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SERIES Q: SWITCHING AND SIGNALLING

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

Interworking between Signalling System No. 7 ISDN user part and the Bearer Independent Call Control protocol

ITU-T Recommendation Q.1912.1

(Formerly CCITT Recommendation)

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ITU-T Recommendation Q.1912.1

Interworking between Signalling System No. 7 ISDN user part and the Bearer Independent Call Control protocol

Summary

This Recommendation defines the signalling interworking between the Bearer Independent Call Control (BICC) protocol and the ISDN User Part (ISUP) of Signalling System No. 7.

Source

ITU-T Recommendation Q.1912.1 was prepared by ITU-T Study Group 11 (2001-2004) and approved under the WTSA Resolution 1 procedure on 2 July 2001.

FOREWORD

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ITU-T Recommendation Q.1912.1

Interworking between Signalling System No. 7 ISDN user part and the Bearer Independent Call Control protocol

1 Scope

This Recommendation defines the signalling interworking between the Bearer Independent Call Control (BICC) protocol and the ISDN User Part (ISUP) of Signalling System No. 7.

BICC is the protocol defined in ITU-T Q.1902.1. It is the call control protocol used between "Serving Nodes" in a network that uses separate call and bearer control protocols. An Interface Serving Node (ISN) is a node that provides an interface to circuit switched networks.

ISUP is the protocol defined in ITU-T Q.761. It is the combined call and bearer control protocol used to support narrow-band ISDN services in a circuit switched network.

The interworking between BICC and ISUP takes place in the CSF at an ISN. The scope of this Recommendation is thus as shown in Figure 1.

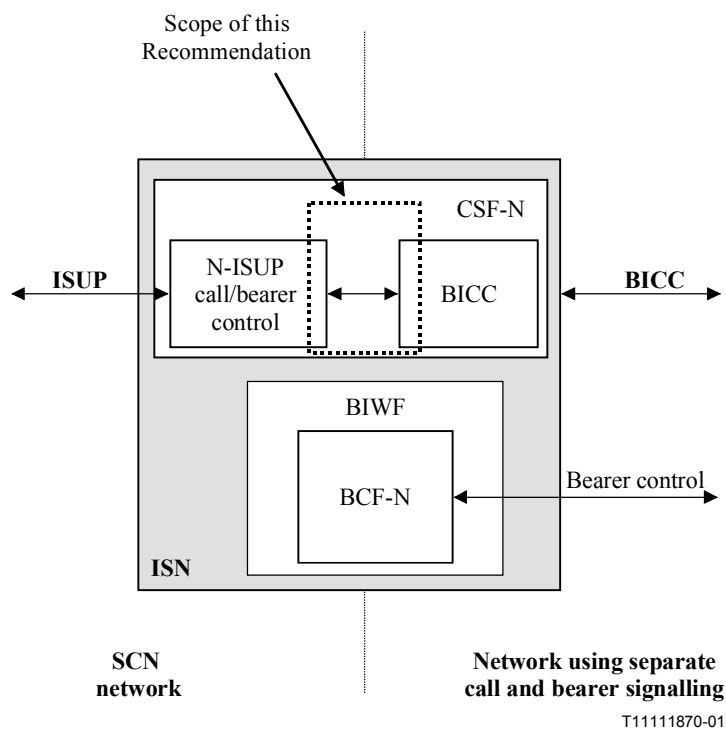


Figure 1/Q.1912.1 – Scope of this Recommendation

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.761 (1999), *Signalling System No. 7 – ISDN user part functional description*.
- [2] ITU-T Q.762 (1999), *Signalling System No. 7 – ISDN user part general functions of messages and signals*.
- [3] ITU-T Q.763 (1999), *Signalling System No. 7 – ISDN user part formats and codes*.
- [4] ITU-T Q.764 (1999), *Signalling System No. 7 – ISDN user part signalling procedures*.
- [5] ITU-T Q.730 (1999), *ISDN user part supplementary services*.
- [6] ITU-T Q.1902.1 (2001), *Bearer Independent Call Control protocol (BICC) (Capability set 2): Functional description*.
- [7] ITU-T Q.1902.2 (2001), *Bearer Independent Call Control protocol (BICC) (Capability set 2) and Signalling System No. 7 ISDN user part: General functions of messages and parameters*.
- [8] ITU-T Q.1902.3 (2001), *Bearer Independent Call Control protocol (BICC) (Capability set 2) and Signalling System No. 7 ISDN user part: Formats and codes*.
- [9] ITU-T Q.1902.4 (2001), *Bearer Independent Call Control protocol (BICC) (Capability set 2): Basic call procedures*.
- [10] ITU-T Q.767 (1991), *Application of the ISDN user part of CCITT Signalling System No. 7 for international ISDN interconnections*.

