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SERIES Q: SWITCHING AND SIGNALLING

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

Bearer Independent Call Control protocol (Capability Set 2): Generic signalling procedures for the support of the ISDN user part supplementary services and for bearer redirection

ITU-T Recommendation Q.1902.6

ITU-T Q-SERIES RECOMMENDATIONS

SWITCHING AND SIGNALLING

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

ITU-T Recommendation Q.1902.6

Bearer Independent Call Control protocol (Capability Set 2): Generic signalling procedures for the support of the ISDN user part supplementary services and for bearer redirection

Summary

This Recommendation specifies the generic signalling procedures and support of the Signalling System No. 7 ISDN User Part (ISUP) supplementary services by the Bearer Independent Call Control (BICC) protocol. The details for the support of the ISUP supplementary services by BICC are described as delta documentation against the ITU-T Q.73x-series Recommendations. In addition, BICC CS-2 procedures for bearer redirection are introduced to optimize the bearer path.

FOREWORD

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

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

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

NOTE

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

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

CONTENTS

ITU-T Recommendation Q.1902.6

Bearer Independent Call Control protocol (Capability Set 2): Generic signalling procedures for the support of the ISDN user part supplementary services and for bearer redirection

1   Scope

This Recommendation specifies details about the procedures for the generic signalling procedures and support of the Signalling System No. 7 ISDN User Part (ISUP) supplementary services by the Bearer Independent Call Control (BICC) protocol.

For the generic signalling procedures, services and functions supported by the BICC protocol (as listed in Table 2/Q.1902.1 [4]) and already supported by the ISUP protocol, the BICC protocol is fully transparent, i.e. the BICC protocol is fully compatible with the ISUP protocol. These generic signalling procedures, services and functions as supported by the ISUP protocol are specified in the ITU-T Q.73x-series Recommendations [1].

The details for the support of the ISUP supplementary services by the BICC protocol are described as delta documentation against the ITU-T Q.73x-series Recommendations. [1]. All references in the ITU-T Q.73x-series to the basic call procedures in ITU-T Q.761-Q.764 [2] and Q.767 [3] shall be read as references to the equivalent procedures of the BICC protocol in ITU-T Q.1902.x-family [4].

In addition, BICC CS-2 procedures for bearer redirection are introduced to optimize the bearer path. These procedures are described in clause 6.

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; 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 Q.73x-series (2000), *ISDN User Part supplementary services generic procedures and clauses with procedures for the individual supplementary services.*

[2]   ITU-T Q.761 to Q.764 (2000), *Specifications of Signalling System No. 7 ISDN User Part (ISUP).*

[3]   ITU-T Q.767 (1991), *Application of the ISDN User Part of CCITT Signalling System No. 7 for international ISDN interconnections.*

[4]   ITU-T Q.1902.1 to Q.1902.4 (2001), *Specifications of the Bearer Independent Call Control Protocol (BICC).*

[5]   ITU-T Q.2150.0 (2001), *Generic Signalling Transport Service.*

[6]   ITU-T Q.2150.1 (2001), *Signalling Transport Convertor on MTP3 and MTP3b.*

[7]   ITU-T Q.765.5 (2000) and its Amendment (2001) for BICC CS-2, *Application Transport Mechanism: Bearer Independent Call Control (BICC).*

3 Definitions

For BICC specific terminology, the reader is referred to ITU-T Q.1902.1 [4].

BC-Anchor node: see 6.2.

CC-Anchor node: see 6.2.

Redirecting-from node: see 6.2.

Redirecting-to node: see 6.2.

4 Abbreviations

This Recommendation uses the following abbreviations:

