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**Q.2630.3**

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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

# AAL type 2 signalling protocol – Capability Set 3

ITU-T Recommendation Q.2630.3

ITU-T Q-SERIES  RECOMMENDATIONS

**SWITCHING AND SIGNALLING**

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

# ITU-T Recommendation Q.2630.3

## AAL type 2 signalling protocol – Capability Set 3

**Summary**

This Recommendation specifies the inter-node protocol and nodal functions that control AAL type 2 point-to-point connections.

The AAL type 2 signalling protocol specified in this Recommendation is usable in switched and non-switched environments and can operate in public or private networks over a range of signalling transport protocol stacks.

It also provides maintenance capabilities, carriage of user-plane protocol stack information and carriage of an identifier to link the connection control protocol with other higher layer control protocols.

FOREWORD

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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.2630.3

# AAL type 2 signalling protocol – Capability Set 3

## 1 Scope

This Recommendation describes the AAL type 2 signalling protocol that supports the dynamic establishment and release of individual AAL type 2 point-to-point connections. It also describes the maintenance procedures, the framework of the protocol, and the interactions between an AAL type 2 signalling protocol entity and:

• the signalling protocol user;

• a signalling transport converter; and

• layer management.

This Recommendation also describes the connection states, messages, parameters, timers, local, and peer-to-peer procedures used for the control of those connections. The scope of this Recommendation is illustrated in Figure 1-1. The AAL type 2 signalling protocol can be deployed over a range of signalling transport protocol stacks.

This Recommendation is based on the requirements defined in ITU-T Q-series Recommendations – Supplement 42 [21] "Signalling Requirements for AAL type 2 Link Control Capability Set 3".
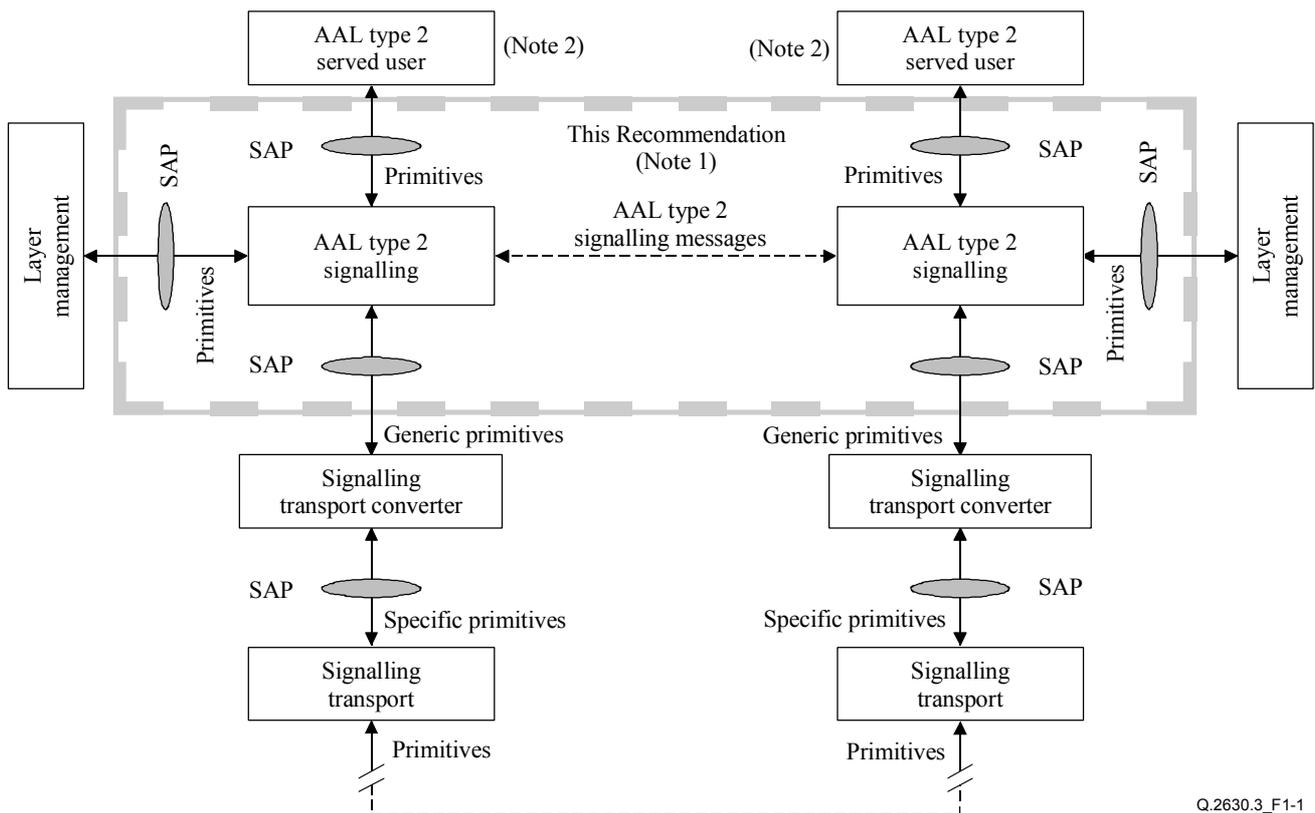


NOTE 1 – The entities and Service Access Points (SAP) bounded by the gray broken line indicate the extent of the definitions specified in this Recommendation.

NOTE 2 – There are cases where the AAL type 2 served user is not present.

**Figure 1-1/Q.2630.3 – Functional architecture of the AAL type 2 signalling**

## 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 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 I.363.2 (2000), *B-ISDN ATM adaptation layer specification: Type 2 AAL*.

[2]     ITU-T Recommendation I.361 (1999), *B-ISDN ATM layer specification*.

[3]     ITU-T Recommendation X.200 (1994) ISO/IEC 7498-1:1994, *Information technology – Open Systems Interconnection – Basic Reference Model: The basic model*.

[4]     ITU-T Recommendation X.210 (1993) | ISO/IEC 10731:1994, *Information technology – Open Systems Interconnection – Basic Reference Model: Conventions for the definition of OSI services*.

[5]     ITU-T Recommendation X.213 (2001) | ISO/IEC 8348:2002, *Information technology – Open Systems Interconnection – Network service definition*.

[6]     ITU-T Recommendation Q.850 (1998), *Usage of cause and location in the Digital Subscriber Signalling System No. 1 and the Signalling System No. 7 ISDN User Part*.

[7]     ITU-T Recommendation Q.2610 (1999), *Usage of cause and location in B-ISDN user part and DSS2*.

[8]     ITU-T Recommendation I.366.2 (1999), *AAL type 2 service specific convergence sublayer for trunking*.

[9]     ITU-T Recommendation I.366.1 (1998), *Segmentation and Reassembly Service Specific Convergence Sublayer for the AAL type 2*.

[10]    ITU-T Recommendation E.164 (1997), *The international public telecommunication numbering plan*.

[11]    IEEE Standard 802-2001, *IEEE Standards for Local and Metropolitan Area Networks: Overview and Architecture*.

[12]    ITU-T Recommendation Q.2150.0 (2001), *Generic signalling transport service*.

[13]    ITU-T Recommendation I.356 (2000), *B-ISDN ATM layer cell transfer performance*.

[14]    ITU-T Recommendation I.366.2 (2000), *AAL type 2 service specific convergence sublayer for narrow-band services*.

[15]    ITU-T Recommendation Q.2630.1 (1999), *AAL type 2 signalling protocol – Capability Set 1*.

[16]    ITU-T Recommendation Q.2630.2 (2000), *AAL type 2 signalling protocol – Capability Set 2*.

[17]    ITU-T Recommendation E.412 (2003), *Network management controls*.

[18]     ITU-T Recommendation Q.542 (1993), *Digital exchange design objectives – Operations and maintenance*.

[19]     ITU-T Recommendation I.378 (2002), *Traffic control and congestion control at the ATM Adaptation Layer Type 2*.

## 2.2     Informative references

The documents listed in this clause provide informative background information for the reader and are not normative within this Recommendation.

[21]     ITU-T Q-series Recommendations – Supplement 42 (2003), *Technical Report TRQ.2402: Transport control signalling requirements – Signalling requirements for AAL type 2 link control Capability Set 3*.

[22]     ITU-T Recommendation Q.2150.1 (2001), *Signalling transport converter on MTP3 and MTP3b*.

[23]     ITU-T Recommendation Q.2150.2 (2001), *Signalling transport converter on SSCOP and SSCOPMCE*.

[24]     ITU-T Recommendation Q.2210 (1996), *Message transfer part level 3 functions and messages using the services of ITU-T Recommendation Q.2140*.