3 Definitions

For the BICC specific terminology, the reader is referred to ITU-T Q.1902.1 [6].

4 Abbreviations

This Recommendation uses the following abbreviations:

ACM	Address Complete Message
BCF	Bearer Control Function
BCF-N	Bearer Control Nodal Function
BICC	Bearer Independent Call Control
BIWF	Bearer InterWorking Function
COT	Continuity message
CPG	Call Progress message
CSF	Call Service Function
CSF-N	Call Service Nodal Function
IAM	Initial Address Message
ISDN	Integrated Services Digital Network
ISN	Interface Serving Node
ISUP	ISDN User Part
PSTN	Public Switched Telephone Network
REL	Release message
RLC	Release Complete message

SCN	Switched Circuit Network
SN	Serving Node

5 Conventions

1) The name of each element of the following classes of terms is capitalized:

- indicators;
- parameters;
- information elements;
- messages.

Examples: Called Party Number parameter, Initial Address message.

2) The definition of a parameter value is written in *italics* and is put between quotation marks.

Example: Nature of Address value 0000011 – "*national (significant) number*".

3) All message names are BICC messages unless explicitly stated otherwise.

Example: The "IAM message" is the IAM message in BICC, whereas an IAM message in ISUP is referred to as an "ISUP IAM message".

6 Interworking with ISUP at an ISN

6.1 General

The protocol at the ISUP interface shall be according to the ISUP Recommendations, see ITU-T Q.761 [1].

The protocol at the BICC interface shall be according to the BICC Recommendations, see ITU-T Q.1902.1 [6].

Transfer of signalling information between the two signalling interfaces shall be done as if the CSF was an ISUP intermediate exchange. Where the signalling information defined for ISUP and for BICC, are identical a one-to-one mapping is performed (unless explicitly specified to the contrary in this Recommendation).

BICC includes a Compatibility procedure in ITU-T Q.1902.4 [9] identical to the Compatibility procedure defined for ISUP in ITU-T Q.764 [4]. The CSF may act as a Type A or Type B exchange for the purposes of this Compatibility procedure.

The following subclauses detail the only exceptions to the above statements.

6.2 Incoming ISUP, outgoing BICC (Incoming ISN)

6.2.1 Successful basic call set-up

6.2.1.1 Forward address signalling

Incoming ISUP (as in 2.1/Q.764 [4]) and outgoing BICC (as in 7.2 and 7.3/Q.1902.4 [6]) procedures apply with the following exception:

When sending the IAM the Continuity indicator in the Nature of Connection Indicators parameter is set according to Q.764 [4] procedures. (Either "*COT to be expected*" or "*no COT to be expected*" can be sent.)

6.2.1.2 Continuity message

The incoming ISUP Continuity check procedures in ITU-T Q.764 [4] apply.

Clause 7.6.1/Q.1902.4 [6] is replaced by:

The Continuity message, with the Continuity Indicators parameter set to *"continuity"* is sent when an ISUP COT with the Continuity Indicators parameter set to *"continuity check successful"* is received from ISUP, according to ITU-T Q.764 [4] intermediate exchange procedures.

6.2.1.3 Through connection of the bearer path

The bearer path shall be connected in both directions when both of the following conditions are satisfied:

- the BICC Outgoing bearer set-up procedure (7.4/Q.1902.4 [6]) is successfully completed; and
- if the ISUP continuity check procedure is being performed, when conditions on the incoming circuit allow, see 2.1.8/Q.764 [4].

In addition, if BICC is performing the "Per-call bearer set-up in the forward direction" Outgoing bearer set-up procedure and the Connect Type is *"notification not required"*, the bearer path shall be connected in both directions when the Bearer Set-Up request is sent (and any ISUP continuity check is complete).

6.2.1.4 Connection type allowing fallback

6.2.1.4.1 Actions in the forward direction

6.2.1.4.1.1 Succeeding network does have the capability of performing fallback

The CSF will set up the call on a route according to the Transmission Medium Requirement parameter *"64 kbit/s unrestricted preferred"* whenever available.

If congestion on the route is encountered, and if there is no alternative route available supporting the connection type allowing fallback, fallback procedures will be initiated according to 6.2.1.4.1.2.