3PTY   Three-Party Service

ACM   Address Complete Message

APM   Application Transport Message

APP   Application Transport Parameter

ASE   Application Service Element

BAT   Bearer Association Transport

BCF   Bearer Control Function

BICC   Bearer Independent Call Control

BIWF   Bearer InterWorking Function

CCBS   Completion of Calls to Busy Subscriber

CCNR   Completion of Calls on No Reply

CD   Call Deflection

CFB   Call Forwarding Busy

CFNR   Call Forwarding No Reply

CFU   Call Forwarding Unconditional

CMN   Call Mediation Node

CON   Connect message

CONF   Conference Calling

CSF   Call Service Function

CUG   Closed User Group

ECT   Explicit Call Transfer

GSN   Gateway Serving Node

IAM   Initial Address Message

ISDN   Integrated Services Digital Network

ISN   Intermediate Serving Node

ISUP   ISDN User Part

ITCC   International Telecommunication Charge Card

PCI   Protocol Control Indicator

REL   Release message

RLC   Release Complete message

ROSE   Remote Operations

SCCP   Signalling Connection Control Part

SN   Serving Node

TC   Transaction Capabilities

TSN   Transit Serving Node

5   Delta documentation against ITU-T Q.73x-series Recommendations

This clause includes exceptions and additions against the ITU-T Q.73x-series [1] for the generic procedures and clauses with procedures for the individual supplementary services.

5.1   Delta Q.730 – Generic procedures

NOTE – The numbering in this clause refers to the clause numbering in ITU-T Q.730 [1].

0   Introduction

0.1   Scope

For information.

0.2   References

For information.

0.3   Terms and definitions

For information.

0.4   Abbreviations

For information.

1   General

Applicable.

1.1   Exceeding the maximum message length

Applicable. The maximum message length support by BICC depends on the capabilities of the signalling transport network. For further see details ITU-T Q.2150.0 [5].

1.2   Network specific facilities (national use)

Applicable.

1.2.1   Sending unsolicited information (national use)

Applicable.

1.3   Generic procedures

1.3.1   Service activation

Applicable.

1.3.2   General digit transfer (national use)

Applicable.

1.3.3 Remote Operations service (ROSE) capability (national use)

Applicable.

1.3.4 Generic notification procedure

Applicable.

1.3.5 Generic number transfer

Applicable.

1.3.6 Pivot Routing

Applicable.

These procedures only apply to signalling relations between ISN/TSN/GSN type of nodes, i.e. both call and bearer need to be controlled in order to have both the call and the bearer rerouted. With BICC the additional bearer redirection procedure may be supported for bearer optimization, see clause 6. These procedures use SS No. 7 signalling point code relations because the pivot routing procedures are based on SS No. 7 signalling point codes. For further details of the signalling transport network capabilities, see ITU-T Q.2150.1 [6].

With regard to the Global Call Reference procedure (see 8.18/Q.1902.4 [4]) the Global Call Reference shall be reused by the SN performing the pivot routing as received with the incoming call.

1.3.7 Redirection (national use)

Applicable.

These procedures only apply to signalling relations between ISN/TSN/GSN type of nodes, i.e. both call and bearer need to be controlled in order to have both the call and the bearer rerouted. With BICC the additional bearer redirection procedure may be supported for bearer optimization, see clause 6. These procedures use SS No. 7 signalling point code relations because the redirection procedures are based on SS No. 7 signalling point codes. For further details of the signalling transport network capabilities, see ITU-T Q.2150.1 [6].

With regard to the Global Call Reference procedure (see 8.18/Q.1902.4 [4]) the Global Call Reference shall be reused by the SN performing the redirection as received with the incoming call.

1.3.8 Relay methods for non-circuit related signalling

Applicable.

NOTE – For further information the reader is referred to ITU-T Q-series Supplement 38 (TRQ.2600) for further details about the signalling transport options for TC-based services.

1.4 End-to-end signalling

With BICC, this part of ITU-T Q.730 documentation is not supported any further, including the non-support of the associated definitions and codings in ITU-T Q.1902.2 and Q.1902.3 [4].

1.5 Layout of service Recommendations

For information.

1.6 List of supplementary services

See 5.2 through 5.8.

1.7 Association of supplementary services to bearer services and teleservices

For information.

1.8   Definition of supplementary services

For information.

Appendix I – Contents of the interface elements between ISUP and SCCP

Not supported.

5.2   Delta Q.731 – Number Identification supplementary services

Applicable.

5.3   Delta Q.732 – Call Offering supplementary services

Applicable. Since the execution of these supplementary services involve the bearer, these services need the control of both the call and the bearer in ISN/TSN/GSN type of nodes.

5.3.1   Handling of Hop Counter with the Call Diversion supplementary 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)

For BICC the following handling of the Hop Counter (see 8.9/Q.1902.4 [4]) applies with regard to the Call Diversion supplementary services. A call forwarding SN receiving a Release message with cause #25 "Exchange routing error", shall notify the management system of the routing error and provide the called party number, identity of the succeeding CSF, and the forwarding number. Cause value #31 "normal unspecified", shall be returned to the preceding CSF.