[25]     ITU-T Recommendation Q.2110 (1994), *B-ISDN ATM adaptation layer – Service Specific Connection Oriented Protocol (SSCOP)*.

[26]     ITU-T Recommendation Q.2130 (1994), *B-ISDN signalling ATM adaptation layer – Service specific coordination function for support of signalling at the user-network interface (SSCF at UNI)*.

[27]     ITU-T Recommendation Q.2941.2 (1999), *Digital Subscriber Signalling System No. 2 – Generic identifier transport extensions*.

[28]     ITU-T Recommendation Q.2150.3 (2002), *Signalling transport converter on SCTP*.

[29]     ITU-T Recommendation Q.2140 (1995), *B-ISDN ATM adaptation layer – Service specific coordination function for signalling at the network node interface (SSCF at NNI)*.

[30]     ETSI TS 126 103 V 5.1.0 (2002), *Universal Mobile Telecommunications System (UMTS); Speech codec list for GSM and UMTS (3GPP TS 26.103 version 5.1.0 Release 5)*.

## 3     Definitions

This Recommendation is based upon the concepts developed in ITU-T Recs X.200 [3] and X.210 [4].

In addition, for the purposes of this Recommendation, the following definitions apply:

**3.1     AAL type 2 channel**: A concept used in ITU-T Rec. I.363.2 [1] to describe transport of CPS-packets [1] associated in a common unique identifier value called CID on an ATM VCC.

**3.2     AAL type 2 connection**: The logical concatenation of one or more AAL type 2 links between two AAL type 2 service endpoints.

**3.3     AAL type 2 connection resource**: Describe the attributes of the AAL type 2 links making up the connection, and the Service Specific Convergence Sublayer resources used at the AAL type 2 service endpoints.

**3.4     AAL type 2 link**: The logical user plane communication facility between two adjacent AAL type 2 switching points or service endpoints. An AAL type 2 link is designated by a single CID value.

**3.5**     **AAL type 2 link characteristics**: Information that describes the attributes of the AAL type 2 link.

NOTE – In this Recommendation, AAL type 2 link characteristics are only used for backward compatibility, i.e., for interworking with AAL type 2 nodes that conform only to ITU-T Recs Q.2630.1 [15] or Q.2630.2 [16] (see Annex C).

**3.6**     **AAL type 2 node**: An AAL type 2 service endpoint or an AAL type 2 switch.

**3.7**     **AAL type 2 path**: An ATM VCC between two adjacent AAL type 2 nodes. This ATM VCC can either be an SVC, SPVC or PVC.

**3.8**     **AAL type 2 path identifier**: The identifier of the AAL type 2 path.

**3.9**     **AAL type 2 requested path type**: Information that describes the AAL type 2 path type. These path types may be "stringent class", "tolerant class", or "stringent bi-level class" (see ITU-T Rec. I.356 [13]).

**3.10**    **AAL type 2 service endpoint**: A termination point of an AAL type 2 connection.

**3.11**    **AAL type 2 served user**: The user of an AAL type 2 signalling protocol.

**3.12**    **AAL type 2 signalling protocol**: Control plane functions for establishing and releasing AAL type 2 connections and the maintenance functions associated with the AAL type 2 signalling.

**3.13**    **AAL type 2 signalling transport**: A facility for carrying AAL type 2 signalling messages.

**3.14**    **AAL type 2 signalling endpoint**: The termination point of an AAL type 2 signalling transport.

**3.15**    **AAL type 2 switch**: A system capable of switching AAL type 2 connections.

**3.16**    **AAL type 2 transfer capability**: Information that describes the attributes of the AAL type 2 link according to ITU-T Rec. I.378 [19].

NOTE – The attributes of the AAL type 2 link as described by AAL type 2 transfer capability parameters are intended to replace the attributes of the AAL type 2 link as described by AAL type 2 link characteristics parameters. The AAL type 2 transfer capability may describe the attributes of the AAL type 2 link in greater detail than the AAL type 2 link characteristics.

**3.17**    **ATM layer signalling**: Control plane functions for establishing, clearing and maintaining ATM VCCs.

**3.18**    **ATM VCC**: The logical concatenation of one or more ATM virtual channel links between two ATM service endpoints.

**3.19**    **Connection resource**: (see AAL type 2 connection resource.)

**3.20**    **CS-1 node**: An AAL type 2 node conforming to capability set 1 (see ITU-T Rec. Q.2630.1 [15]).

**3.21**    **CS-1 service endpoint**: An AAL type 2 service endpoint conforming to capability set 1 (see ITU-T Rec. Q.2630.1 [15]).

**3.22**    **CS-1 switch**: An AAL type 2 switch conforming to capability set 1 (see ITU-T Rec. Q.2630.1 [15]).

**3.23**    **CS-2 node**: An AAL type 2 node conforming to capability set 2 (see ITU-T Rec. Q.2630.2 [16]).

**3.24**    **CS-2 service endpoint**: An AAL type 2 service endpoint conforming to capability set 2 (see ITU-T Rec. Q.2630.2 [16]).

**3.25**    **CS-2 switch**: An AAL type 2 switch conforming to capability set 2 (see ITU-T Rec. Q.2630.2 [16]).

**3.26    CS-3 node**: An AAL type 2 node, switch, or service endpoint conforming to capability set 3 (defined in this Recommendation).

**3.27    CS-3 service endpoint**: An AAL type 2 service endpoint conforming to capability set 3 (defined in this Recommendation).

**3.28    CS-3 switch**: An AAL type 2 switch conforming to capability set 3 (defined in this Recommendation).

**3.29    field**: Information carried in a parameter in a message. A field can have fixed or variable length data.

**3.30    generic signalling transport**: The function that enables an AAL type 2 signalling entity to communicate with a peer AAL type 2 signalling entity independently of the underlying signalling transport.

**3.31    link associated signalling relationship**: A logical signalling relationship that is established during AAL type 2 connection establishment between two protocol entities in adjacent AAL type 2 nodes associated with the AAL type 2 link as part of the connection. A link associated signalling relationship is uniquely identified by a pair of Signalling Association Identifiers (Originating and Destination) within a signalling transport association and for the time the link exists.

**3.32    link characteristics**: (See AAL type 2 link characteristics.)

**3.33    network default stringent QoS class**: A stringent QoS class as defined in ITU-T Rec. I.356 [13] and as deployed in a network operating with signalling defined in ITU-T Rec. Q.2630.1 [15].

**3.34    nodal function**: The functions that provide the bridge between incoming and outgoing protocol entities, perform the routing, and keep track of the AAL type 2 path resources.

**3.35    parameter**: Information carried in a message. A parameter has a fixed, defined set of fields.

**3.36    path identifier**: See AAL type 2 path identifier.

**3.37    protocol entity**: The functions performed within an AAL type 2 signalling entity that relate to the exchange of AAL type 2 signalling information.

**3.38    requested path type**: (See AAL type 2 requested path type.)

**3.39    signalling transport association**: A signalling capability that exists between two adjacent AAL type 2 nodes to control the AAL type 2 connections that may exist in one or more AAL type 2 paths. There may be one or more signalling transport associations between two adjacent AAL type 2 nodes.

**3.40    signalling transport**: A signalling link or network that connects two AAL type 2 nodes.

**3.41    signalling transport converter**: A function that converts the services provided by a particular signalling transport to the services required by the generic signalling transport.

**3.42    subfield**: The smallest unit of information in a field that has its own functional meaning.

**3.43    transfer capability**: (See AAL type 2 transfer capability.)


# 4    Abbreviations

This Recommendation uses the following abbreviations:

A2P        AAL type 2 Path Identifier

A2SU      AAL type 2 Served User

AAL        ATM Adaptation Layer

| | |
|---|---|
| ACC | Automatic Congestion Control |
| AESA | ATM End System Address |
| AMR | Adaptive Multi-rate Codec |
| ANI | Adjacent AAL type 2 Node Identifier |
| ATM | Asynchronous Transfer Mode |
| ATM VCC | ATM Virtual Channel Connection |
| BCD | Binary Coded Decimal |
| BLC | Block Confirm Message |
| BLO | Block Request Message |
| CAS | Channel Associated Signalling |
| CAU | Cause Parameter |
| CEID | AAL type 2 Connection Element Identifier |
| CFN | Confusion Message |
| CID | Channel Identifier |
| CMD | Circuit Mode Data |
| CP | Connection Priority |
| CPHL | CPS Packet Header Overhead Length |
| CPS | (AAL type 2) Common Part Sublayer |
| CS | Capability Set |
| CS-1 | Capability Set 1 (ITU-T Rec. Q.2630.1 [15]) |
| CS-2 | Capability Set 2 (ITU-T Rec. Q.2630.2 [16]) |
| CS-3 | Capability Set 3 (this Recommendation) |
| DA2EA | Destination AAL type 2 Service Endpoint Address (Note 1) |
| DESEA | Destination E.164 Service Endpoint Address Parameter (Note 1) |
| DNSEA | Destination NSAP Service Endpoint Address Parameter (Note 1) |
| DSAID | Destination Signalling Association Identifier |
| DTMF | Dual Tone Multi-Frequency |
| ECF | Establish Confirm Message |
| ERQ | Establish Request Message |
| FAX | Demodulated Facsimile Data |
| FBW | Fixed Bandwidth Transfer Capability |
| FRM | Frame Mode Data |
| GST | Generic Signalling Transport |
| HBx | Header Bit Rate associated with x |
| HC | Hop Counter |
| ID | Identifier |

| | |
|---|---|
| IEC | International Electrotechnical Commission |
| IEEE | Institute of Electrical and Electronics Engineers |
| ISO | International for Standardization Organization |
| LB | Loopback |
| LC | Link Characteristics (Note 2) |
| LM | Layer Management |
| LSB | Least Significant Bit |
| M | Mandatory |
| MF-R1 | Multi-Frequency R1 |
| MF-R2 | Multi-Frequency R2 |
| MOA | Modification Acknowledge message |
| MOD | Modification Request message |
| MOR | Modification Reject message |
| MSB | Most Significant Bit |
| MSLC | Modify Support for Link Characteristics |
| MSSSI | Modify Support for SSCS Information |
| MTP3b | Message Transfer Part level 3 using ITU-T Rec. Q.2140 [29] |
| NF | Nodal Function |
| NNI | Network-Network Interface |
| NSAP | Network Service Access Point |
| O | Optional |
| OA2EA | Origination AAL type 2 Service Endpoint Address |
| OESEA | Origination E.164 Service Endpoint Address Parameter |
| ONSEA | Origination NSAP Service Endpoint Address Parameter |
| OSAID | Originating Signalling Association Identifier (Parameter) |
| OUI | Organizational Unique Identifier |
| PFBW | Preferred FBW |
| PLC | Preferred Link Characteristics |
| PSSCS | Preferred SSCS Information |
| PSSIAE | Preferred Service Specific Information (Audio Extended) |
| PSSIME | Preferred Service Specific Information (Multirate Extended) |
| PT | Path Type |
| PTC | Preferred Transfer Capability |
| PVBWS | Preferred VBWS |
| PVBWT | Preferred VBWT |

| | |
|---|---|
| PVC | Permanent Virtual Channel |
| RC | Rate Control |
| REL | Release Request Message |
| RES | Reset Request Message |
| RLC | Release Confirm Message |
| RSC | Reset Confirm Message |
| SAAL | ATM Adaptation Layer for Signalling |
| SAID | Signalling Association Identifier |
| SAP | Service Access Point |
| SAR | Segmentation and Reassembly (Sublayer) |
| SDL | Specification and Description Language |
| SDU | Service Data Unit |
| SPVC | Soft PVC |
| SSCOP | Service Specific Connection Oriented Protocol |
| SSCS | Service Specific Convergence Sublayer |
| SSCS | SSCS Information |
| SSIA | Service Specific Information (Audio) Parameter |
| SSIAE | Service Specific Information (Audio Extended) |
| SSIM | Service Specific Information (Multirate) Parameter |
| SSIME | Service Specific Information (Multirate Extended) |
| SSISA | Service Specific Information (SAR-assured) Parameter |
| SSISU | Service Specific Information (SAR-unassured) Parameter |
| SSSAR | Segmentation and Reassembly Service Specific Convergence Sublayer |
| STC | Signalling Transport Converter |
| SUCI | Served User Correlation ID |
| SUGR | Served User Generated Reference |
| SUT | Served User Transport |
| SVC | Switched Virtual Channel |
| SYN | Synchronization of change in SSCS operation |
| TAR | Temporary Alternative Routing |
| TC | Transfer Capability |
| TCC | TAR Controlled Connection |
| TCI | Test Connection Indication |
| TCS | Transfer Capability Support |
| TED | Transmission Error Detection |
| UBC | Unblock Confirm Message |
| UBL | Unblock Request Message |

| UNI | User-Network Interface |
| UU | User-user |
| VBWS | Variable Bandwidth Stringent Transfer Capability |
| VBWT | Variable Bandwidth Tolerant Transfer Capability |
| VCC | Virtual Channel Connection |
| VPC | Virtual Path Connection |

NOTE 1 – In ITU-T Recs Q.2630.1 [15] and Q.2630.2 [16], the abbreviation A2EA was used instead of DA2EA, ESEA instead of DESEA, and NSEA instead of DNSEA.

NOTE 2 – In ITU-T Rec. Q.2630.1 [15], the abbreviation ALC was used instead of LC.


# 5      General framework of the AAL type 2 signalling protocol

The AAL type 2 signalling protocol provides the signalling capability to establish, release and maintain AAL type 2 point-to-point connections across a series of ATM VCCs that carry AAL type 2 links. These services are accessible via the AAL type 2 served user service access point (A2SU-SAP).

The AAL type 2 signalling protocol also provides maintenance functions associated with the AAL type 2 signalling.

An AAL type 2 signalling endpoint shall be able to control AAL type 2 links on more than one AAL type 2 path. These AAL type 2 paths may be contained on different ATM VPCs, which in turn may be carried on different ATM physical interfaces.

Two peer AAL type 2 signalling entities rely on the generic signalling transport service to provide assured data transfer between them and service availability indications. These services are accessible via the Generic Signalling Transport Service Access Point (GST-SAP).

NOTE – Primitives over the A2SU-SAP, GST-SAP, and LM-SAP are used for descriptive purpose only. They do not imply a specific implementation.

Both peer AAL type 2 signalling entities provide the same set of services.

The AAL type 2 signalling entity is subdivided into protocol entities and nodal functions as shown in Figure 5-1. At each AAL type 2 service endpoint, the AAL type 2 signalling entity communicates with the AAL type 2 served user. At an AAL type 2 switch, the AAL type 2 signalling entity does not communicate with an AAL type 2 served user.

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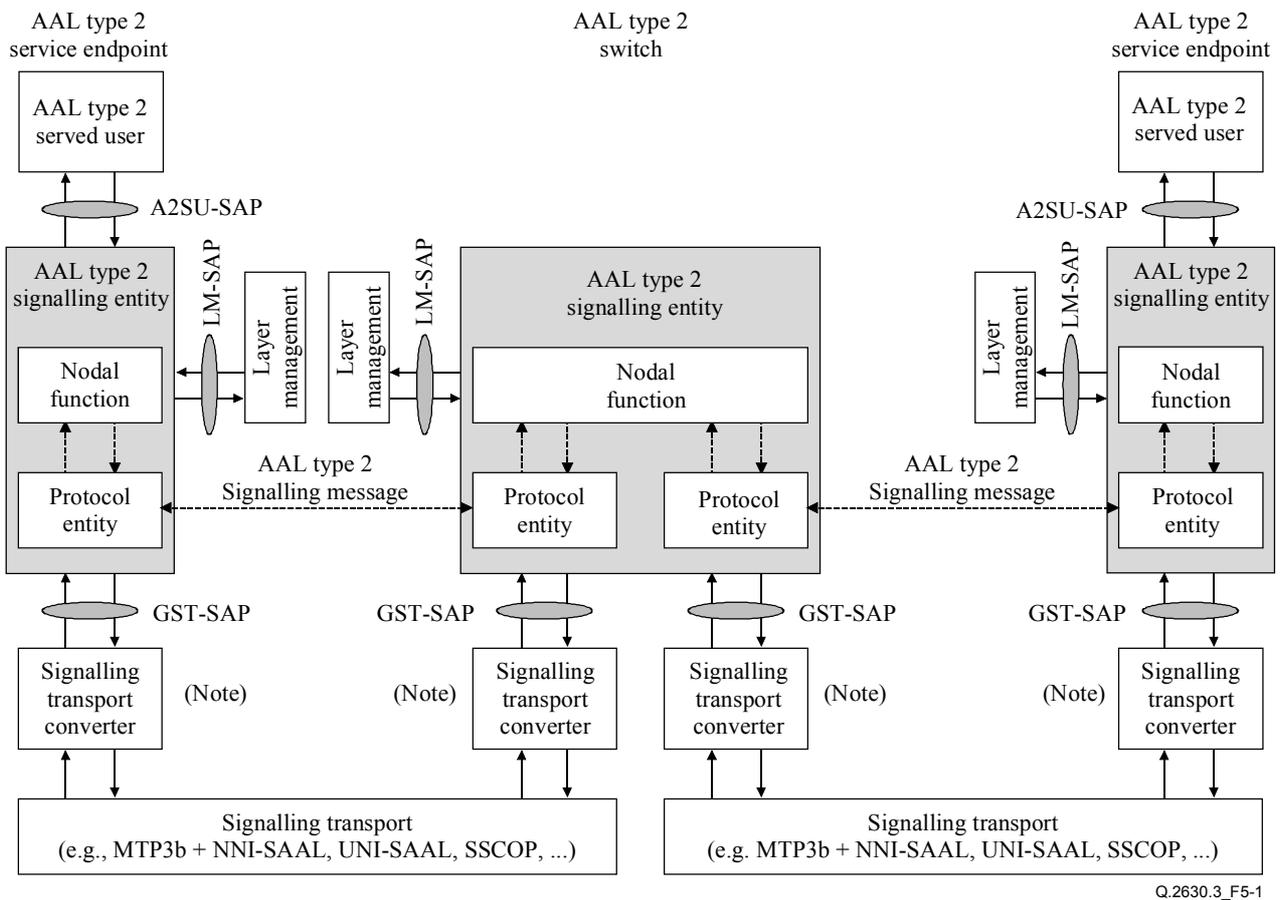
NOTE – In every AAL type 2 node, a signalling transport converter instance is associated with each AAL type 2 signalling transport.

