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SERIES Q: SWITCHING AND SIGNALLING

Broadband ISDN – Common aspects of B-ISDN application protocols for access signalling and network signalling and interworking

Interworking between AAL type 2 signalling protocol Capability Set 2 and IP connection control signalling protocol Capability Set 1

ITU-T Recommendation Q.2632.1

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ITU-T Recommendation Q.2632.1

Interworking between AAL type 2 signalling protocol Capability Set 2 and IP connection control signalling protocol Capability Set 1

Summary

This Recommendation describes the interworking between the AAL type 2 signalling protocol and the IP connection control signalling protocol. This Recommendation describes the mapping tables and diagrams which support interworking between the two protocols for call set-up, modification and clear down.

Source

ITU-T Recommendation Q.2632.1 was approved by ITU-T Study Group 11 (2001-2004) under the ITU-T Recommendation A.8 procedure on 14 October 2003.

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.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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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.2632.1

Interworking between AAL type 2 signalling protocol Capability Set 2 and IP connection control signalling protocol Capability Set 1

1 Scope

This Recommendation defines the interworking relationship between the AAL type 2 signalling protocol Capability Set 2 and the IP connection control signalling protocol. For the purpose of this interworking, AAL type 2 signalling is defined in ITU-T Rec. Q.2630.2 [1] and subject to restrictions stated in TRQ.2800 [3]. For the purpose of this interworking, IP Connection Control signalling is defined in ITU-T Rec. Q.2631.1 [2].

The interworking between the above two signalling protocols typically may occur in 3GPP UTRANs with AAL type 2 and IP network portions connected via an Interworking Unit.

The objective of this ITU-T Recommendation is to specify the interworking between the AAL type 2 protocol and the IP Connection Control signalling protocol.

Interworking is shown as message arrow diagrams. The diagrams included represent a sample of typical situations. Mapping tables are provided to define the relationship between AAL type 2 protocol messages and parameters, on the one hand, and IP Connection Control signalling protocol messages and parameters on the other hand.

Tables are provided for each AAL type 2 message that maps onto an IP Connection Control message. These tables also specify the mapping of parameters, which are carried by the concerned messages.

Parameters that are of local significance only, i.e. are not mapped onto parameters in the other signalling system, are not shown.

The arrow diagrams used in this Recommendation show the message movement for interworking the bearer control protocols of AAL type 2 signalling and IP Connection Control signalling. The working inside of the exchanges will not be shown, but rather the external stimulus to the exchange only (see Figures 1 and 2).

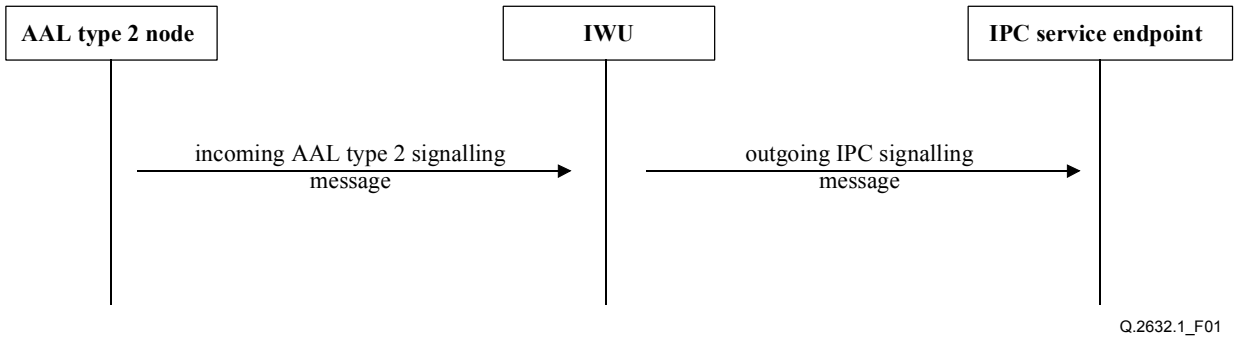

Figure 1/Q.2632.1 – AAL type 2 to IPC signalling interworking

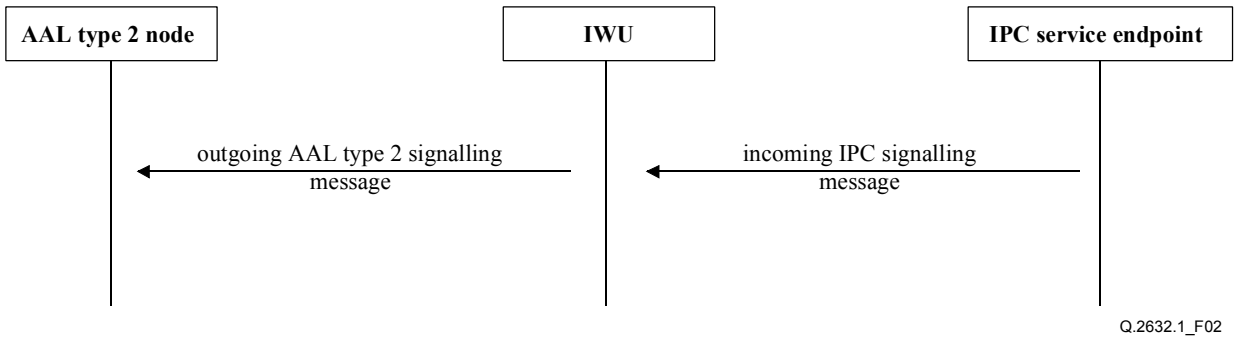

Figure 2/Q.2632.1 – IPC to AAL type 2 signalling interworking

2 References

2.1 Normative 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. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[1] ITU-T Recommendation Q.2630.2 (2001), *AAL type 2 signalling protocol – Capability Set 2*.

[2] ITU-T Recommendation Q.2631.1 (2003), *IP connection control signalling protocol – Capability Set 1*.

2.2 Informative references

[3] ITU-T Q-series Recommendations – Supplement 44 (2003), *Technical Report TRQ.2800: Transport control signalling requirements – Signalling requirements for AAL type 2 to IP interworking Capability Set 1*.

3 Abbreviations

This Recommendation uses the following abbreviations:

3GPP 3rd Generation Partnership Project

A2EA AAL type 2 Service Endpoint Address

A2IP AAL type 2 – IP

AAL ATM Adaptation Layer

AAL2 AAL type 2

ATM Asynchronous Transfer Mode

BLC Block Confirm Message

BLO Block Request Message

CAU Cause Parameter

CEID AAL type 2 Connection Element Identifier

CFN	ConFusioN message
CPS	(AAL type 2) Common Part Sublayer
DEAE	Destination Endpoint E.164 Address
DEAX	Destination Endpoint X.213 Address
ECF	Establish Confirm Message
ERQ	Establish Request Message
ESEA	Destination E.164 Service Endpoint Address parameter
HBx	Header bit rate associated with x
IP	Internet Protocol
IPC	IP Connection Control
IPHL	Total length of the header of an IP packet
IPQOS	IP Quality of Service parameter
IPTT	IP Transport Type parameter
IWU	InterWorking Unit
LC	(AAL type 2) Link Characteristics parameter
MAX	Maximum function
MIN	Minimum function
MOA	Modification Acknowledge message
MOD	Modification Request message
MOR	Modification Reject message
MSLC	Modify Support for Link Characteristics parameter
MSSSI	Modify Support for SSCS Information parameter
MSTC	Modify Support for IP Transfer Capability parameter
NSEA	Destination NSAP Service Endpoint Address parameter
PLC	Preferred Link Characteristics parameter
PSSCS	Preferred SSCS Information parameter
PSSIAE	Preferred Service Specific Information (Audio Extended) parameter
PSSIME	Preferred Service Specific Information (Multirate Extended) parameter
PT	Path Type parameter
PTC	Preferred IP Transfer Capability
PTC-DBW	Dedicated Bandwidth Preferred IP Transfer Capability
PTC-SBW	Statistical Bandwidth Preferred IP Transfer Capability
REL	Release Request Message
RES	Reset Request Message
RLC	Release Confirm Message
RSC	Reset Confirm Message
SAR	Segmentation and Reassembly (Sublayer)

SDU Service Data Unit

SSCS Service Specific Convergence Sublayer

SSIA Service Specific Information (Audio) parameter

SSIAE Service Specific Information (Audio Extended) parameter

SSIM Service Specific Information (Multirate) parameter

SSIME Service Specific Information (Multirate Extended) parameter

SSISA Service Specific Information (SAR-assured) parameter

SSISU Service Specific Information (SAR-unassured) parameter

SSSAR Segmentation and Reassembly Service Specific Convergence Sublayer

SUCI Served User Correlation ID parameter

SUGR Served User Generated Reference parameter

SUT Served User Transport parameter

TC (IP) Transfer Capability

TC-DBW Dedicated Bandwidth IP Transfer Capability

TC-SBW Statistical Bandwidth IP Transfer Capability

TCI Test Connection Indication parameter

UBC Unblock Confirm Message

UBL Unblock Request Message

UTRAN UMTS Terrestrial Radio Access Network

4 General statements on interworking

- No ATM or AAL type 2 specific parameters defined for AAL type 2 signalling will be carried in the IP connection control signalling.
- No IP specific parameters defined for IP connection control signalling will be carried in the AAL type 2 signalling.
- All AAL type 2 and all IP connection control messages carry message compatibility information.
- All AAL type 2 and all IP connection control parameters carry parameter compatibility information.
- Through-connection in the IWU will occur immediately after either the AAL type 2 or the IP connection control signalling sends the Establish Request Message (ERQ).
- According to TRQ.2800 [3] interworking is specified for AAL type 2 signalling with SSCS support restricted to SSSAR unassured. Therefore, reception of any of the parameters listed in Table 1 at the IWU shall lead to the behaviour as specified there. Furthermore, none of these parameters shall be generated at the IWU in AAL type 2 signalling messages.