NOTE – The method of identifying the succeeding/preceding CSF is for further study.

5.3.2   Handling of Global Call Reference with the Explicit Call Transfer supplementary services

–   Q.732.7 Explicit Call Transfer (ECT).

With regard to the Global Call Reference procedure (see 8.18/Q.1902.4 [4]) the Global Call Reference associated with the call on the transferred leg is for further study.

5.4   Delta Q.733 – Call Completion supplementary services

Applicable. Since the execution of these supplementary services involve the bearer, these services need the control of both the call and the bearer in ISN/TSN/GSN type of nodes.

5.4.1   TC-based signalling transport with the Call Completion supplementary services

–   Q.733.3 Completion of Calls to Busy Subscriber (CCBS)

–   Q.733.5 Completion of Calls on No Reply (CCNR)

NOTE – For further information the reader is referred to ITU-T Q-series Supplement 38 (TRQ.2600) for further details about the signalling transport options for TC-based services.

5.5   Delta Q.734 – Multiparty supplementary services

Applicable. As for the execution of these supplementary services the bearer is involved, these services need the control of both the call and the bearer in ISN/TSN/GSN type of nodes.

5.5.1 Handling of Global Call Reference with the Multiparty supplementary services

– Q.734.1 Conference Calling (CONF)

– Q.734.2 Three-Party Service (3PTY)

With regard to the Global Call Reference procedure (see 8.18/Q.1902.4 [4]) the Global Call Reference associated with the calls on the multiparty legs is for further study.

5.6 Delta Q.735 – Community of Interest supplementary services

Applicable.

5.6.1 TC-based signalling transport with the Community of Interest supplementary services

– Q.735.1 Closed User Group (CUG) with centralized administration of CUG data

NOTE – For further information the reader is referred to ITU-T Q-series Supplement 38 (TRQ.2600) for further details about the signalling transport options for TC-based services.

5.7 Delta Q.736 – Charging supplementary services

Applicable.

5.7.1 TC-based signalling transport with the Charging supplementary services

– Q.736.1 International Telecommunication Charge Card (ITCC)

NOTE – For further information the reader is referred to ITU-T Q-series Supplement 38 (TRQ.2600) for further details about the signalling transport options for TC-based services.

5.8 Delta Q.737 – Additional Information Transfer supplementary services

Applicable.

6 Bearer Redirection

6.1 Introduction

Bearer redirection is a generic mechanism for optimizing the bearer path when an endpoint of a call changes due to the operation of an application layer service.

For example, in the case of the ISDN supplementary service Call Forwarding No Reply (CFNR), a call and bearer connection is initially made to the Served User, and subsequently a new connection is made to the Forwarded-To User. By default, the new connection would be made from the Served User's SN to the Forwarded-To user's SN, placing a requirement on the Served User's SN to tandem the bearer connection.

Bearer redirection provides the capability for the new bearer connection to be made directly from the Calling User's SN to the Forwarded-To User's SN whilst the call control path is tandemed through the Served User's SN. This is assuming there is bearer connectivity directly between these SNs i.e. that they are part of the same network. Otherwise the mechanism is limited to operation between SNs in a single network.

6.2 Interaction with services invoking bearer redirection

The bearer redirection procedure itself is not responsible for addition or removal of call legs between the nodes. However, call legs may be added or removed by the service which is invoking bearer redirection (e.g. when Call Forwarding adds a new call leg to the Forwarding-To node). The service

then makes use of bearer redirection to optimize the bearer. Hence the description of bearer redirection must take account of the addition/removal of call legs by the service.

Bearer redirection is therefore modelled using four types of node, each of which provides a particular piece of functionality required for performing bearer redirection. The four node types are as follows:

CC-Anchor node: The SN or CMN at which the service invoking bearer redirection is operating. This node serves as an anchor point for the call control during the bearer redirection procedure. A CC-Anchor node remains in the call path for the duration of the call. How the CC-Anchor node determines that bearer redirection is required is beyond the scope of this Recommendation.

BC-Anchor node: The SN which serves as an anchor point for the bearer control during the bearer redirection procedure. Both old and new bearer connections terminate at the BC-Anchor node.

Redirecting-from node: The SN to which the call and bearer are initially connected, before redirection.