**Figure 5-1/Q.2630.3 – AAL type 2 signalling protocol reference architecture**

Protocol Entities define the interactions between two adjacent AAL type 2 nodes. AAL type 2 messages are exchanged between peer protocol entities using the generic signalling transport service.

The AAL type 2 signalling is independent of the signalling transport, although an assured data transport is required and a message size limit applies. The Generic Signalling Transport Service used is defined in ITU-T Rec. Q.2150.0 [12]. To adapt the Generic Signalling Transport Services to a specific signalling transport service, a signalling transport converter may be needed. The specification of signalling transport converters is beyond the scope of this Recommendation (see ITU-T Recs Q.2150.1 [22], Q.2150.2 [23] and Q.2150.3 [28]).

The protocol entity is divided into several procedures as shown in Figure 5-2.



Q.2630.3_F5-2
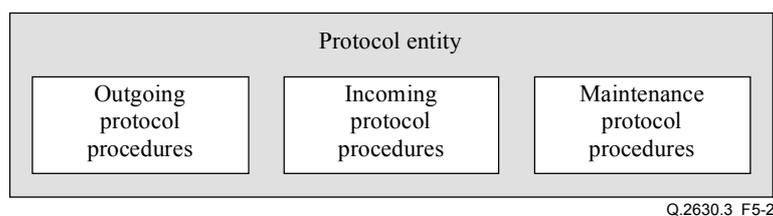
**Figure 5-2/Q.2630.3 – Internal structure of the AAL type 2 signalling protocol entity**

The outgoing protocol procedures provide the mechanism to initiate an AAL type 2 connection request. The incoming protocol procedures are applied when a request for an AAL type 2 connection is received from a peer entity. Both of these procedures provide for the orderly release of an AAL type 2 connection. The maintenance protocol procedures provide the mechanisms to align the status of the AAL type 2 resources at the two adjacent AAL type 2 nodes and the procedures to block and unblock an AAL type 2 path.

The unrecognized information procedures in the nodal function as well as in the protocol entities provide the forward compatibility mechanism which enables extension of the protocol in the future.

The nodal function provides the bridge between incoming and outgoing protocol entities, performs the routing functionality, and keeps track of the AAL type 2 path resources.

## 5.1 Interface between the AAL type 2 signalling entity and the AAL type 2 served user

### 5.1.1 Service provided by the AAL type 2 signalling entity

The AAL type 2 signalling entity provides the following services to the AAL type 2 served user across the A2SU-SAP:

• establishment of AAL type 2 connections;

• release of AAL type 2 connections; and

• modification of AAL type 2 connection resources.

The AAL type 2 signalling protocol entity is independent of the AAL type 2 served user.

### 5.1.2 Primitives between AAL type 2 signalling entities and the AAL type 2 served user

The A2SU-SAP primitives are used:

1) by the originating served user to initiate AAL type 2 connection establishment and by the originating and destination served users to initiate the release of a connection;

2) by the AAL type 2 signalling entities to indicate an incoming connection to the destination served user and notifying either the originating or destination served user of the release of a connection;

3) by the modification sending served user to originate, and the modification receiving served user to respond to, an AAL type 2 connection resource modification request; and

4) by the AAL type 2 signalling entities to indicate a modification of the AAL type 2 connection resource to the modification receiving served user and notify the modification originating served user of the successful or unsuccessful modification.

NOTE – When sending a primitive between the signalling protocol and its user, the primitive needs to be associated with a particular AAL type 2 connection instance. The mechanism used for this binding is considered to be an implementation detail and therefore is outside the scope of this Recommendation.

The services are provided through the transfer of primitives which are summarized in Table 5-1, and are defined after the table.

The AAL type 2 served user passes information in parameters in the primitives. Some of those parameters are mandatory and some are optional; the appropriate usage of the parameters is described in clause 8.

**Table 5-1/Q.2630.3 – Primitives and parameters exchanged between the AAL type 2 signalling entities and the AAL type 2 served user**

| Primitive generic name | Type | | | |
|---|---|---|---|---|
| | Request | Indication | Response | Confirm |
| ESTABLISH | DA2EA, OA2EA, SUGR, SUT, TC, PTC, TCS, LC, PLC, MSLC, SSCS, PSSCS, MSSSI, PT, CP, TCI | OA2EA, SUGR, SUT, TC, PTC, TCS, LC, PLC, MSLC, SSCS, PSSCS, MSSSI, PT, CP, TCI | Not defined | TCS, MSLC, MSSSI |
| RELEASE | Cause | Cause | Not defined | Cause |
| MODIFY | TC, LC, SSCS, SUCI | TC, LC, SSCS, SUCI | SUCI | SUCI |
| MODIFY-REJECT | Not defined | Not defined | Not defined | Cause |

a) **ESTABLISH.request**:
This primitive is used by the AAL type 2 served user to initiate the establishment of a new AAL type 2 connection, and optionally request the capability for subsequent modification to be performed on the requested connection.

b) **ESTABLISH.indication**:
This primitive is used by the AAL type 2 signalling entities to indicate that an incoming connection has been successfully established, and optionally indicate that the incoming connection is capable of subsequent modification.

c) **ESTABLISH.confirm**:
This primitive is used by the AAL type 2 signalling entities to indicate that the connection (which was previously requested by the served user) has successfully been established and optionally indicate that the established connection is capable of subsequent modification.

d) **RELEASE.request**:
This primitive is used by the AAL type 2 served user to initiate clearing of an AAL type 2 connection.

e) **RELEASE.indication**:
This primitive is used by the AAL type 2 signalling entities to indicate that an AAL type 2 connection has been released.

f) **RELEASE.confirm**:
This primitive is used as a negative acknowledgement for an ESTABLISH.request.

g) **MODIFY.request**:
This primitive is used by the AAL type 2 served user to originate the modification of the AAL type 2 connection resource.

h) **MODIFY.indication**:
This primitive is used by the AAL type 2 signalling entities to indicate that the modification of the AAL type 2 connection resource has been successfully performed.

i) **MODIFY.response**:
This primitive is used by the AAL type 2 served user to respond to the modification of the AAL type 2 connection resource.

j)   **MODIFY.confirm**:
     This primitive is used by the AAL type 2 signalling entities to indicate that the AAL type 2 connection resource modification (which was previously requested by the served user) has successfully been performed.

k)   **MODIFY-REJECT.confirm**:
     This primitive is used by the AAL type 2 signalling entities to indicate that the AAL type 2 connection resource modification (which was previously requested by the served user) has been rejected.