Table 1/Q.2632.1 – List of non-supported AAL type 2 parameters

AAL type 2 parameter	Action on reception	
	AAL type 2 side	IP side
MSSSI in ERQ and ECF messages	Discard parameter, do not send notification	As specified in 5.1.1 and 5.2
PSSIAE in ERQ message	Discard parameter, do not send notification	As specified in 5.1.1
PSSIME in ERQ message	Discard parameter, do not send notification	As specified in 5.1.1
SSIAE in ERQ message	Release connection, do not send notification	–
SSIA in ERQ message	Release connection, do not send notification	–
SSIME in ERQ message	Release connection, do not send notification	–
SSIM in ERQ message	Release connection, do not send notification	–
SSISA in ERQ message	Release connection, do not send notification	–
SUCI in MOD and MOA messages	Discard parameter, do not send notification	As specified in 8.1.1 and 8.2
NOTE – These parameters are not shown in the mapping tables.		

5 Successful connection set-up

5.1 Mapping of the establish request message

5.1.1 Connection establishment initiated from the AAL type 2 network

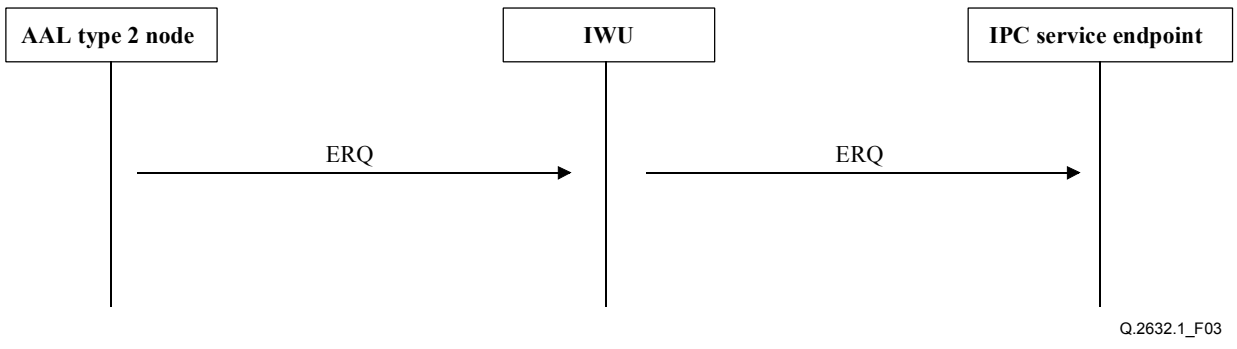

Figure 3/Q.2632.1 – ERQ from AAL type 2 network

Table 2/Q.2632.1 – Mapping of ERQ parameters (ERQ initiated from AAL2)

Incoming AAL type 2 ERQ	Outgoing IPC ERQ
ESEA (Note 1)	DEAE (Note 2)
NSEA (Note 1)	DEAX (Note 2)
LC	TC (Note 3)
PLC	PTC (Note 3)
MSLC	MSTC
SSISU	(Note 3)
SUGR	SUGR
SUT	SUT
TCI	Not carried
PT	Not carried (Note 4)
	IPQOS (Note 4)
	IPTT (Note 5)

NOTE 1 – Only one of these parameters is present.

NOTE 2 – Only one of these parameters is present. Values may be taken unchanged or with format conversion (E.164 to NSAP, NSAP to E.164) or derived by address translation with and without format change from the received ESEA or NSEA parameter.

NOTE 3 – TC and PTC are of the form of a Dedicated Bandwidth or Statistical Bandwidth IP Transfer Capability. Appendix I gives a guideline for the derivation of these parameters.

NOTE 4 – The PT value may be taken into account to derive the value of this parameter.

NOTE 5 – The value of this parameter may de determined from administrative settings and/or routing decisions.

5.1.2 Connection establishment initiated from the IP network

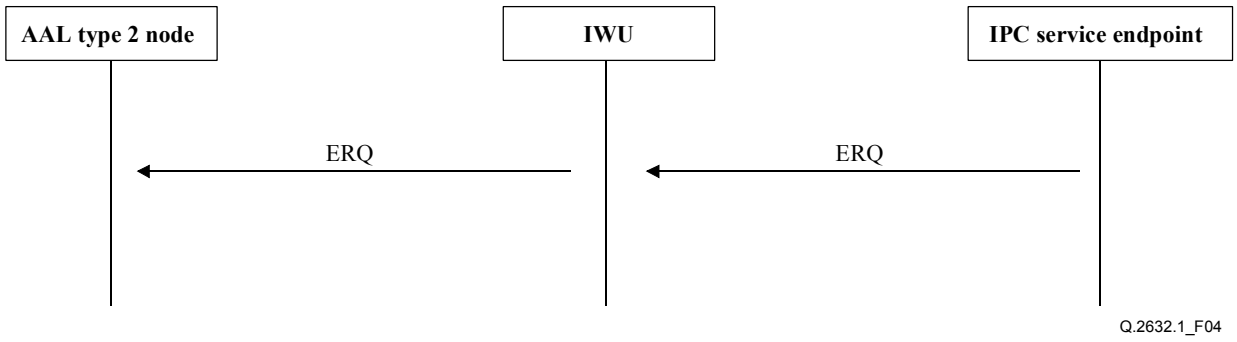

Figure 4/Q.2632.1 – ERQ from IP network

Table 3/Q.2632.1 – Mapping of ERQ parameters (ERQ initiated from IP)

Outgoing AAL type 2 ERQ	Incoming IPC ERQ
ESEA (Note 2)	DEAE (Note 1)
NSEA (Note 2)	DEAX (Note 1)
LC (Note 3)	TC (Note 4)
PLC (Note 3)	PTC (Note 4)
MSLC	MSTC
SSISU (Note 3)	Not carried
SUGR	SUGR
SUT	SUT
TCI (Note 6)	
PT (Note 5)	
Not carried	IPQOS
Not carried	IPTT

NOTE 1 – Only one of these parameters is present.

NOTE 2 – Only one of these parameters is present. Values may be taken unchanged or with format conversion (E.164 to NSAP, NSAP to E.164) or derived by address translation with and without format change from the received DEAE or DEAX parameter.

NOTE 3 – Appendix I gives a guideline for the derivation of these parameters.

NOTE 4 – TC and PTC are of the form of a Dedicated Bandwidth or Statistical Bandwidth IP Transfer Capability.

NOTE 5 – The IPQOS value may be taken into account to derive the value of this parameter.

NOTE 6 – TCI shall not be generated by the IWU. Only listed for completeness.