Redirecting-to node: The SN to which the call and bearer are subsequently connected, after the redirection.

The node types are functional entities and some may be combined together in a physical node in different ways, depending on the requirements of the service. For example, if the service does not require the removal of any call leg, but does require the addition of a new call leg, then the CC-Anchor node and Redirecting-from node will be combined. This is illustrated in Figure 1, and is the configuration which would operate, for example, in the case of Call Forwarding.
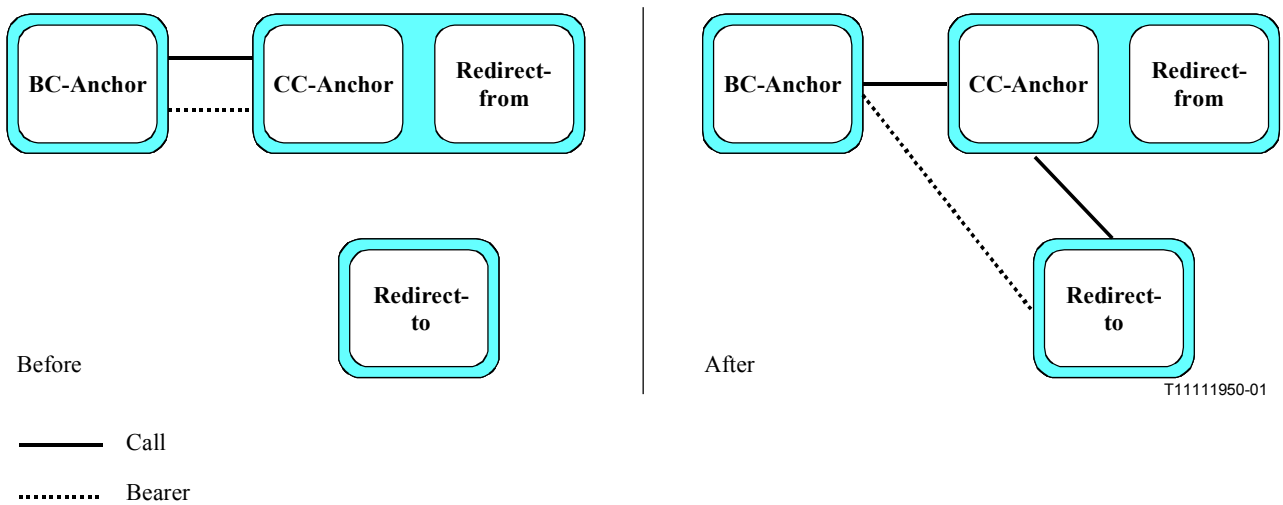

Figure 1/Q.1902.6 – CC-Anchor and Redirecting-from nodes combined

Conversely, if the service requires a call leg to be removed, without the creation of a new call leg, the CC-Anchor node and Redirecting-to node are combined. This is shown in Figure 2.
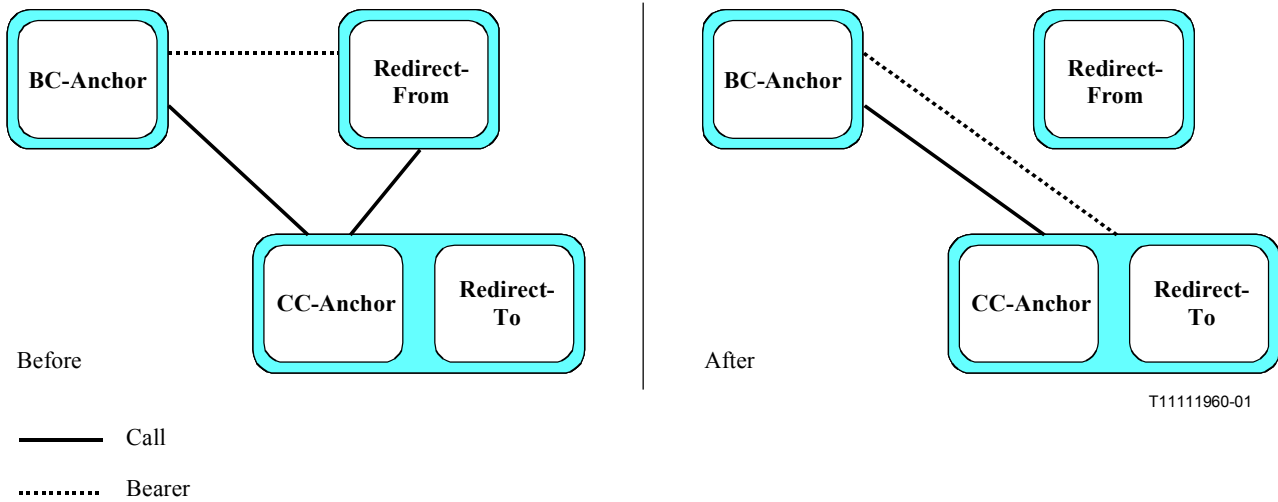
Figure 2/Q.1902.6 – CC-Anchor and Redirecting-to nodes combined