## 5.1.3   Parameters between AAL type 2 signalling entities and the AAL type 2 served user

a)   **Destination AAL type 2 Service Endpoint Address (DA2EA)**
     This parameter carries the service endpoint address of the destination. It can have the form of an E.164 address or an NSAP address.

b)   **Origination AAL type 2 Service Endpoint Address (OA2EA)**
     This parameter carries the service endpoint address of the origination. It can have the form of an E.164 address or an NSAP address.

c)   **Served User Generated Reference (SUGR)**
     This parameter carries a reference provided by the originating AAL type 2 served user and this reference is transported unmodified to the destination served user.

d)   **Served User Transport (SUT)**
     This parameter carries the served user data that is transported unmodified to the destination served user.

e)   **Transfer Capability (TC)**
     This parameter gives an indication of the AAL type 2 transfer capability required for the AAL type 2 connection. This parameter can have the form of either:

     •   Fixed Bandwidth Transfer Capability; or

     •   Variable Bandwidth Stringent Transfer Capability; or

     •   Variable Bandwidth Tolerant Transfer Capability.

f)   **Preferred Transfer Capability (PTC)**
     This parameter gives an indication that the AAL type 2 Transfer Capability shall be set as indicated in this parameter if the modification of the AAL type 2 Transfer Capability is permitted. This parameter can have the form of either:

     •   Preferred Fixed Bandwidth Transfer Capability; or

     •   Preferred Variable Bandwidth Stringent Transfer Capability; or

     •   Preferred Variable Bandwidth Tolerant Transfer Capability.

g)   **Transfer Capability Support (TCS)**
     This parameter gives an indication whether Transfer Capabilities are supported by all AAL type 2 nodes of the AAL type 2 connection.

h)   **Link Characteristics (LC)**
     This parameter gives an indication of the resources required for the AAL type 2 connection and is used only for AAL type 2 path selection and connection admission control.

i)   **Preferred Link Characteristics (PLC)**
     This parameter gives an indication that the Link Characteristics shall be set as indicated in this parameter if the modification of the Link Characteristics is permitted.

j)    **Modify Support for Link Characteristics (MSLC)**
This parameter gives an indication that the AAL type 2 Link Characteristics of the AAL type 2 connection may need to be modified during the lifetime of the AAL type 2 connection (ESTABLISH.request) or is permitted to be modified (ESTABLISH.indication and ESTABLISH.confirm).

k)    **SSCS Information (SSCS)**
This parameter identifies the type and the capabilities of an AAL type 2 SSCS protocol. This parameter can have the form of either:

•    Service Specific Information (Multirate) (see ITU-T Rec. I.366.2 [14]),

•    Service Specific Information (Audio) (see ITU-T Rec. I.366.2 [14]),

•    Service Specific Information (Multirate Extended) (see Note);

•    Service Specific Information (Audio Extended) (see Note); or

•    Service Specific Information (SAR) (see ITU-T Rec. I.366.1 [9]) with or without the additional parameters necessary for the assured data transfer.

NOTE – Multirate Extended and Audio Extended are used in this Recommendation to support the services of the U-Plane definitions of the 2000 version of ITU-T Rec. I.366.2 [14]. The (non-extended) Multirate and Audio are retained for backward compatibility with ITU-T Rec. Q.2630.1 [15]. For example, the Audio Extended form of the SSCS Information parameter in this Recommendation (see 7.4.19) adds support for LB, RC, and SYN that were added as U-Plane functions in the 2000 version of ITU-T Rec. I.366.2 [14].

l)    **Preferred SSCS Information (PSSCS)**
This parameter gives an indication that the SSCS Information shall be set as indicated in this parameter if the modification of the SSCS Information is permitted. This parameter can have the form of either:

•    Preferred Service Specific Information (Multirate Extended) (see Note); or

•    Preferred Service Specific Information (Audio Extended) (see Note).

Modification of Frame Mode Data as specified in ITU-T Rec. I.366.2 [14], or modification of SAR as specified in ITU-T Rec. I.366.1 [9] is outside the scope of this Recommendation.

m)    **Modify Support for SSCS Information (MSSSI)**
This parameter gives an indication that the SSCS Information of the AAL type 2 connection may need to be modified during the lifetime of the AAL type 2 connection (ESTABLISH.request) or are permitted to be modified (ESTABLISH.indication and ESTABLISH.confirm).

n)    **Path Type (PT**)
This parameter indicates a request for an AAL type 2 path with a specified Quality of Service.

o)    **Connection Priority (CP)**
This parameter carries information sent in the forward direction to indicate the priority level of the connection request.

p)    **Test Connection Indication (TCI)**
By its presence, this parameter indicates that the AAL type 2 connection to be established is a test connection.

q)    **Cause**
This parameter describes the reason for the release of the AAL type 2 connection. It also may indicate the reason why an AAL type 2 connection could not be established or a modification was rejected.

r) **Served User Correlation ID (SUCI)**

This parameter carries the SSCS correlation ID (as specified in ITU-T Rec. I.366.2 [14]) during the modification of SSCS information and is transported unmodified to the destination or origination served user.

## 5.2 Interface between the AAL type 2 signalling entity and the generic signalling transport

### 5.2.1 Service provided by the generic signalling transport service

The Generic Signalling Transport Service is specified in ITU-T Rec. Q.2150.0 [12]. For convenience, a summary of the primitives for accessing the service is reproduced in Table 5-2. In the event of any difference between this table and the definitions in ITU-T Rec. Q.2150.0, the definitions in ITU-T Rec. Q. 2150.0 take precedence.

**Table 5-2/Q.2630.3 – Primitives and parameters of the Generic Signalling Transport Sublayer**

| Primitive | Type | | | |
|---|---|---|---|---|
| generic name | Request | Indication | Response | Confirm |
| START-INFO | Not defined | Max_Length CIC_Control | Not defined | Not defined |
| IN-SERVICE | Not defined | Level | Not defined | Not defined |
| OUT-OF-SERVICE | Not defined | (Note 1) | Not defined | Not defined |
| CONGESTION | Not defined | Level | Not defined | Not defined |
| TRANSFER | Sequence Control STC User Data Priority (Note 2) | STC User Data Priority (Note 2) | Not defined | Not defined |
| NOTE 1 – This primitive has no parameters. NOTE 2 – This parameter is a national option (and the use of this parameter is not supported by all signalling transports). | | | | |

On the establishment of a signalling transport converter entity and the respective signalling transport converter user entity, for example at power up, the initial conditions are the same as if an OUT-OF-SERVICE.indication primitive had been conveyed across this SAP. Also at this time the START-INFO.indication is sent to the signalling entity.

NOTE – The CIC_Control parameter of the START-INFO.indication is ignored by the AAL type 2 signalling entity.

### 5.2.2 State transition diagram for sequences of primitives of the generic signalling transport service

This clause defines the constraints on the sequences in which the primitives may occur at the layer boundaries of the generic signalling transport service. The sequences are related to the states at one generic signalling transport endpoint between the generic signalling transport service provider and its user. The possible overall sequences of primitives are shown in the state transition diagram, Figure 5-3.
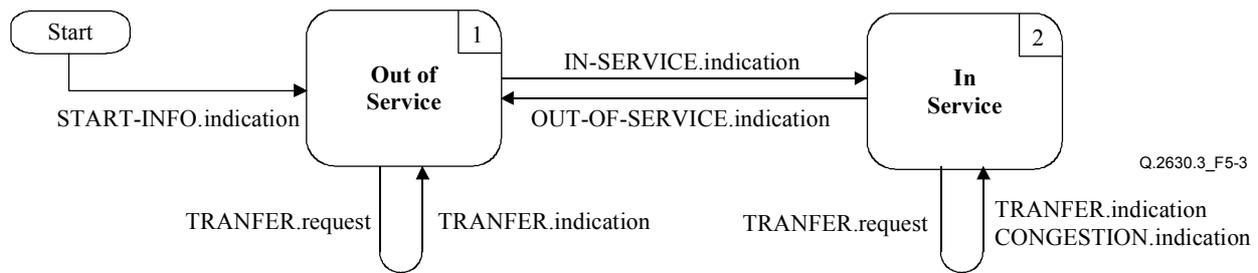
**Figure 5-3/Q.2630.3 – State transition diagram for sequences of primitives between the GST and its user**

This model assumes that a request primitive is never issued at the same time as an indication primitive. The model also assumes that the primitives are serviced immediately and in zero time.

## 5.3 Interface between the AAL type 2 signalling entity and layer management

### 5.3.1 Service provided by layer management

This interface provides the internal interface to the network management system.

### 5.3.2 Primitives between AAL type 2 signalling entities and layer management

The primitives are summarized in Table 5-3, and are defined after the table.