5.2 Mapping of the establish confirm message

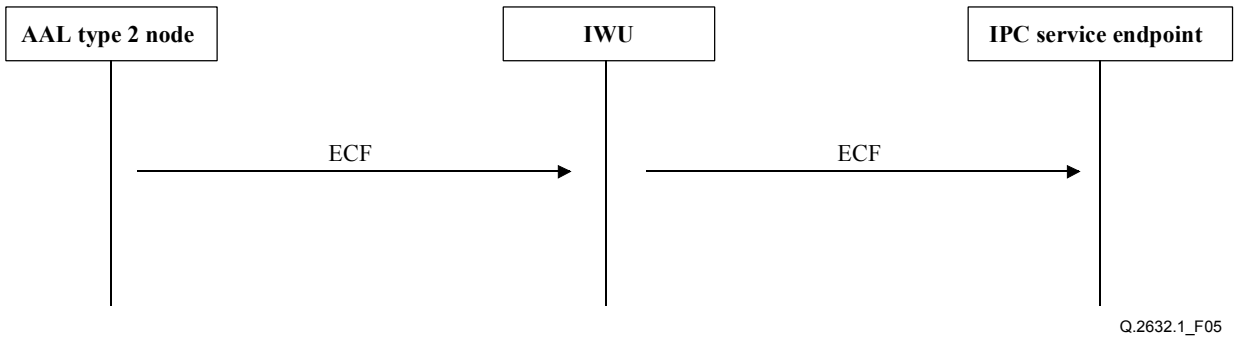

Figure 5/Q.2632.1 – ECF from AAL type 2 network

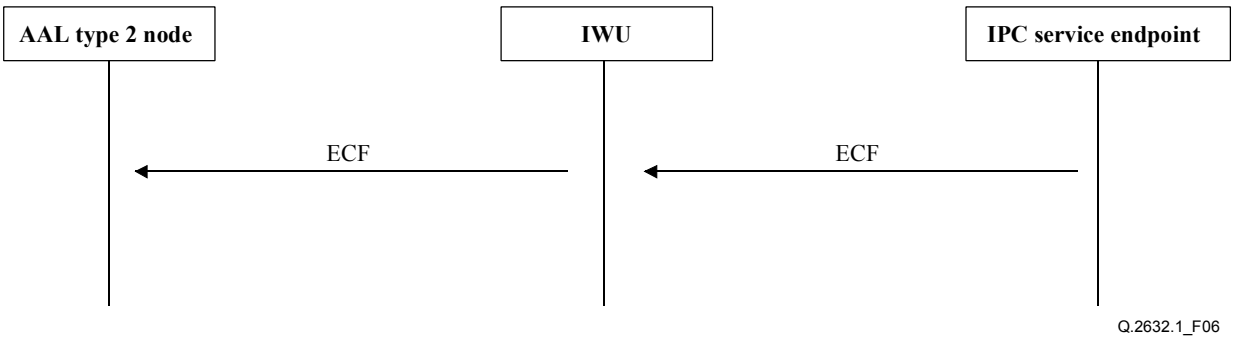

Figure 6/Q.2632.1 – ECF from IP network

Table 4/Q.2632.1 – Mapping of ECF parameters

Incoming/Outgoing AAL type 2 ECF	Outgoing/Incoming IPC ECF
MSLC	MSTC

6 Unsuccessful connection set-up

6.1 Mapping of the RLC message

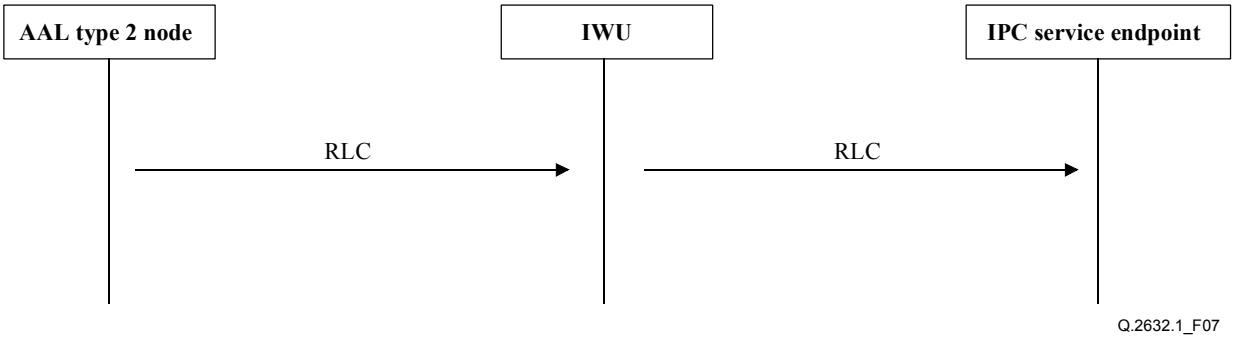

Figure 7/Q.2632.1 – RLC from AAL type 2 network

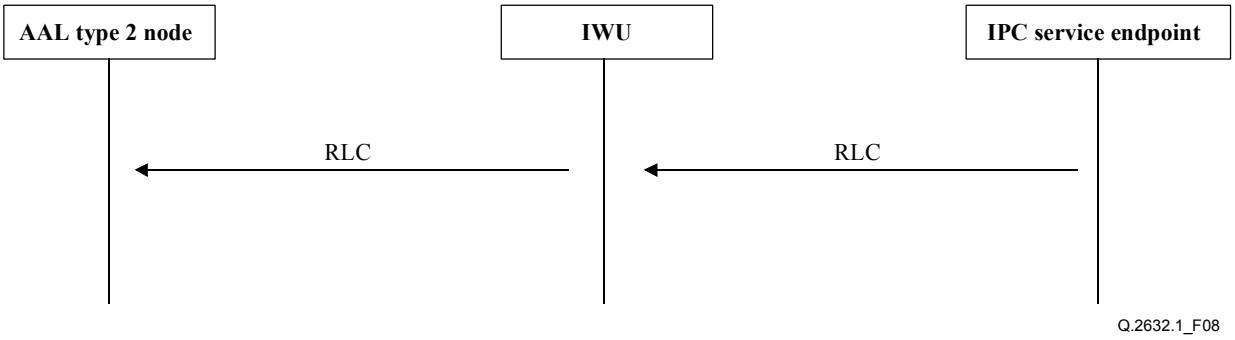

Figure 8/Q.2632.1 – RLC from IP network

Table 5/Q.2632.1 – Mapping of RLC parameters

Incoming/Outgoing AAL type 2 RLC	Outgoing/Incoming IPC RLC
CAU (Notes 1 and 2)	CAU (Notes 1 and 2)
NOTE 1 – Cause values received at the IWU that are unique to the network portion where they are generated, i.e., unknown in the other network portion, shall be mapped to "Normal, unspecified". NOTE 2 – If Cause parameters are received containing compatibility information, the cause value shall be mapped to "Normal unspecified" and the diagnostics shall be discarded.	

7 Connection release

In AAL type 2 signalling the Connection Establishment procedures show an end-to-end behaviour, whereas the Connection Release procedures are of a link-by-link characteristic. The A2IP Interworking Unit simulates these principles; i.e., the A2IP IWU behaves from the point of view of the AAL type 2 network portion like an AAL type 2 switch.

Guided by this principle, a Connection Release procedure will be handled by the A2IP IWU in the following manner:

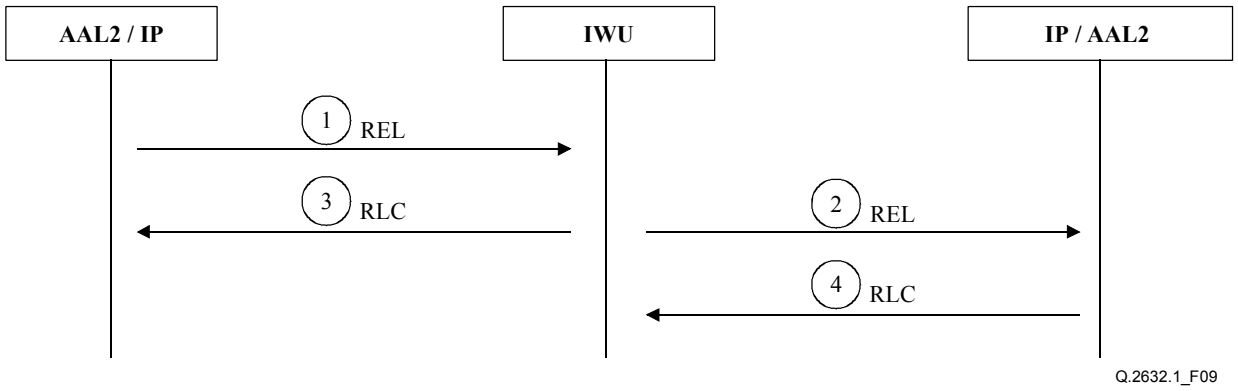

Figure 9/Q.2632.1 – General release handling

The REL message (1) causes the REL message (2) and the RLC message (3) to be sent. There is no time or logical correlation between (2) and (3) or between (3) and (4).