The procedures here describe the most general case where all of the functional entities are located in separate physical nodes. By modelling the bearer redirection in this way a completely generic mechanism is obtained which meets a range of possible service scenarios.

When functional entities are combined, the links between them are not externally visible. From a protocol point of view this simply means that the signalling which would have taken place between such entities is internalized in the physical node.

6.3 Cut-through of new bearer connection

Two possibilities are provided for the cut-through of the new bearer connection at the BC-Anchor node:

• Immediate Cut-Through.

• Late Cut-Through.

In the case of Immediate Cut-Through, the new bearer connection is cut-through immediately it is established, according to the procedures for standard bearer set-up.

In the case of Late Cut-Through, cut-through of the new bearer connection is under control of the CC_Anchor node which sends an explicit cut-through request to the BC-Anchor to trigger cut-through.

6.4 Use of BAT ASE

Bearer redirection makes use of the services of the BAT ASE described in ITU-T Q.765.5 to transport bearer redirection related information between the nodes. The services of the BAT ASE are accessed by means of primitives (such as "BICC_data") which are defined in ITU-T Q.765.5 [7].

6.5   Procedures

6.5.1   Indication of Bearer Redirection Capability

An SN that supports the Bearer Control Anchor node capabilities shall indicate this within the IAM and first backwards Call Control message (ACM or CON) of the original call by including the Bearer Redirection Capability Information element within the BAT APP within those messages.

In the case of ISNs and GSNs, this indication may be included only if the node itself supports the Bearer Redirection procedures for a BC-Anchor node. In the case of TSNs it may additionally be included if received from the preceding or succeeding node and if the procedures of 6.5.2.3 are supported. (A CMN has no Bearer Interworking Function and so cannot perform the Bearer Control Anchor function.)

If the Late Cut-Through option is supported, the Late Cut-Through Indicator shall be set to "*Late Cut-Through Supported*", otherwise it shall be set to "*Late Cut-Through Not Supported*".

The compatibility information of the Bearer Redirection Capability shall be set so as to cause the information element to be discarded by nodes that do not support Bearer Redirection.

6.5.2   Bearer redirection takes place in the same direction as the call

6.5.2.1   Actions at a CC-Anchor node

An invoking application at the CC-Anchor node may determine a new endpoint for the call at any time (either before or after ACM). If the Bearer Redirection Capability Information element has been received from the preceding node, the application may then invoke bearer redirection. How an application determines whether it is to be the CC-Anchor node for the call, or whether bearer redirection is required, is beyond the scope of this Recommendation.

The invoking application is responsible for storing any relevant IAM information required for the service. This information may be released when no further bearer redirections are required to be invoked by the application.

Bearer redirection is invoked at the CC-Anchor node which signals invocation to the BC-Anchor node. The new bearer will be established between this BC-Anchor and the Redirecting-to node.

Bearer redirection involves the moving of one bearer endpoint from one destination to another. At any one time, however, only one of these destinations is considered to be the real bearer endpoint for the call. The CC-Anchor node controls the cut-over point, that is the point in time at which the bearer endpoint changes from the initial destination to the final destination.

6.5.2.1.1   Negotiation of bearer redirection capabilities

When the CC-Anchor node has decided to invoke bearer redirection, an APM is sent to the preceding node with the action indicator in the BICC_Data request primitive set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*Redirect Backwards Request*" or "*Redirect Forwards Request*" as appropriate depending on the capability of the Redirecting-to node, i.e. the CC-Anchor node determines whether the Forward or Backward procedures are to be used towards the Redirecting-to node in a way similar to how a node initiating a new call determines whether the Forwards or Backwards procedure should be used towards that node. The Bearer Redirection Indicators are also included in the BICC_Data request primitive.

