1 Contents of the REQUEST type 1**

The REQUEST type 1 interface element may contain the following parameters:

- connection identification (for further study);
- receipt confirmation selection;
- expedited data selection;
- quality of service parameter set.

#### **I.2 Contents of the REQUEST type 2**

The REQUEST type 2 interface element may contain the following parameters:

- network indicator (for further study);
- protocol class;
- credit;
- connection identification (for further study);
- source local reference;
- originating signalling point code;
- reply request;
- refusal indicator.

#### **I.3 Contents of the REPLY**

The REPLY interface element may contain the following parameters:

- source local reference;
- protocol class;
- credit;
- connection identification (for further study).



## ITU-T RECOMMENDATIONS SERIES

Series A	Organization of the work of the ITU-T
Series B	Means of expression: definitions, symbols, classification
Series C	General telecommunication statistics
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
Series M	TMN and network maintenance: international transmission systems, telephone circuits, telegraphy, facsimile and leased circuits
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Telephone transmission quality, telephone installations, local line networks
<b>Series Q</b>	<b>Switching and signalling</b>
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks and open system communications
Series Y	Global information infrastructure
Series Z	Languages and general software aspects for telecommunication systems

**\*17815\***