7.1 Mapping of the REL message

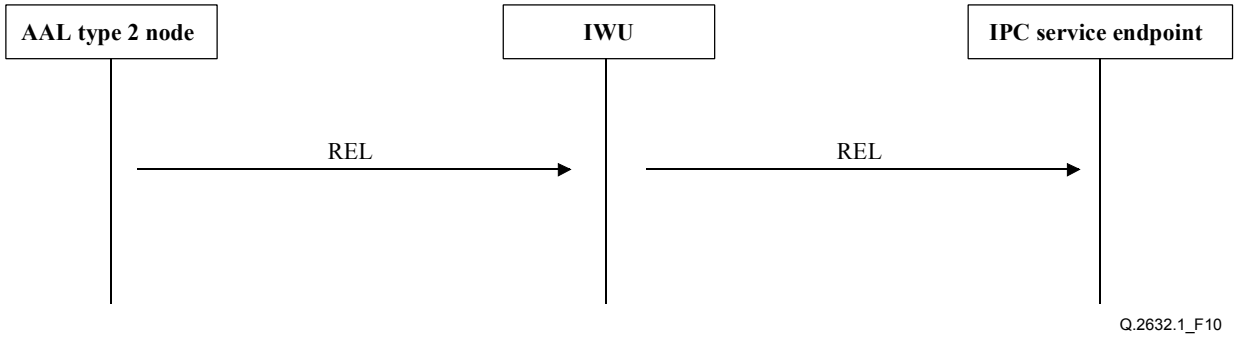

Figure 10/Q.2632.1 – REL from AAL type 2 network

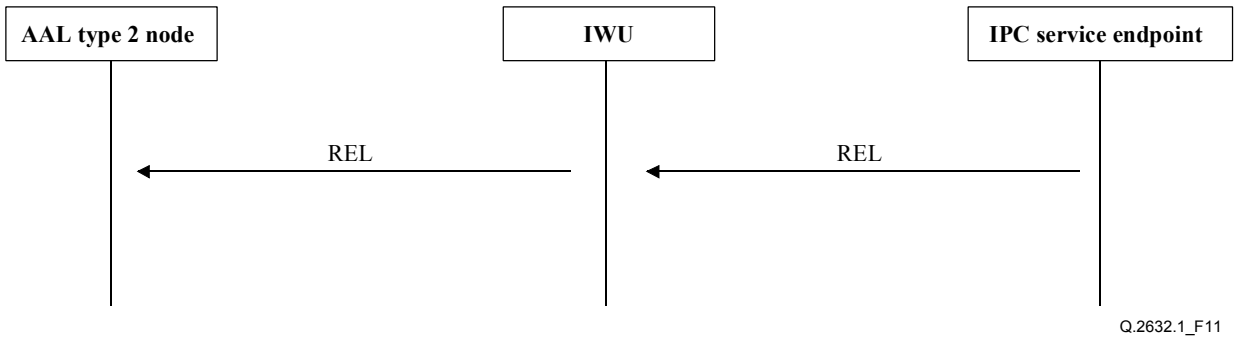

Figure 11/Q.2632.1 – REL from IP network

Table 6/Q.2632.1 – Mapping of REL parameters

Incoming/Outgoing AAL type 2 REL	Outgoing/Incoming IPC REL
CAU (Notes 1 and 2)	CAU (Notes 1 and 2)
NOTE 1 – Cause values received at the IWU that are unique to the network portion where they are generated, i.e., unknown in the other network portion, shall be mapped to "Normal, unspecified". NOTE 2 – If Cause parameters are received containing compatibility information, the cause value shall be mapped to "Normal unspecified" and the diagnostics shall be discarded.	

7.2 Mapping of the RLC message

There is no interworking of RLC messages at connection release.

A RLC message that is received in response to a REL message which has been initiated in the IWU due to a reset procedure in the other network portion (see clause 10), shall not be interworked.

NOTE – Interworking of RLC messages takes place if and only if the RLC message is received as negative acknowledgement to an ERQ message in case of unsuccessful connection set-up (see 6.1)

8 Successful modification

8.1 Mapping of the MOD message

8.1.1 Modification initiated from the AAL type 2 network

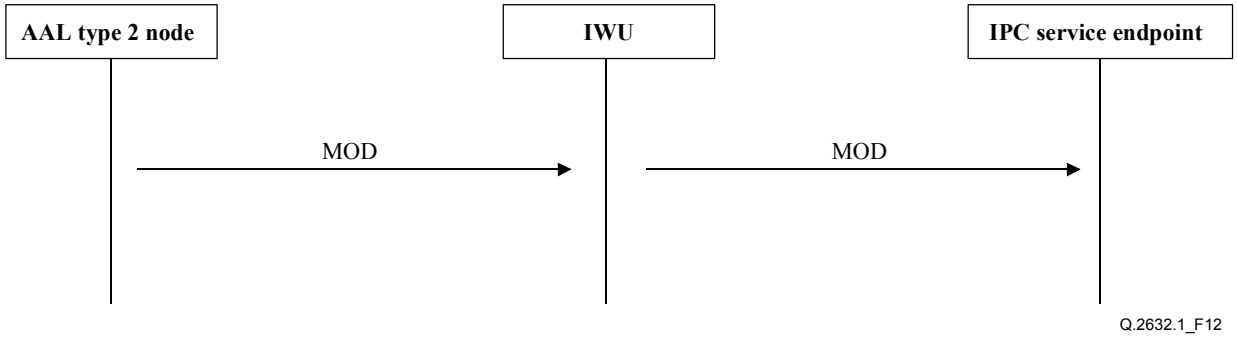

Figure 12/Q.2632.1 – MOD from AAL type 2 network

Table 7/Q.2632.1 – Mapping of MOD parameters (MOD initiated from AAL2)

Incoming AAL type 2 MOD	Outgoing IPC MOD
LC	TC (Note)
NOTE – TC is of the form of a Dedicated Bandwidth or Statistical Bandwidth IP Transfer Capability. Appendix I gives a guideline for the derivation of these parameters.	

8.1.2 Modification initiated from the IP network

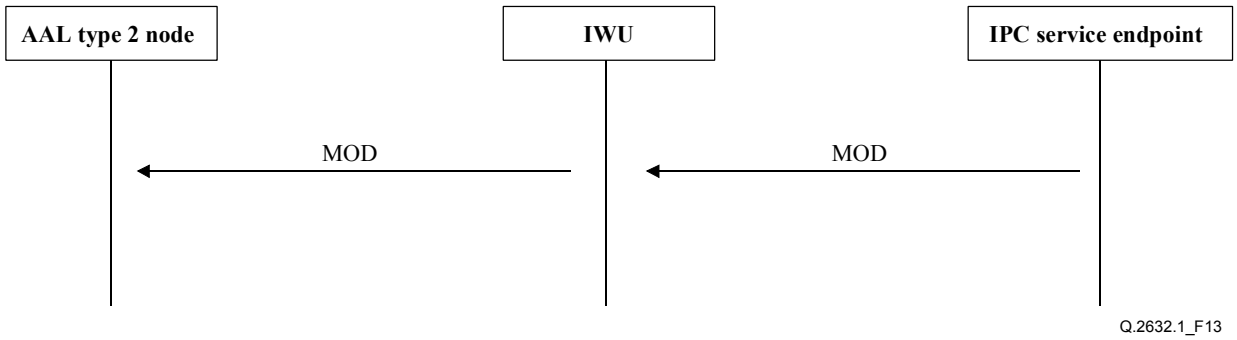

Figure 13/Q.2632.1 – MOD from IP network

Table 8/Q.2632.1 – Mapping of MOD parameters (MOD initiated from IP)

Outgoing AAL type 2 MOD	Incoming IPC MOD
LC (Note 1)	TC (Note 2)
NOTE 1 – Appendix I gives guidelines for the derivation of this parameter. NOTE 2 – TC is of the form of a Dedicated Bandwidth or Statistical Bandwidth IP Transfer Capability.	