If Late Cut-Through is desired and the Late Cut-Through indicator received in the Bearer Redirection Capability Information Element in the IAM was set to "*Late Cut-Through Supported*", then a Bearer Redirection Indicator "*Late Cut-Through Requested*" shall be included.

On receipt of a BICC_Data indication primitive (corresponding to an APM received from the preceding node (BC-Anchor)) with action indicator set to "*Connect Backward*" or "*Connect Forward*", CC-Anchor node the procedures of 6.5.2.1.2 followed by 6.5.2.1.3 apply.

6.5.2.1.2 Set-up of new call leg and bearer connection

To initiate set-up of the new call leg and bearer connection the service at the CC-Anchor node uses the stored IAM information to construct an IAM to be sent to the Redirecting-to node. The APP with Application Context Identifier "BAT ASE" included in the IAM shall only include the information elements from the APP received by the CC-Anchor node in 6.5.2.1.1.

The CC-Anchor node subsequently behaves as follows:

- BAT ASE information received from the Redirecting-from node is passed on to the BC-Anchor according to standard CMN procedures.

- BAT ASE information received from the Redirecting-to node is passed on to the BC-Anchor according to standard CMN procedures but with a Bearer Redirection Indicator "*new connection identifier*" included.

- BAT ASE information received from the BC-Anchor node containing a Bearer Redirection Indicator "*new connection identifier*" is passed on to the Redirecting-to node according to standard CMN procedures but with the Bearer Redirection Indicator "*new connection identifier*" removed.

- BAT ASE information received from the BC-Anchor node not containing a Bearer Redirection Indicator "*new connection identifier*" is passed on to the Redirecting-from node according to standard CMN procedures.

The behaviour of the CC-Anchor node with respect to other messages/information depends on the application invoking Bearer redirection.

The CC-Anchor node waits for a BICC_Data indication primitive (corresponding to an APM) with Action Indicator set to "*Connected*" or with Action Indicator set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*redirect bearer connected*" to be received from the BC-Anchor node. In the former case, this indication is passed onwards to the Redirecting-to node.

In the case of Late Cut-Through, when Cut-through of the new connection is required, the CC-Anchor node shall send a BICC_Data request primitive (in association with any suitable message) with Action indicator set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*redirect cut-through request*" towards the BC-Anchor node.

The new bearer set-up procedure is now complete.

6.5.2.1.3 Release of old call leg and bearer connection

When the controlling application requires the release of the old call leg and bearer to the Redirecting-from node, the CC-Anchor node sends an APM to the preceding node with the action indicator in the BICC_Data request primitive set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*redirect bearer release request*".

On receipt of an APM from the preceding node with the action indicator in the BICC_Data indication primitive set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*redirect bearer release proceed*", a REL message is sent to the Redirecting-from node as per the normal release procedures. The release cause value is determined by the application. The CC-Anchor node awaits receipt of the RLC from the Redirecting-from node.

On receipt of the RLC from the Redirecting-from node, an APM is sent to the preceding node with the action indicator in the BICC_Data request primitive set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*redirect bearer release complete*".

6.5.2.2   Actions at a BC-Anchor

6.5.2.2.1   Negotiation of bearer redirection capabilities

On receipt of a BICC_Data indication primitive (corresponding to an APM received from the succeeding node) with action indicator set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*redirect forwards request*" or "*redirect backwards request*", the node determines whether it will perform the BC-Anchor node functions, or, in the case that Bearer Redirection Capabilities Information Element was received from the preceding node, whether the request will be sent to the preceding node. How this determination is made is beyond the scope of this Recommendation.

In the case that the BC-Anchor node functions are to be performed, the normal BICC outgoing set-up procedures for outgoing bearer set-up (clause 7/Q.1902.4) are followed with the following exceptions:

1)   The BC-Anchor node selects the BIWF which is already associated with the call.

2)   An IAM is not sent. Instead an APM is sent to the succeeding node containing the BAT ASE information that would have been sent in the IAM, other IAM parameters are not included.

6.5.2.2.2   Set-up of new bearer connection

6.5.2.2.2.1   Handling of APP parameters

Subsequent to the procedures of 6.5.2.2.1, receipt of any message containing an APP parameter with Application Context Identifier "BAT ASE" shall be handled as follows:

•   messages containing Bearer Redirection Indicator "*new connection identifier*" shall be handled by the normal BICC outgoing call set-up procedures with respect to the new connection;

•   messages not containing Bearer Redirection Indicator "*new connection identifier*" shall be handled by the procedures for existing bearers with respect to the old connection.