**Table 5-3/Q.2630.3 – Primitives and parameters exchanged between the AAL type 2 signalling entities and layer management**

| Primitive generic name | Type | | | |
|---|---|---|---|---|
| | Request | Indication | Response | Confirm |
| BLOCK | ANI, A2P | Not defined | Not defined | Cause |
| UNBLOCK | ANI, A2P | Not defined | Not defined | Cause |
| RESET | ANI, CEID | ANI, CEID | Not defined | – |
| STOP-RESET | ANI, CEID | Not defined | Not defined | Not defined |
| ADD-PATH | Not defined | ANI, A2P, PT Ownership | Not defined | Not defined |
| REMOVE-PATH | Not defined | ANI, A2P | Not defined | Not defined |
| ERROR | Not defined | ANI, CEID, Cause | Not defined | Not defined |
| – This primitive has no parameters. | | | | |

NOTE – When sending a primitive between the AAL type 2 signalling entity and layer management, the primitive needs to be associated with a particular management action instance. The mechanism used for this binding is considered to be an implementation detail and, therefore, is outside the scope of this Recommendation.

a) **BLOCK.request**:
   A primitive to request the AAL type 2 signalling entity to locally block a particular, unblocked AAL type 2 path and to indicate this to the peer AAL type 2 signalling entity.

b) **BLOCK.confirm**:
   A primitive with no parameter indicates that the AAL type 2 signalling entity has successfully informed the peer AAL type 2 signalling entity of the blocking of a particular AAL type 2 path. A primitive with a cause parameter indicates that the AAL type 2 signalling entity has detected an error in the blocking procedures.

c)   **UNBLOCK.request**:
A primitive to request the AAL type 2 signalling entity to locally unblock a particular, blocked AAL type 2 path and to indicate this to the peer AAL type 2 signalling entity.

d)   **UNBLOCK.confirm**:
A primitive with no parameter indicates that the AAL type 2 signalling entity has successfully informed the peer signalling entity of the unblocking of a particular AAL type 2 path. A primitive with a cause parameter indicates that the AAL type 2 signalling entity has detected an error in the unblocking procedures.

e)   **RESET.request**:
A primitive to request the AAL type 2 signalling entity to reset a particular channel, all channels on a particular AAL type 2 path, or all channels on all AAL type 2 paths associated with a signalling transport association to the "Idle" state and to indicate this to the peer AAL type 2 signalling entity.

f)   **RESET.indication**:
A primitive indicating that the AAL type 2 signalling entity has reset a particular channel, all channels on a particular AAL type 2 path, or all channels on all AAL type 2 paths associated with a signalling transport association to the "Idle" state on the request of the peer AAL type 2 signalling entity.

g)   **RESET.confirm**:
A primitive indicating that the AAL type 2 signalling entity has successfully informed the peer AAL type 2 signalling entity of the resetting of the channel or all the channels on a specific AAL type 2 path or on all AAL type 2 paths associated with a signalling transport association.

h)   **STOP-RESET.request**:
A primitive to request the AAL type 2 signalling entity to stop a reset procedure.

i)   **ADD-PATH.indication**:
This primitive informs the AAL type 2 signalling entity that a new AAL type 2 path has been established towards one of the adjacent AAL type 2 nodes.

j)   **REMOVE-PATH.indication**:
This primitive informs the AAL type 2 signalling entity that an AAL type 2 path has been removed.

k)   **ERROR.indication**:
A primitive to indicate any operational errors in the AAL type 2 signalling procedures.

**5.3.3   Parameters between AAL type 2 signalling entities and layer management**

a)   **AAL type 2 Path Identifier (A2P)**
This parameter indicates an AAL type 2 path.

b)   **Connection Element Identifier (CEID)**
This parameter allows for the identification of:

i)   all AAL type 2 paths between two adjacent AAL type 2 nodes associated with a signalling transport association;

ii)   a particular AAL type 2 path; or

iii)   a particular channel on a particular AAL type 2 path.

c)   **Cause**
This parameter gives the reason of an operational error.

d)    **Ownership**
      This parameter indicates whether a newly established AAL type 2 path is owned by the AAL type 2 signalling entity or by its peer.

e)    **Adjacent AAL type 2 Node Identifier (ANI)**
      This parameter is used to unambiguously indicate an adjacent AAL type 2 node.

f)    **Path Type (PT)**
      This parameter indicates the Quality of Service class of the newly established AAL type 2 path.

## 6      Forward and backward compatibility

The compatibility mechanism remains unchanged for all capability sets and/or subsets of the AAL type 2 protocol defined in this Recommendation. It is based on forward compatibility information associated with all signalling information.

The compatibility method eases the network operation, for example:

•      For the typical case of an AAL type 2 signalling protocol mismatch during a network upgrading.

•      To interconnect two networks on a different functional level.

•      For networks using a different subset of the same AAL type 2 protocol, etc.

NOTE – A node may be at a different functional level due to having implemented a different capability set or another subset of the protocol specified in this Recommendation.

The coding of message and parameter compatibility information is shown in Annex B; these codings shall be used to maintain backward compatibility with AAL type 2 nodes conforming only to ITU-T Rec. Q.2630.1 [15] and with AAL type 2 nodes conforming only to ITU-T Rec. Q.2630.2 [16].

The forward compatibility mechanism specified in 6.2 and 8.1 applies to this and future capability sets of this Recommendation.

### 6.1     Backward compatibility rules

Compatible interworking between AAL type 2 protocol capability sets should be optimized by adhering to the following rules when specifying a new capability set (release):

1)     Existing protocol elements, i.e., procedures, messages, parameters and subfield values, should not be changed unless a protocol error needs to be corrected or it becomes necessary to change the operation of the service that is being supported by the protocol.

2)     The semantics of a message, a parameter, or of a field and subfield within a parameter should not be changed.

3)     Established rules for formatting and encoding messages and parameters should not be modified.

### 6.2     Forward compatibility mechanism

Compatibility between this and future capability sets will be guaranteed, in the sense that any two capability sets can be interconnected directly with each other, if the following requirements are fulfilled:

i)     *Protocol compatibility*
       Connections between any two AAL type 2 protocols do not fail for the reason of not satisfying protocol requirements.

ii)     *Service and functional compatibility*
        This feature may be considered as compatibility typically between originating and destination nodes. Services and functions available at these nodes, but possibly not yet taken into account in the intermediate nodes, are supported, provided that information related to these services and functions can be passed transparently through intermediate nodes.

iii)    *Resource control and management compatibility*
        For these functions, occurring only link-by-link, at least a backward notification is needed, if correct handling is not possible.

## 7       Format and coding of AAL type 2 signalling protocol

## 7.1     Coding conventions for the AAL type 2 signalling protocol

### 7.1.1   Principles

The following principles shall apply for the coding of the AAL type 2 signalling protocol:

a)      The order of coding of messages shall consist of "destination signalling association identifier", "message identifier", "message compatibility", and any parameters.

b)      Messages shall carry zero or more parameters.

c)      The sequence of parameters is unconstrained.

d)      The order of coding of parameters shall consist of "parameter identifier", "parameter compatibility", "parameter length", and any fields.

e)      Parameters shall carry zero or more fields.

f)      A parameter shall always consist of the same sequence of fields.

g)      If new fields need to be added to a parameter or the length of a fixed size field needs to be changed, the modifications shall be carried in a new parameter (different parameter identifier); the existing parameter shall remain unchanged.

h)      Any sequence of fixed size fields and variable size fields is permissible.

i)      Fixed length fields shall consist of the "field" only; no length is indicated.

j)      Variable length fields shall consist of "field length" and "field".

k)      Fields shall be multiples of one octet.

l)      Fields are composed of one or more subfields.

m)      Reserved subfields shall be coded all zeroes and need not be interpreted by the receiver.

n)      If there is no information to be carried in a variable size field, its length shall be set to zero, i.e., only the field length octet will be present.

o)      If there is no information to be carried in a fixed size field, its content shall be set to zero in all octets.

p)      The presence or the interpretation of a field shall not depend on the value of a field in another parameter.

Consistent with the above coding principles, it is further specified that:

•       The message length shall allow for lengths of up to 4 000 octets.

•       The parameter length shall allow for lengths of up to 255 octets.

## 7.1.2 General format of messages

The general format of a message is shown in Table 7-1.

NOTE – No "message length" needs to be carried in the message itself; the length of information passed via a primitive implicitly defines its length and the assured data transfer assures that no octets are lost or gained in transport.

**Table 7-1/Q.2630.3 – AAL type 2 message format**

| | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|---|
| Header | Destination signalling association identifier | | | | | | | | 4 octets |
| | Message identifier | | | | | | | | 1 octet |
| | Message compatibility | | | | | | | | 1 octet |
| Payload | Parameters | | | | | | | | |
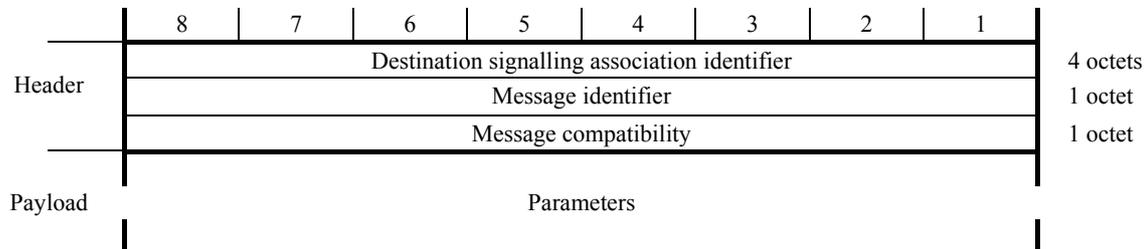
The message header consists of the destination signalling association identifier field, the message identifier field, and the message compatibility field. The destination signalling association identifier field is coded the same as the signalling association identifier field (see 7.4.2), the coding of the message identifier field is specified in 7.2.1, and the message compatibility field is coded the same as the compatibility field (see 7.4.1).