8.2 Mapping of the MOA message

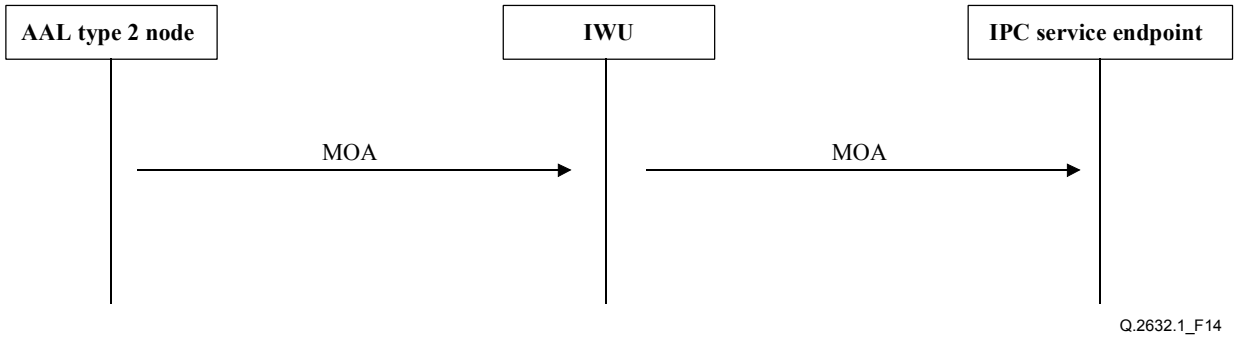

Figure 14/Q.2632.1 – MOA from AAL type 2 network

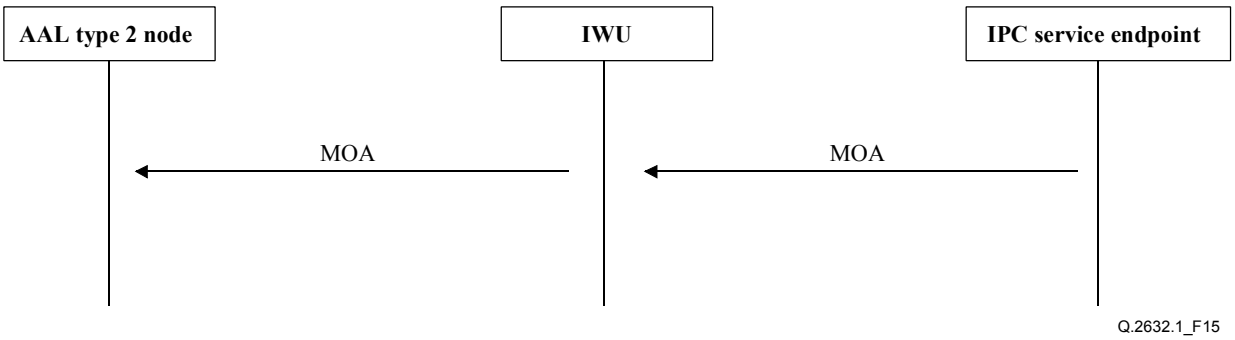

Figure 15/Q.2632.1 – MOA from IP network

Table 9/Q.2632.1 – Mapping of MOA parameters

Incoming/Outgoing AAL type 2 MOA	Outgoing/Incoming IPC MOA
(Note)	(Note)
NOTE – MOA messages carry no parameters requiring interworking.	

9 Unsuccessful modification

9.1 Mapping of the MOR message

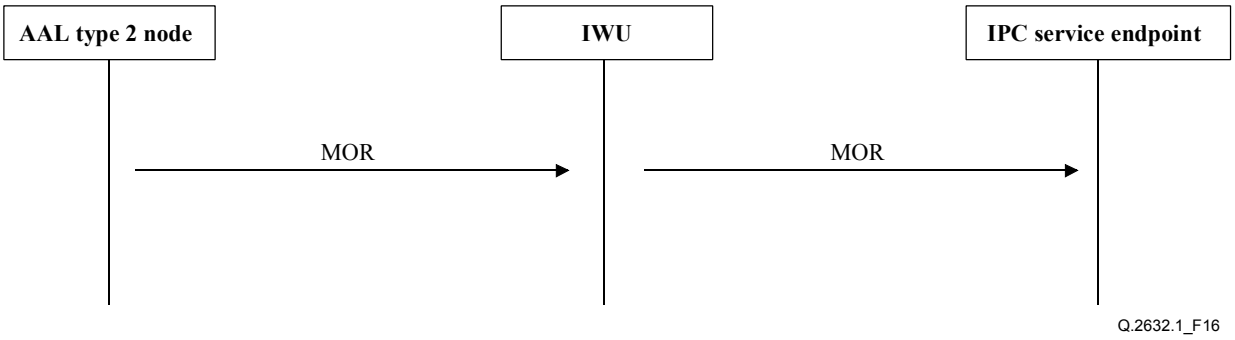

Figure 16/Q.2632.1 – MOR from AAL type 2 network

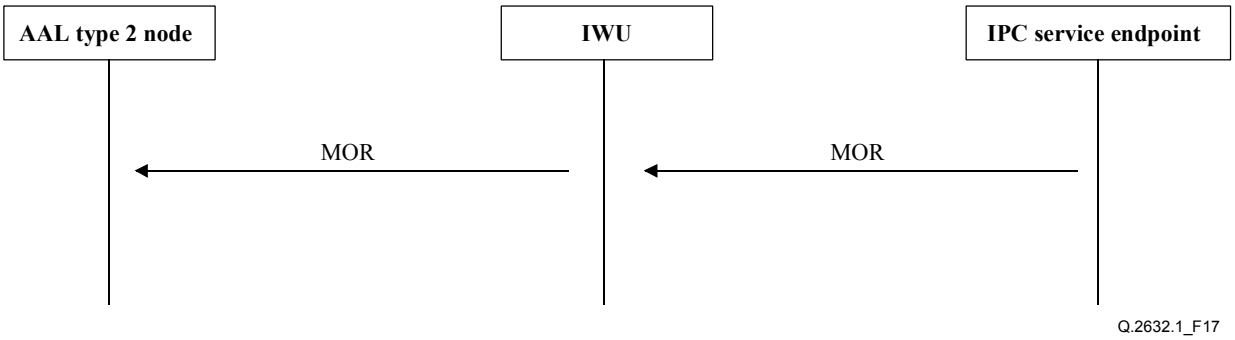

Figure 17/Q.2632.1 – MOR from IP network

Table 10/Q.2632.1 – Mapping of MOR parameters

Incoming/Outgoing AAL type 2 MOR	Outgoing/Incoming IPC MOR
CAU (Notes 1 and 2)	CAU (Notes 1 and 2)
NOTE 1 – Cause values received at the IWU that are unique to the network portion where they are generated, i.e., unknown in the other network portion, shall be mapped to "Normal, unspecified". NOTE 2 – If Cause parameters are received containing compatibility information, the cause value shall be mapped to "Normal unspecified" and the diagnostics shall be discarded.	

10 Reset

10.1 Reset initiated in AAL type 2/IP network

In AAL type 2 signalling, the reset procedures are confined to two adjacent nodes.

Guided by this principle, a reset procedure will be handled by the A2IP IWU in the following manner:

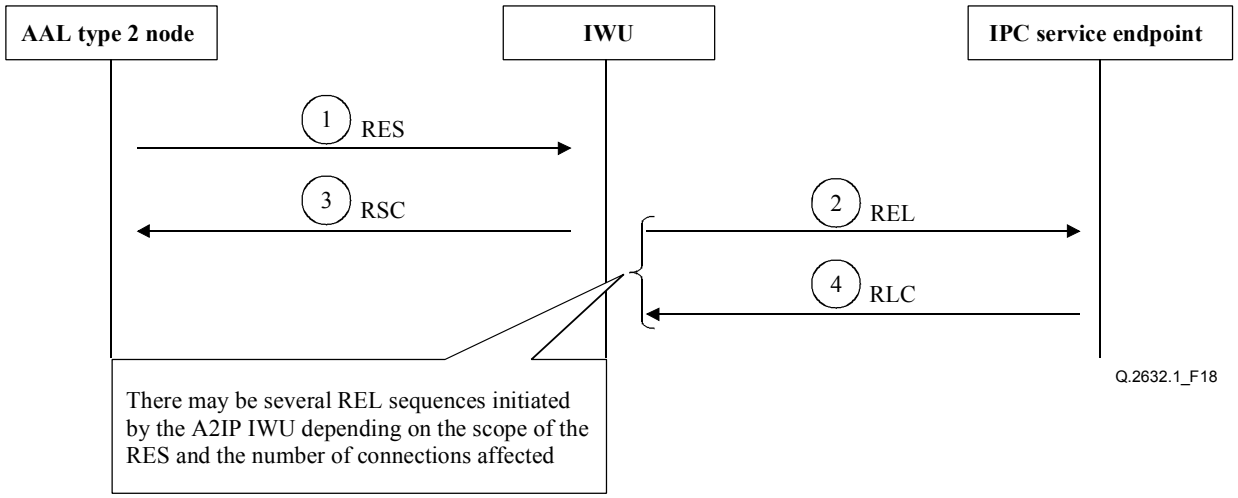

Figure 18/Q.2632.1 – General reset handling

Reception of the RES message (1) causes the REL message (2) and the RSC message (3) to be sent. There is no time or logical correlation between (2) and (3) or between (3) and (4).

The handling is analogous in cases where the RES is received from the IP network portion or generated by the IWU.