6.2.1.4.1.2 Succeeding network does not have the capability of performing fallback

In case there is no route available being capable of satisfying the connection type requirements of *"64 kbit/s unrestricted preferred"*, the CSF will continue the call, discard the User Service Information Prime parameter, maintain the User Service Information parameter, change the Transmission Medium Requirement parameter in accordance with the fallback connection type contained in the Transmission Medium Requirement Prime parameter and then discard the Transmission Medium Requirement Prime parameter.

6.2.1.4.2 Actions in the backward direction

6.2.1.4.2.1 Succeeding network does have the capability of performing fallback

The CSF will know that fallback has occurred by receiving the Transmission Medium Used parameter. This parameter indicates the fallback connection type.

Appropriate actions to modify network resources, e.g. μ -law/A-law conversion will be initiated.

If echo control is required on the connection, appropriate procedures will be initiated (see 2.7/Q.764 [4]).

6.2.1.4.2.2 Succeeding network does not have the capability of performing fallback

The CSF will include a Transmission Medium Used parameter (which has been set according to the fallback connection type indicated in the Transmission Medium Requirement Prime parameter) in the ACM or CPG indicating that fallback has occurred for this call.

Appropriate actions to modify network resources, e.g. μ -law/A-law conversion will be initiated.

If echo control is required on the connection, appropriate procedures will be initiated (see 2.7/Q.764 [4]).

6.2.2 Call release

On receipt of an ISUP REL from the preceding exchange, the CSF immediately requests the disconnection of the internal bearer path and invokes the BICC Release sending procedure (11.5/Q.1902.4 [6]) towards the succeeding CSF. When the ISUP circuit is re-selectable, an ISUP RLC is returned to the preceding exchange.

On receipt of a REL from the succeeding CSF, the CSF invokes the BICC Release reception procedure and sends an ISUP REL to the preceding exchange. Timers T1 and T5 are started to ensure that a RLC is received from the preceding exchange (expiration of timers T1 and T5 is covered in 2.9.6/Q.764 [4]).

6.3 Incoming BICC, outgoing ISUP (Outgoing ISN)

6.3.1 Successful call set-up

6.3.1.1 Forward address signalling

Incoming BICC (as in 7.2 and 7.3/Q.1902.4 [6]) and outgoing ISUP (as in 2.1/Q.764 [4]) procedures apply, with the following clarifications and exceptions with regards to when ISUP IAM and Continuity messages are to be sent:

Two cases are supported:

- 1) Sending an early ISUP IAM, using the continuity check protocol to withhold call completion until establishment of the bearer is complete.
- 2) Withholding the sending of the ISUP IAM until establishment of the bearer is complete.

For the early IAM case (where the subsequent network supports the continuity check protocol) the ISUP IAM is sent when the incoming procedure decides that the call can be routed. The Continuity Check indicator in the Nature of Connection Indicators parameter is set to indicate "*continuity check performed on previous circuit*", or "*continuity required on this circuit*" may alternatively be sent if the continuity check is to be performed.

The Continuity message, with the Continuity Indicators parameter set to "*continuity check successful*" is sent when all the following conditions are satisfied:

- 1) If the incoming IAM indicated "*COT to be expected*", a Continuity message, with the Continuity Indicators parameter set to "*continuity*" shall be received.
- 2) One of the following events, which indicate successful completion of bearer set-up, shall also be received by the Incoming bearer set-up procedure (7.5/Q.1902.4 [6]) depending on the procedure being applied:
 - 2.1) Bearer Set-up indication – for the forward bearer set-up case where the incoming Connect Type is "*notification not required*".
 - 2.2) BICC_Data indication primitive with Action indicator set to "*Connected*" – for the forward bearer set-up cases (with, or without bearer control tunnelling) where the incoming Connect Type is "*notification required*", and for the fast set-up (backward) case.

- 2.3) Bearer Set-up Connect indication – for the backward bearer set-up case.
- 2.4) BNC set-up success indication for cases using bearer control tunnelling, except as identified in 2.2) above.
- 3) If the continuity check is being performed on the outgoing ISUP circuit, the test shall be successfully completed.