The message payload consists of zero, one, or more parameters.

### 7.1.2.1 Bit coding rules

When a field is contained within a single octet, the lowest bit number of the field represents the lowest order value.

When a field spans more than one octet, the order of bit values within each octet progressively decreases as the octet number increases; the lowest bit number associated with the field represents the lowest order value.

(This coding conforms to the coding conventions specified in 2.1/I.361 [2].)

## 7.1.3 General format of parameters

The general format of a parameter is shown in Table 7-2.

**Table 7-2/Q.2630.3 – AAL type 2 parameter format**

| | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|---|
| Header | Parameter identifier | | | | | | | | 1 octet |
| | Parameter compatibility | | | | | | | | 1 octet |
| | Parameter length | | | | | | | | 1 octet |
| Payload | Fields | | | | | | | | |
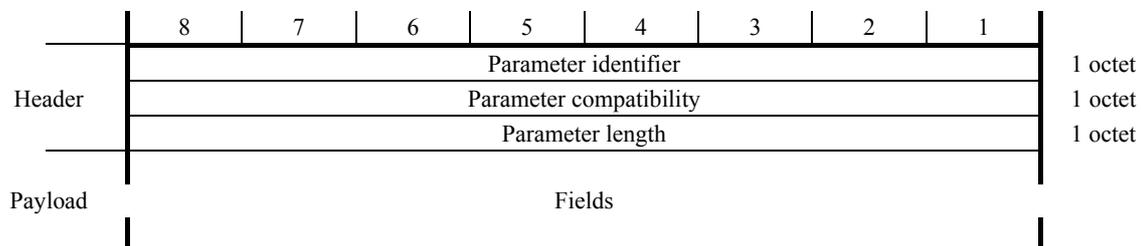
The coding of the parameter identifier field is specified in 7.2.2, Table 7-7 and the parameter compatibility field is coded as a compatibility field (see 7.4.1). The coding of the parameter length is a binary value indicating the number of octets in the parameter payload, i.e., the count does not include the octets in the parameter header.

Each parameter has a defined number of fields of defined type and in a particular order.

## 7.1.4 General format of fixed length fields

The general format of a fixed length field is shown in Table 7-3.

**Table 7-3/Q.2630.3 – AAL type 2 field – Fixed length format**

| Payload | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Field | | | | n octets |
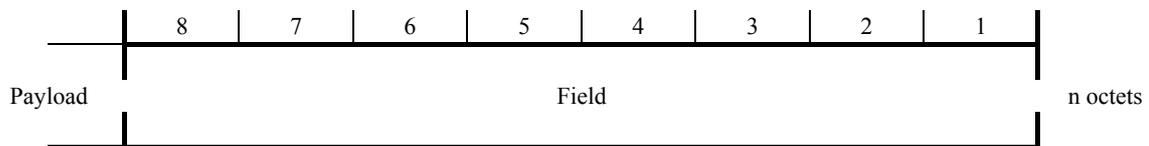
The field type is determined by the location of the field in the particular parameter.

## 7.1.5 General format of variable length fields

The general format of a variable length field is shown in Table 7-4.

**Table 7-4/Q.2630.3 – AAL type 2 field – Variable length format**

| | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Field length | | | | | 1 octet |
| Payload | | | | Field | | | | | n octets |
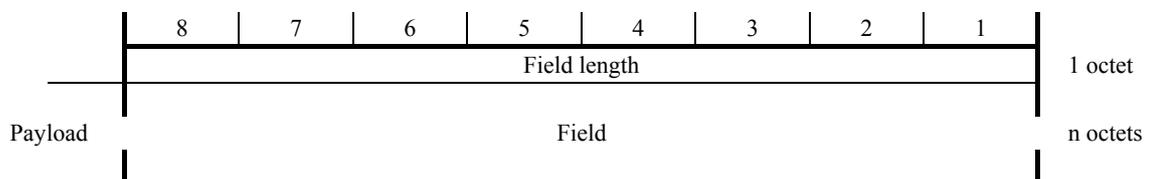
The coding of the field length is a binary value indicating the number of octets in the field payload, i.e., the count does not include the field length octet.

The field type is determined by the location of the field in the particular parameter.

## 7.2 Format and coding of the AAL type 2 signalling protocol messages

### 7.2.1 AAL type 2 signalling protocol messages

The AAL type 2 signalling protocol messages and their message identifiers are shown in Table 7-5.

**Table 7-5/Q.2630.3 – AAL type 2 messages and the coding of the message identifiers**

| Message | Acronym | Message identifier |
|---|---|---|
| Block Confirm | BLC | 0 0 0 0 0 0 0 1 |
| Block Request | BLO | 0 0 0 0 0 0 1 0 |
| Confusion | CFN | 0 0 0 0 0 0 1 1 |
| Establish Confirm | ECF | 0 0 0 0 0 1 0 0 |
| Establish Request | ERQ | 0 0 0 0 0 1 0 1 |
| Modify Acknowledge | MOA | 0 0 0 0 1 1 0 0 |
| Modify Reject | MOR | 0 0 0 0 1 1 0 1 |
| Modify Request | MOD | 0 0 0 0 1 1 1 0 |
| Release Confirm | RLC | 0 0 0 0 0 1 1 0 |
| Release Request | REL | 0 0 0 0 0 1 1 1 |
| Reset Confirm | RSC | 0 0 0 0 1 0 0 0 |
| Reset Request | RES | 0 0 0 0 1 0 0 1 |
| Unblock Confirm | UBC | 0 0 0 0 1 0 1 0 |
| Unblock Request | UBL | 0 0 0 0 1 0 1 1 |

## 7.2.2 Parameters of the AAL type 2 signalling protocol messages

The parameters of the AAL type 2 signalling protocol messages are shown in Table 7-6. The indications of "mandatory" and "optional" are for information only. The authoritative definition is given in clause 8 and Annex C. If any difference between the indications in this clause and the definitions in clause 8 and Annex C exists, the definitions in clause 8 take precedence.

Multiple presence of the same parameter in a single message is not permitted.

**Table 7-6/Q.2630.3 (part 1 of 2) – Parameters of the AAL type 2 signalling protocol messages**

| Parameter | Message | | | | | | |
|---|---|---|---|---|---|---|---|
| | ERQ | ECF | REL | RLC | MOD | MOA | MOR |
| Automatic Congestion Control | – | – | O | O | – | – | – |
| Cause | – | – | M | (Note 12) | – | – | M |
| Connection Element Identifier | M | – | – | O | – | – | – |
| Connection Priority | O | – | – | – | – | – | – |
| Destination E.164 Service Endpoint Address | (Note 2) | – | – | – | – | – | – |
| Destination NSAP Service Endpoint Address | (Note 2) | – | – | – | – | – | – |
| Destination Signalling Association Identifier (Note 1) | (Note 3) | M | M | M | M | M | M |
| Hop Counter | O | – | – | – | – | – | – |
| Link Characteristics | (Note 4) | – | – | – | (Note 4) | – | – |
| Modify Support for Service Specific Information | (Notes 4, 16) | (Note 4) | – | – | – | – | – |
| Modify Support for Link Characteristics | (Notes 4, 14) | (Note 4) | – | – | – | – | – |
| Originating Signalling Association Identifier | M | M | – | – | – | – | – |
| Origination E.164 Service Endpoint Address | (Note 5) | – | – | – | – | – | – |
| Origination NSAP Service Endpoint Address | (Note 5) | – | – | – | – | – | – |
| Path Type | (Note 6) | – | – | – | – | – | – |
| Preferred Link Characteristics | (Notes 4, 15) | – | – | – | – | – | – |
| Preferred Service Specific Information (Audio Extended) | (Notes 4, 7) | – | – | – | – | – | – |
| Preferred Service Specific Information (Multirate Extended) | (Notes 4, 7) | – | – | – | – | – | – |
| Preferred Transfer Capability (FBW) | (Notes 4, 8) | – | – | – | – | – | – |
| Preferred Transfer Capability (VBWS) | (Notes 4, 8) | – | – | – | – | – | – |
| Preferred Transfer Capability (VBWT) | (Notes 4, 8) | – | – | – | – | – | – |
| Served User Correlation ID | – | – | – | – | O | O | – |
| Served User Generated Reference | O | – | – | – | – | – | – |