Where it is required to send an APP parameter relating to the old connection, this shall be sent as for the non-bearer redirection case.

Where it is required to send an APP parameter relating to the new connection, a Bearer Redirection Indicator "*New connection identifier*" shall also be included.

6.5.2.2.2.2   Confirmation and Cut-Through of the new bearer connection

If the Bearer Redirection Indicators information element received with the bearer redirection request indication in 6.5.2.2.1 above did not include "*late cut-through requested*", then the newly established bearer connection is cut-through immediately it is established, according to the normal connection set-up procedures.

On completion of the outgoing set-up procedure then except in the case of Forward Set-up with Connect Type set to "*Forwards Notify*", the BC-Anchor node shall send a BICC_Data request primitive with Action Indicator set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*redirect bearer connected*" to the CC-Anchor node.

In the case of Forward set-up with Connect Type set to "*Forwards Notify*" the BC-Anchor node shall behave as described in the normal Forwards set-up procedures.

If the Bearer Redirection Indicators information element received with the bearer redirection Request indication in 6.5.2.2.1 above indicated "*late cut-through requested*", then, on receipt of a BICC_Data indication primitive (corresponding to any message) with action indicator set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*redirect cut-through request*", the BC-Anchor node cuts through the new bearer connection.

6.5.2.2.3 Release of old bearer connection

On receipt of an APM from the succeeding node with the action indicator in the BICC_Data indication primitive set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*redirect release request*" the BC-Anchor requests the BCF to disconnect the internal through-connection of the old bearer path connection between the BC-Anchor and the Redirecting-from node. A normal cause value is passed from the CSF to the BCF.

At the same time as the start of the release of the switched path, the BC-Anchor sends an APM to the succeeding node with the action indicator in the BICC_Data request primitive set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*redirect release proceed*".

The BC-Anchor awaits receipt of an APM from the succeeding node with the action indicator in the BICC_Data indication primitive set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*redirect release complete*". On receipt of this indication, the BC-Anchor instructs the BCF to release remaining resources associated with the old bearer connection.

6.5.2.3 Actions at an intermediate node which is not a BC-Anchor or CC-Anchor node

An intermediate node that is not a BC-Anchor or a CC-Anchor node shall pass on unchanged all received indications related to bearer redirection.

In the case that the Bearer Redirection Capability information element was sent to the succeeding node at call set-up, then on receipt of a BICC_Data indication from the preceding node with Action Indicator set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*redirect release proceed*", the node shall note that Bearer Release should be expected. Subsequent to receipt of this Bearer Release, the node shall behave according to the CMN procedures.

NOTE – In the case that the Bearer Redirection Capability information element was not sent to the succeeding node at call set-up, then this scenario will not occur, since the succeeding node will not invoke Bearer Redirection.

6.5.2.4 Actions at a Redirecting-to node

A Redirecting-to node shall follow the normal call set-up procedures described in ITU-T Q.1902.4 [4].

6.5.2.5 Actions at a Redirecting-from node

A Redirecting-from node shall follow the normal call set-up procedures described in ITU-T Q.1902.4 [4].

6.5.3 Redirection takes place in the opposite direction to the original call set-up

The procedures in 6.5.2 apply with the word "preceding" replaced by "succeeding" and vice versa.

6.5.4 Special Cases

6.5.4.1 Handling of multiple bearer redirection requests

The following procedures ensure that multiple bearer redirection requests sent along the same call leg are handled in series rather than in parallel.

A CC-Anchor node may not initiate more than one bearer redirection procedure at a time for a given call.

A CC-Anchor node that receives a bearer redirection request from the succeeding node while waiting for the response to a bearer redirection request sent to the preceding node shall return to the succeeding node a BICC-Data indication primitive (corresponding to an APM) with the Action Indicator set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*redirect temporary reject*".

A CC-Anchor node that receives a bearer redirection request from the preceding node while waiting for the response to a bearer redirection request sent to the succeeding node shall return to the preceding node a BICC-Data indication primitive (corresponding to an APM) with the Action Indicator set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*redirect temporary reject*".