10.1.1 Reset initiated in AAL type 2 network

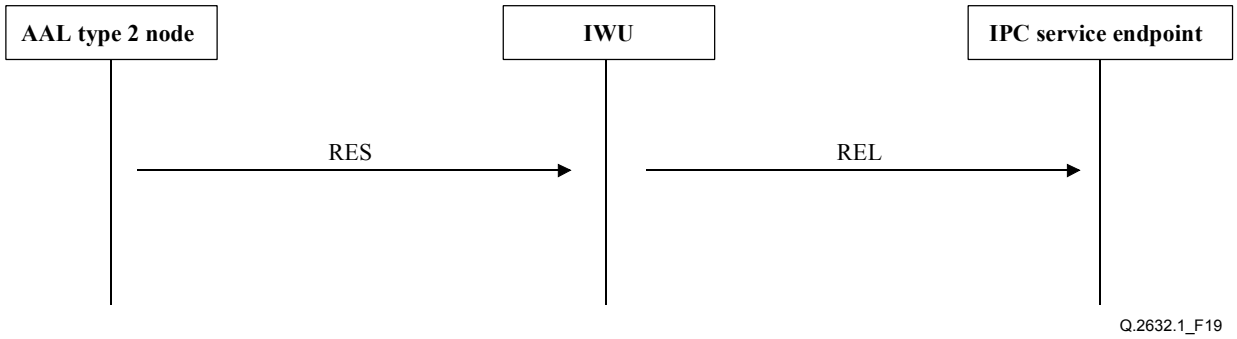

Figure 19/Q.2632.1 – RES from AAL type 2 network

Table 11/Q.2632.1 – Mapping of RES parameters

Incoming AAL type 2 RES	Outgoing IPC REL (Note 3)
(Note 1)	CAU (Note 2)
NOTE 1 – RES messages carry no parameters requiring interworking. NOTE 2 – Cause value set to "Temporary failure". NOTE 3 – If the RES applies to one or more AAL type 2 paths affecting several active connections, a REL message for each of these connections shall be generated at the IP side.	

10.1.2 Reset initiated in IP network

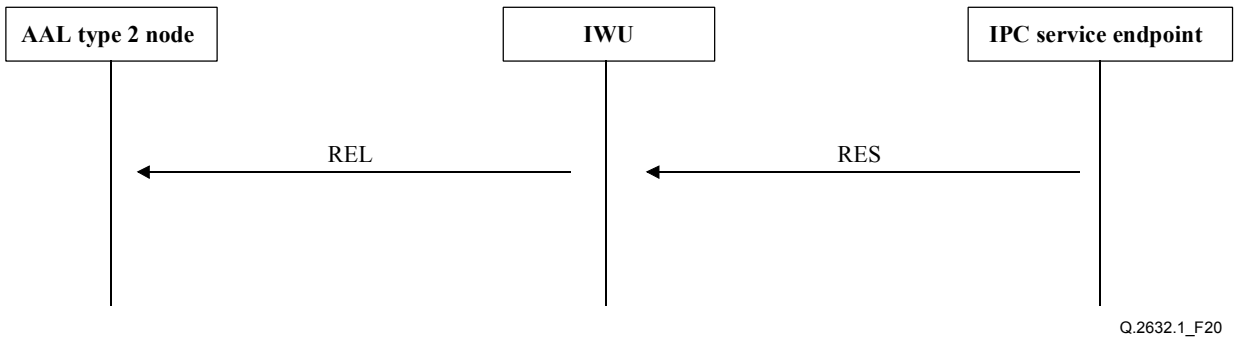

Figure 20/Q.2632.1 – RES from IP network

Table 12/Q.2632.1 – Mapping of RES parameters

Outgoing AAL type 2 REL	Incoming IPC RES (Note 3)
CAU (Note 2)	(Note 1)
NOTE 1 – RES messages carry no parameters requiring interworking. NOTE 2 – Cause value set to "Temporary failure". NOTE 3 – If the RES affects several active connections, a REL message for each of these connections shall be generated at the AAL type 2 side.	

10.2 Reset initiated by the IWU

Analagous to the reset handling in AAL type 2 signalling, a reset procedure initiated by the IWU shall be handled according to Figure 21:

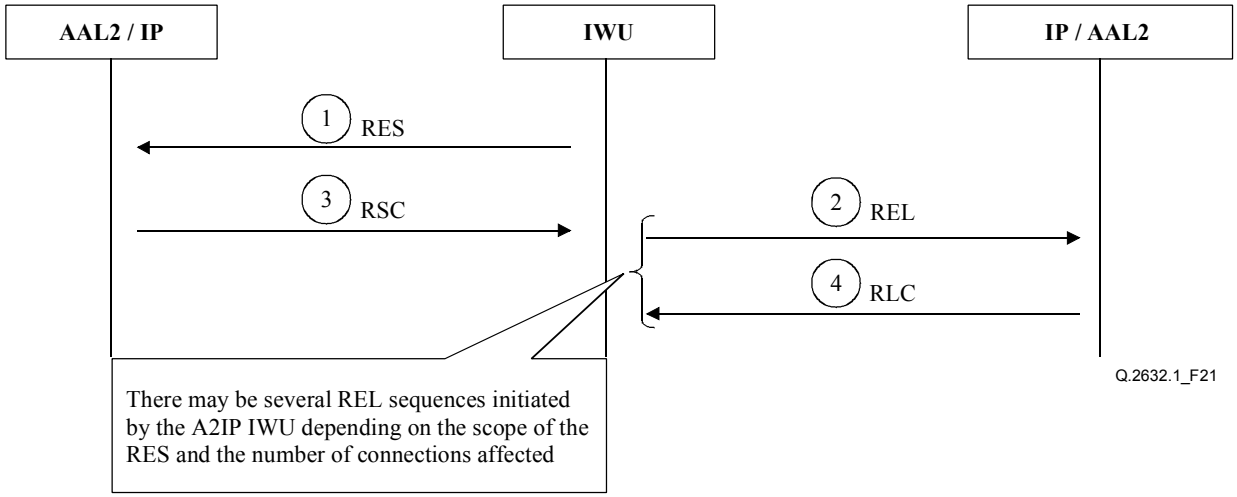

Figure 21/Q.2632.1 – General IWU-initiated reset handling

Sending of the RES message (1) causes the REL message (2) to be sent.

10.2.1 Reset towards the AAL type 2 network

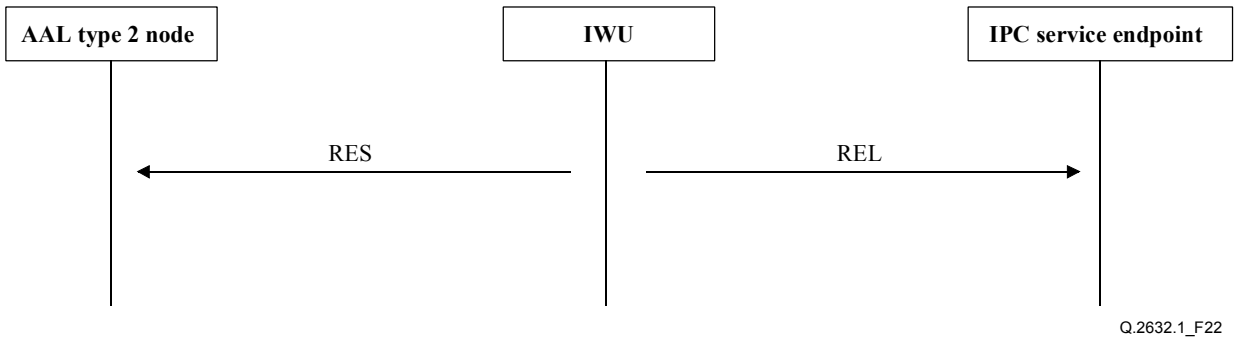

Figure 22/Q.2632.1 – RES towards AAL2 network

Table 13/Q.2632.1 – Mapping of RES parameters

Outgoing AAL type 2 RES	Outgoing IPC REL (Note 3)
CAU (Note 2)	(Note 1)
NOTE 1 – RES messages carry no parameters requiring interworking. NOTE 2 – Cause value set to "Temporary failure". NOTE 3 – If the RES affects several active connections, a REL message for each of these connections shall be generated at the IP side.	