For the late IAM case (where the subsequent network does not support the continuity check protocol) the sending of the ISUP IAM is delayed until all the following conditions are satisfied:

- 1) If the incoming IAM indicated "*COT to be expected*", a Continuity message, with the Continuity Indicators parameter set to "*continuity*" shall be received.
- 2) One of the following events, which indicate successful completion of bearer set-up, shall be received by the Incoming bearer set-up procedure (7.5/Q.1902.4 [6]):
 - 2.1) Bearer Set-up indication – for the forward bearer set-up case where the incoming Connect Type is "*notification not required*".
 - 2.2) BICC_Data indication primitive with Action indicator set to "*Connected*" – for the forward bearer set-up cases (with or without bearer control tunnelling) where the incoming Connect Type is "*notification required*", and for the fast set-up (backward) case.
 - 2.3) Bearer Set-up Connect indication – for the backward bearer set-up case.
 - 2.4) BNC set-up success indication for cases using bearer control tunnelling, except as identified in 2.2) above.

6.3.1.2 Through connection of the bearer path

The bearer path shall be connected in both directions when both of the following conditions are satisfied:

- the Incoming bearer set-up procedure (7.5/Q.1902.4 [6]) is successfully completed; and
- if the ISUP continuity check procedure is being performed, when conditions on the outgoing circuit allow, see 2.1.8/Q.764 [4].

6.3.1.3 Connection type allowing fallback

6.3.1.3.1 Actions in the forward direction

6.3.1.3.1.1 Succeeding network does have the capability of performing fallback

The CSF will set up the call on a circuit according to the Transmission Medium Requirement parameter "*64 kbit/s unrestricted preferred*" whenever available, and the Transmission Medium Requirement, Transmission Medium Requirement Prime, User Service Information and User Service Information Prime parameters are passed on unchanged.

If congestion on the route is encountered, and if there is no alternative route available supporting the connection type allowing fallback, fallback procedures will be initiated according to 6.3.1.3.1.2.

6.3.1.3.1.2 Succeeding network does not have the capability of performing fallback

In case of either:

- interworking to an ISDN User Part not supporting the Transmission Medium Requirement parameter "*64 kbit/s unrestricted preferred*"; or
- there is no circuit available being capable of satisfying the connection type requirements of "*64 kbit/s unrestricted preferred*",

the CSF will continue the call, discard the User Service Information Prime parameter, maintain the User Service Information parameter, change the Transmission Medium Requirement parameter in

accordance with the fallback connection type contained in the Transmission Medium Requirement Prime parameter and then discard the Transmission Medium Requirement Prime parameter. This will typically be the case when the succeeding network consists of an ISDN User Part conforming to ITU-T Q.767 [11] or a version of ITU-T Q.764 [4] not supporting the procedures.

NOTE – This will also be the case during an interim period of time when interworking to ISDN User Part networks not capable of out-band control of echo control devices and/or μ -law/A-law converters.

If echo control is required on the connection, appropriate procedures will be initiated (see 2.7/Q.764 [4]).

6.3.1.3.2 Actions in the backward direction – fallback indicated before answer

6.3.1.3.2.1 Succeeding network does have the capability of performing fallback

The CSF will know that fallback has occurred by receiving the Transmission Medium Used parameter. This parameter indicates the fallback connection type.

Appropriate actions to modify network resources, e.g. μ -law/A-law conversion will be initiated if applicable.

If echo control is required on the connection, appropriate procedures will be initiated (see 2.7/Q.764 [4]).

6.3.1.3.2.2 Succeeding network does not have the capability of performing fallback

The CSF will include a Transmission Medium Used parameter (which has been set according to the fallback connection type indicated in the Transmission Medium Requirement Prime parameter) in the ACM or CPG indicating that fallback has occurred for this call.

Appropriate actions to modify network resources, e.g. μ -law/A-law conversion will be initiated if applicable.

6.3.1.3.3 Actions in the backward direction – fallback indicated at answer

The CSF will know that fallback has occurred by receiving the Transmission Medium Used parameter. This parameter indicates the fallback connection type.

Appropriate actions to modify network resources, e.g. μ -law/A-law conversion, will be initiated.

If echo control is required on the connection, appropriate procedures will be initiated (see 2.7/Q.764 [4]).

6.3.2 Call release

On receipt of a REL from the preceding CSF, the CSF invokes the BICC Release reception procedure and sends an ISUP REL to the succeeding exchange. Timers T1 and T5 are started to ensure that a RLC is received from the succeeding exchange (expiration of timers T1 and T5 is covered in 2.9.6/Q.764 [4]).

On receipt of an ISUP REL from the succeeding exchange, the CSF immediately requests the disconnection of the internal bearer path and invokes the BICC Release sending procedure (11.5/Q.1902.4 [6]) towards the preceding CSF. When the ISUP circuit is re-selectable, an ISUP RLC is returned to the succeeding exchange.

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