A CC-Anchor node that receives a bearer redirection request from the preceding node while waiting for the response to a bearer redirection request sent to the preceding node shall return to the preceding node a BICC-Data indication primitive (corresponding to an APM) with the Action Indicator set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*bearer redirect temporary reject*".

A node that receives a bearer redirection request from the succeeding node while waiting for the response to a bearer redirection request sent to the succeeding node shall act on the received bearer redirection request received according to 6.5.2.2.

6.5.4.2 Temporary Reject

If the request for Bearer Redirection cannot be honoured by the BC-Anchor node, it shall send to the CC-Anchor node a BICC-Data indication primitive (corresponding to an APM) with the Action Indicator set to "*bearer redirect*" and including a Bearer Redirection Indicator "*redirect temporary reject*".

A "*redirect temporary reject*" indication received by an intermediate node shall be passed on unmodified.

If the indication is received by the CC-Anchor node originating the request then the invoking application shall take appropriate action (which could involve requesting bearer redirection again after a suitable period of time).

6.5.4.3 Bearer redirection abandoned by CC-Anchor node

Prior to the procedures of 6.5.2.1.3, the service at the CC-Anchor node may determine that the bearer redirection be abandoned, returning to the old bearer.

6.5.4.3.1 Actions at the CC-Anchor node

When the service at the CC-Anchor node determines that the bearer redirection should be abandoned, the procedures of 6.5.2.1.3 are followed except that the Bearer Redirection Indicator "*new connection identifier*" is included in each APM sent by the CC-Anchor node to the BC-Anchor.

6.5.4.3.2 Actions at the BC-Anchor node

On receipt of an APM from the succeeding node with the action indicator in the BICC_Data indication primitive set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*Redirect Release Request*" and including Bearer Redirection Indicator "*new connection identifier*", the procedures of 6.5.2.2.3 are followed with respect to the new bearer.

The Bearer Redirection Indicator "*new connection identifier*" is included in each APM sent by the BC-Anchor to the CC-Anchor node.

6.5.4.4 Bearer redirection failure at BC-Anchor Node

6.5.4.4.1 Actions at the BC-Anchor node

Subsequent to the procedures of 6.5.2.2.1, if the new connection cannot be established at the BC-Anchor node, a BICC_Data request shall be sent to the CC-Anchor node with Action Indicator set to "*Bearer Redirect*" and including Bearer Redirection Indicator "*Redirect Failure*".

6.5.4.4.2 Actions at the CC-Anchor node

On receipt of a BICC_Data indication (corresponding to an APM) from the BC-Anchor node containing a Bearer Redirection Indicator "*Redirect Failure*", the call leg towards the Redirecting-to node shall be released according to the standard call release procedures in ITU-T Q.1902.4 [4].

Further action (e.g. re-attempt of bearer redirection) may be taken according to the service at the CC-Anchor node.

6.5.4.5 Unexpected Bearer Redirection Request

If a node receives a Bearer Redirection Request which is unexpected (e.g. because the Bearer Redirection Capabilities Information Element was not included in the BAT APP in the IAM) then this is handled according to the standard procedures for unexpected BAT ASE information described in ITU-T Q.1902.4 [4].

6.5.4.6 Unexpected New Connection Identifier

The Bearer Redirection Indication "*New Connection Identifier*" is only meaningful in the state where two bearer connections exist, or where one exists and the other is in the process of being set up. If this indication is received at other times, it shall be treated as unrecognized according to the procedures of ITU-T Q.1902.4 [4].

6.5.5 Interaction with Pivot Routing

Once bearer redirection has been invoked, Pivot Routing to redirect the call control to the same location may disconnect the call. Therefore, for any node that offers support of bearer redirection on a given call:

a)   if an offer of Pivot Routing is received from a previous SN, it shall be passed forward unchanged;

b)   if an invocation of Pivot Routing is received, it shall be passed unchanged and the SN shall not act on the invocation;

c)   an originating SN shall not make simultaneous offers of Pivot Routing and bearer redirection.

6.5.6 Interaction with Redirection (national use)

Once bearer redirection has been invoked, the use of Redirection to redirect the call control to the same location will temporarily interrupt the bearer path between the calling and called parties.

Bibliography

−   ITU-T Q-series Recommendations Supplement 38 (2001), *TRQ.2600: BICC signalling transport requirements – Capability Set 1*.

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