10.2.2 Reset towards the IP network

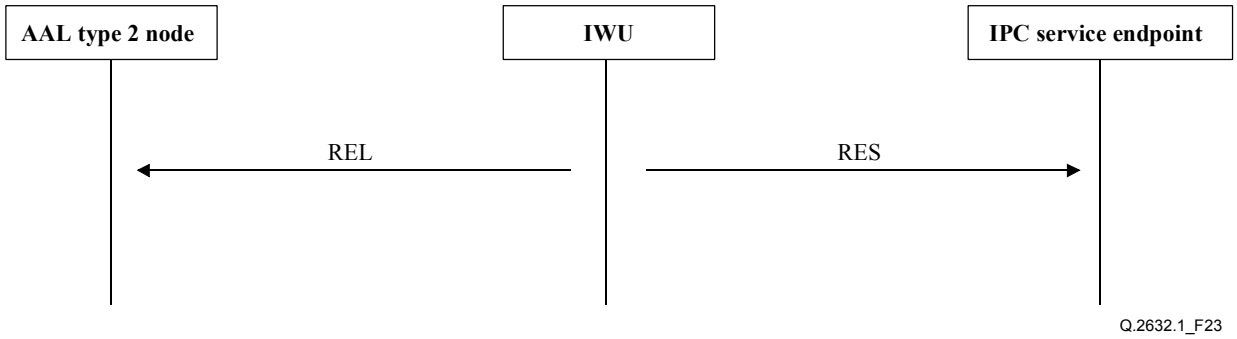

Figure 23/Q.2632.1 – RES towards IP network

Table 14/Q.2632.1 – Mapping of RES parameters

Outgoing AAL type 2 REL	Outgoing IPC RES (Note 3)
CAU (Note 2)	(Note 1)
NOTE 1 – RES messages carry no parameters requiring interworking. NOTE 2 – Cause value set to "Temporary failure". NOTE 3 – If the RES affects several active connections, a REL message for each of these connections shall be generated at the AAL2 side.	

11 Messages requiring no interworking

11.1 AAL type 2 messages

The following AAL type 2 messages are not interworked when received at the IWU: CFN, RSC, BLO, BLC, UBL, and UBC.

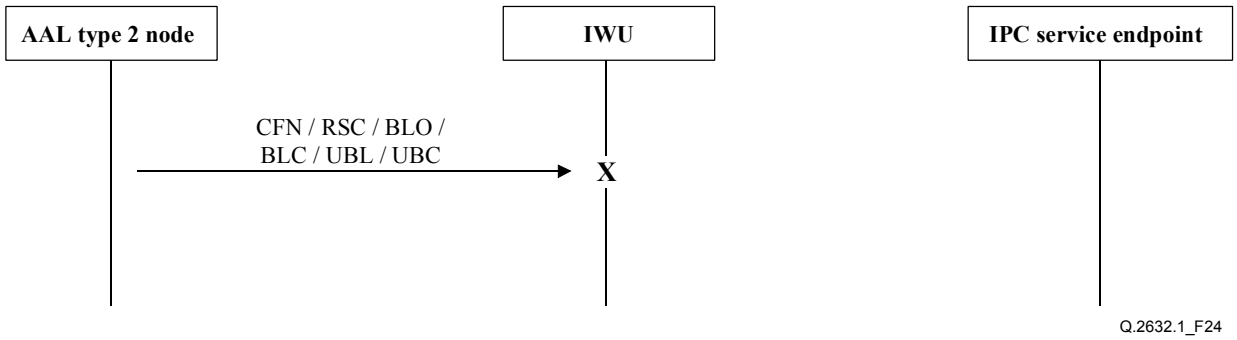

Figure 24/Q.2632.1 – AAL type 2 messages without interworking

11.2 IPC messages

The following IPC messages are not interworked when received at the IWU: CFN, RSC.

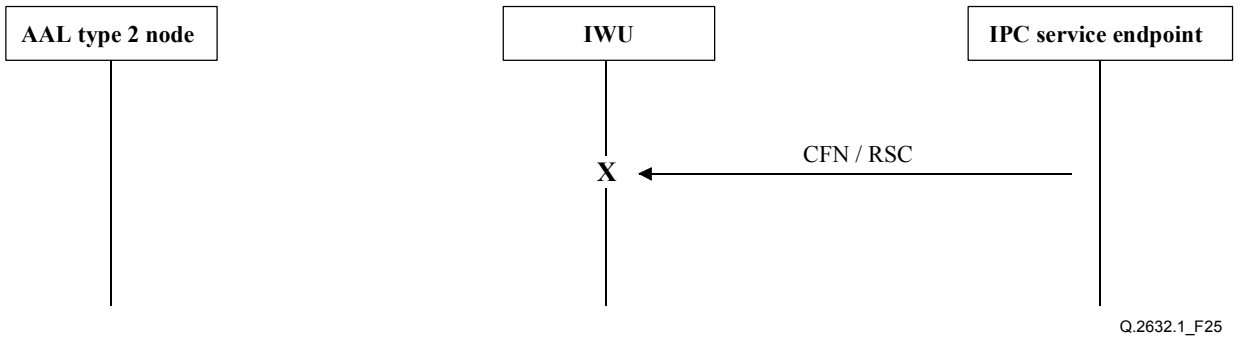

Figure 25/Q.2632.1 – IPC messages without interworking

Appendix I

Interworking of AAL type 2 link characteristics and SSISU parameters with IPC IP transfer capabilities

I.0 Guidelines and definitions

This Appendix provides rules for conversions between LC-type and TC-type parameters. In some cases, explicit expressions are defined that allow computing outgoing parameter values based on incoming parameter values. These expressions should be understood as formal in the sense that:

– they do not intrinsically request the existence of certain parameters neither incoming nor outgoing,

– they do not overrule constraints of any type that are defined within any of the interworked protocols.

Due to the modification capability of both interworked protocols, situations may arise where parameters are received in a Modification Request message that contain, in part, identical values compared to those that are already in operation for the part of the network where the modification is received from. Here, application of the conversion rules might lead to an "artificial" alteration of connection parameters in the other network part. In order to avoid these artificial alterations, the corresponding values already in operation in the succeeding network portion shall be used.

This is illustrated with the following example:

For an established connection, the IP side wants to modify only the token bucket sizes. Therefore, a MOD message is sent that contains identical bit rates and maximum packet sizes compared to those that are in use for the IP part of the connection and new token bucket size values. In this case, the MOD message generated by the A2IP IWU for the AAL type 2 network shall contain a Link Characteristics parameter with values identical to those already in use in the AAL type 2 network portion for this connection.

For the purposes of this Appendix, the following shorthand notation shall be used (see Tables I.1 to I.5).

Table I.1/Q.2632.1 – LC parameter fields

A = maximum CPS-SDU bit rate in the forward direction
B = average CPS-SDU bit rate in the forward direction
C = maximum CPS-SDU bit rate in the backward direction
D = average CPS-SDU bit rate in the backward direction
E = maximum CPS-SDU size in the forward direction
F = average CPS-SDU size in the forward direction
G = maximum CPS-SDU size in the backward direction
H = average CPS-SDU size in the backward direction

Table I.2/Q.2632.1 – SSISU parameter fields

I = maximum length of SSSAR-SDU in the forward direction
J = maximum length of SSSAR-SDU in the backward direction

Table I.3/Q.2632.1 – TC parameter fields

U = peak bit rate in the forward direction
V = sustainable bit rate in the forward direction
W = peak bit rate in the backward direction
X = sustainable bit rate in the backward direction
Y = maximum allowed packet size in the forward direction
Z = maximum allowed packet size in the backward direction

Table I.4/Q.2632.1 – PLC parameter fields

a = maximum CPS-SDU bit rate in the forward direction
b = average CPS-SDU bit rate in the forward direction
c = maximum CPS-SDU bit rate in the backward direction
d = average CPS-SDU bit rate in the backward direction
e = maximum CPS-SDU size in the forward direction
f = average CPS-SDU size in the forward direction
g = maximum CPS-SDU size in the backward direction
h = average CPS-SDU size in the backward direction

Table I.5/Q.2632.1 – PTC parameter fields

u = peak bit rate in the forward direction
v = sustainable bit rate in the forward direction
w = peak bit rate in the backward direction
x = sustainable bit rate in the backward direction
y = maximum allowed packet size in the forward direction
z = maximum allowed packet size in the backward direction

IPHL shall denote the total length of the header of the IP packet measured in octets and including the IP packet header, the UDP header, and, if RTP is used, the RTP header.

For any real number x, [x] is defined as the smallest integer greater or equal to x.

MAX (x1, ..., xn) determines the maximum, MIN (x1, ..., xn) the minimum of the values x1, ..., xn.

Bit rates are measured in bit per second ("bit/s"), sizes, e.g., of data structures, in octets.

I.1 Interworking for AAL type 2 to IP

I.1.1 Bit rates

The conversion from LC-type bit rates to TC-type bit rates requires to estimate the rate that will be caused by the IP overhead of length IPHL. This estimate is given in Table I.6. The values are "normalized" to multiples of 64 bit/s.

Table I.6/Q.2632.1 – IP overhead rates

Definition	Meaning
HBA: = [(IPHL×A) / (64×F)] × 64	Estimate of the IPHL bit rate for the Peak Bit Rate in the forward direction for given LC
HBa: = [(IPHL×a) / (64×f)] × 64	Estimate of the IPHL bit rate for the Peak Bit Rate in the forward direction for given PLC
HBB: = [(IPHL×B) / (64×F)] × 64	Estimate of the IPHL bit rate for the Sustainable Bit Rate in the forward direction for given LC
HBb: = [(IPHL×b) / (64×f)] × 64	Estimate of the IPHL bit rate for the Sustainable Bit Rate in the forward direction for given PLC
HBC: = [(IPHL×C) / (64×H)] × 64	Estimate of the IPHL bit rate for the Peak Bit Rate in the backward direction for given LC
HBc: = [(IPHL×c) / (64×h)] × 64	Estimate of the IPHL bit rate for the Peak Bit Rate in the backward direction for given PLC
HBD: = [(IPHL×D) / (64×H)] × 64	Estimate of the IPHL bit rate for the Sustainable Bit Rate in the backward direction for given LC
HBd: = [(IPHL×d) / (64×h)] × 64	Estimate of the IPHL bit rate for the Sustainable Bit Rate in the backward direction for given PLC
NOTE 1 – If a denominator turns out to be zero in any of the expressions above, the result of the expression shall be set equal to zero. NOTE 2 – If a factor does not exist in any of the expressions above, the result of the expression shall be set equal to zero. NOTE 3 – The definitions in this table are formal. Whether or not a certain expression is required, is determined by the interworking.	

Table I.7 defines the interworking of LC bit rates (AAL type 2) to TC bit rates (IP).

Table I.7/Q.2632.1 – TC bit rates determined from LC

TC parameter field	Value
U	A + HBA
V	B + HBB
W	C + HBC
X	D + HBD
NOTE 1 – The interworking and the involved protocols determine whether or not a certain field is required. NOTE 2 – The involved protocol determines whether or not a certain value is meaningful and valid.	

Table I.8 defines the interworking of PLC bit rates (AAL type 2) to PTC bit rates (IP).

Table I.8/Q.2632.1 – PTC bit rates determined from PLC

PTC parameter field	Value
u	a + HBa
v	b + HBb
w	c + HBc
x	d + HBd
NOTE 1 – The interworking and the involved protocols determine whether or not a certain field is required. NOTE 2 – The involved protocol determines whether or not a certain field is required.	

I.1.2 Maximum allowed packet sizes

Table I.9 defines the derivation of TC and PTC maximum allowed packet sizes from LC and PLC CPS-SDU sizes and/or SSISU.

Table I.9/Q.2632.1 – Determination of maximum allowed packet sizes

TC/PTC SDU size subfields	Value
Y	IPHL + MAX (E, I)
Z	IPHL + MAX (G, J)
y	IPHL + MAX (e, I)
z	IPHL + MAX (g, J)
NOTE 1 – "0" is assumed as value to guarantee a correct working of the MAXimum function if a certain parameter does not exist. NOTE 2 – The interworking and the involved protocols determine whether or not a certain field is required. NOTE 3 – The involved protocol determines whether or not a certain field is required.	

I.1.3 Token bucket sizes

The A2IP interworking unit shall set the token bucket sizes to the allowed maximum values. The allowed maximum value is the minimum out of the maximum defined by the protocol and the maximum defined within the network.

NOTE – An appropriate adjustment of the token bucket sizes controlled by the served user may be initiated from the IP network portion with a subsequent MOD message.

I.1.4 Determination of the TC class

ITU-T Rec. Q.2631.1 [2] supports two IP transfer capability classes: dedicated bandwidth and statistical bandwidth transfer capability.

For an incoming connection set-up from the AAL type 2 network portion, the AAL2IP interworking unit has to determine the IP transfer capability class to be used in the IP portion.

If all subsequent conditions

C1) A = B

C2) C = D

C3) E = F

C4) G = H

C5) MSLC not set

are satisfied, the dedicated bandwidth transfer capability shall be selected. If at least one of the conditions C1), ..., C5) is not fulfilled, the statistical bandwidth transfer capability shall be applied.

NOTE – If no LC parameter is received and no specific provisions are applied for this case, the A2IP IWU may reject the connection request.

I.2 Interworking for IP to AAL type 2

I.2.1 Bit rates

The conversion from TC-type bit rates to LC-type bit rates necessitates the estimation of the portion that is induced by the IP overhead of length IPHL. This estimate is given in Table I.10. The values are "normalized" to multiples of 64 bit/s.

Table I.10/Q.2632.1 – Received IP overhead rates

Definition	Meaning
HBU: = [(IPHL×U) / (64×Y)] × 64	Estimate of the IPHL bit rate portion in the Peak Bit Rate in the forward direction for given TC
HBu: = [(IPHL×u) / (64×y)] × 64	Estimate of the IPHL bit rate portion in the Peak Bit Rate in the forward direction for given PTC
HBV: = [(IPHL×V) / (64×Y)] × 64	Estimate of the IPHL bit rate portion in the Sustainable Bit Rate in the forward direction for given TC
HBv: = [(IPHL×v) / (64×y)] × 64	Estimate of the IPHL bit rate portion in the Sustainable Bit Rate in the forward direction for given PTC
HBW: = [(IPHL×W) / (64×Z)] × 64	Estimate of the IPHL bit rate portion in the Peak Bit Rate in the backward direction for given TC
HBw: = [(IPHL×w) / (64×z)] × 64	Estimate of the IPHL bit rate portion in the Peak Bit Rate in the backward direction for given PTC
HBX: = [(IPHL×X) / (64×Z)] × 64	Estimate of the IPHL bit rate portion in the Sustainable Bit Rate in the backward direction for given TC
HBx: = [(IPHL×x) / (64×z)] × 64	Estimate of the IPHL bit rate portion in the Sustainable Bit Rate in the backward direction for given PTC
NOTE 1 – If a denominator turns out to be zero in any of the expressions above, the result of the expression shall be set equal to zero. NOTE 2 – If a factor does not exist in any of the expressions above, the result of the expression shall be set equal to zero. NOTE 3 – The definitions in this table are formal. Whether or not a certain expression is required, is determined by the interworking.	

Tables I.11 and I.12 define the interworking of TC/PTC bit rates (IP) to LC/PLC bit rates (AAL type 2) if a statistical bandwidth transfer capability was received.

Table I.11/Q.2632.1 – Interworking of TC to LC bit rates

LC parameter field	Value
A	U – HBU
B	V – HBV
C	W – HBW
D	X – HBX
NOTE 1 – The interworking and the involved protocols determine whether or not a certain field is required. NOTE 2 – The involved protocol determines whether or not a certain field is required.	

Table I.12/Q.2632.1 – PLC bit rates determined from PTC

PLC parameter field	Value
a	u – HBu
b	v – HBv
c	w – HBw
d	x – HBx
NOTE 1 – The interworking and the involved protocols determine whether or not a certain field is required. NOTE 2 – The involved protocol determines whether or not a certain field is required.	

For received dedicated bandwidth transfer capability, Tables I.13 and I.14 define the interworking of TC/PTC bit rates (IP) to LC/PLC bit rates (AAL type 2).

Table I.13/Q.2632.1 – Interworking of TC to LC bit rates

LC parameter field	Value
A	U – HBU
B	U – HBU
C	W – HBW
D	W – HBW
NOTE 1 – The interworking and the involved protocols determine whether or not a certain field is required. NOTE 2 – The involved protocol determines whether or not a certain field is required.	

Table I.14/Q.2632.1 – PLC bit rates determined from PTC

PLC parameter field	Value
a	u – HBu
b	u – HBu
c	w – HBw
d	w – HBw
NOTE 1 – The interworking and the involved protocols determine whether or not a certain field is required. NOTE 2 – The involved protocol determines whether or not a certain field is required.	

I.2.2 CPS-SDU sizes

Tables I.15 and I.16 define the derivation of LC/PLC CPS-SDU sizes from TC/PTC maximum allowed packet sizes.

Table I.15/Q.2632.1 – TC to LC CPS-SDU size interworking

LC CPS-SDU size subfields	Value
E, F	MIN (Y – IPHL, 45)
G, H	MIN (Z – IPHL, 45)

Table I.16/Q.2632.1 – PTC to PLC CPS-SDU size interworking

PLC CPS-SDU size subfields	Value
e, f	MIN (y – IPHL, 45)
g, h	MIN (z – IPHL, 45)

I.2.3 SSISU SDU sizes

Table I.17 defines the derivation of SSISU SDU sizes from TC and PTC maximum allowed packet sizes.

Table I.17/Q.2632.1 – TC and PTC to SSISU interworking

SSISU subfields	Value
I	MAX (Y – IPHL, y – IPHL)
J	MAX (Z – IPHL, z – IPHL)
NOTE 1 – "0" is assumed as value to guarantee a correct working of the MAXimum function if a certain parameter does not exist. NOTE 2 – If the value of all SSISU subfields determined according to these rules does not exceed 45, no SSISU parameter will be generated at all.	

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