| Parameter | Message | | | | | | |
|---|---|---|---|---|---|---|---|
| | ERQ | ECF | REL | RLC | MOD | MOA | MOR |
| Served User Transport | O | – | – | – | – | – | – |
| Service Specific Information (Audio Extended) | (Notes 9, 10) | – | – | – | (Notes 13, 17) | – | – |
| Service Specific Information (Audio) | (Notes 4, 9, 10) | – | – | – | – | – | – |
| Service Specific Information (Multirate Extended) | (Notes 9, 10) | – | – | – | (Notes 13, 17) | – | – |
| Service Specific Information (Multirate) | (Notes 4, 9, 10) | – | – | – | – | – | – |
| Service Specific Information (SAR-assured) | (Note 9) | – | – | – | – | – | – |
| Service Specific Information (SAR-unassured) | (Note 9) | – | – | – | – | – | – |
| TAR Controlled Connection | O | – | – | – | – | – | – |
| Test Connection Indicator | O | – | – | – | – | – | – |
| Transfer Capability (FBW) | (Note 11) | – | – | – | (Notes 13, 17) | – | – |
| Transfer Capability (VBWS) | (Note 11) | – | – | – | (Notes 13, 17) | – | – |
| Transfer Capability (VBWT) | (Note 11) | – | – | – | (Notes 13, 17) | – | – |
| Transfer Capability Support (TCS) | (Note 4) | (Note 4) | – | – | – | – | – |

M  Mandatory parameter
O  Optional parameter
–  Parameter not present

NOTE 1 – This row designates the Destination Signalling Association Identifier field in the message header.

NOTE 2 – Exactly one of these parameters must be present in an instance of the message.

NOTE 3 – The Destination Signalling Association Identifier field contains the value "unknown".

NOTE 4 – This parameter is only used for backward compatibility, i.e., for interworking with AAL type 2 nodes that conform only to ITU-T Recs Q.2630.1 [15] or Q.2630.2 [16] (see Annex C).

NOTE 5 – At most one of these parameters is present in an instance of the message.

NOTE 6 – If the path type parameter is not included, the path type shall be considered to be the network default stringent QoS class.

NOTE 7 – This parameter may only be included if "Modify Support for Service Specific Information" is included; at most one of these parameters is present in an instance of the message. If present it must refer to the same service specific information as the Service Specific Information parameter present in the same Establish Request message, i.e., Audio or Multirate.

NOTE 8 – This parameter must be included if a "Preferred Link Characteristics" and/or a "Preferred Service Specific Information" is included. At most one of these parameters is present in an instance of the message. If present, it must refer to the same transfer capability as the Transfer Capability parameter present in the same Establish Request message.

NOTE 9 – At most one of these parameters is present in an instance of the message.

**Table 7-6/Q.2630.3 (part 1 of 2) – Parameters of the AAL type 2
signalling protocol messages**

| Parameter | Message | | | | | | |
|---|---|---|---|---|---|---|---|
| | ERQ | ECF | REL | RLC | MOD | MOA | MOR |
| NOTE 10 – If the Modify Support for Service Specific Information parameter is included, this parameter shall also be included. | | | | | | | |
| NOTE 11 – Exactly one of these parameters is present in an instance of the message. | | | | | | | |
| NOTE 12 – The "Cause" parameter is present in the Release Confirm message if: | | | | | | | |
| a)  the RLC is used to reject a connection establishment; or | | | | | | | |
| b)  the cause reports unrecognized information received in the REL message. | | | | | | | |
| NOTE 13 – At most one of these parameters is present in an instance of the message, and only the same parameter that was present in the Establish Request message may be present. | | | | | | | |
| NOTE 14 – This parameter may be present only if the parameter "Link Characteristics" is present also. | | | | | | | |
| NOTE 15 – This parameter may be present only if the parameter "Modify Support for Link Characteristics" is present also. | | | | | | | |
| NOTE 16 – This parameter may be present only if one of the parameters "Service Specific Information (Audio)", "Service Specific Information (Audio Extended)", "Service Specific Information (Multirate)", and "Service Specific Information (Multirate Extended)" is present also. | | | | | | | |
| NOTE 17 – At least one of these parameters is present in an instance of the message. | | | | | | | |

**Table 7-6/Q.2630.3 (part 2 of 2) – Parameters of the AAL type 2
signalling protocol messages**

| Parameter | Message | | | | | | |
|---|---|---|---|---|---|---|---|
| | RES | RSC | BLO | BLC | UBL | UBC | CFN |
| Cause | – | (Note 4) | – | (Note 4) | – | (Note 4) | M |
| Connection Element Identifier | M | – | M (Note 3) | – | M (Note 3) | – | – |
| Destination Signalling Association Identifier (Note 1) | (Note 2) | M | (Note 2) | M | (Note 2) | M | M |
| Originating Signalling Association Identifier | M | – | M | – | M | – | – |
| M  Mandatory parameter<br>O  Optional parameter<br>–  Parameter not present<br><br>NOTE 1 – This row designates the Destination Signalling Association Identifier field in the message header.<br><br>NOTE 2 – The Destination Signalling Association Identifier field contains the value "unknown".<br><br>NOTE 3 – The Channel Identifier field is set to "Null", but the Path Identifier includes a value identifying an AAL type 2 path.<br><br>NOTE 4 – The "Cause" parameter is present only if the cause reports unrecognized information received. | | | | | | | |

The identifiers of the AAL type 2 message parameters are defined in Table 7-7.

**Table 7-7/Q.2630.3 – Identifiers of the AAL type 2 message parameters**

| AAL type 2 Parameter | Ref. | Acronym | Identifier |
|---|---|---|---|
| Automatic Congestion Control | 7.3.25 | ACC | 0 0 0 1 1 0 0 0 |
| Cause | 7.3.1 | CAU | 0 0 0 0 0 0 0 1 |
| Connection Element Identifier | 7.3.2 | CEID | 0 0 0 0 0 0 1 0 |
| Connection Priority | 7.3.26 | CP | 0 0 0 1 1 0 0 1 |
| Destination E.164 Service Endpoint Address | 7.3.3 | DESEA | 0 0 0 0 0 0 1 1 |
| Destination NSAP Service Endpoint Address | 7.3.4 | DNSEA | 0 0 0 0 0 1 0 0 |
| Hop Counter | 7.3.27 | HC | 0 0 0 1 1 0 1 0 |
| Link Characteristics (Note) | 7.3.5 | LC | 0 0 0 0 0 1 0 1 |
| Modify Support for Link Characteristics (Note) | 7.3.20 | MSLC | 0 0 0 0 1 1 1 0 |
| Modify Support for Service Specific Information (Note) | 7.3.21 | MSSSI | 0 0 0 0 1 1 1 1 |
| Originating Signalling Association Identifier | 7.3.6 | OSAID | 0 0 0 0 0 1 1 0 |
| Origination E.164 Service Endpoint Address | 7.3.23 | OESEA | 0 0 0 1 1 0 1 1 |
| Origination NSAP Service Endpoint Address | 7.3.24 | ONSEA | 0 0 0 1 0 1 0 1 |
| Path Type | 7.3.14 | PT | 0 0 0 1 0 0 0 0 |
| Preferred Link Characteristics (Note) | 7.3.19 | PLC | 0 0 0 1 0 0 0 1 |
| Preferred Service Specific Information (Audio Extended) (Note) | 7.3.17 | PSSIAE | 0 0 0 1 0 0 1 0 |
| Preferred Service Specific Information (Multirate Extended) (Note) | 7.3.18 | PSSIME | 0 0 0 1 0 0 1 1 |
| Preferred Transfer Capability (FBW) (Note) | 7.3.29 | PFBW | 0 0 0 1 1 1 0 0 |
| Preferred Transfer Capability (VBWS) (Note) | 7.3.30 | PVBWS | 0 0 0 1 1 1 0 1 |
| Preferred Transfer Capability (VBWT) (Note) | 7.3.31 | PVBWT | 0 0 0 1 1 1 1 0 |
| Served User Correlation ID | 7.3.22 | SUCI | 0 0 0 1 0 1 0 0 |
| Served User Generated Reference | 7.3.7 | SUGR | 0 0 0 0 0 1 1 1 |
| Served User Transport | 7.3.8 | SUT | 0 0 0 0 1 0 0 0 |
| Service Specific Information (Audio Extended) | 7.3.15 | SSIAE | 0 0 0 1 0 1 1 0 |
| Service Specific Information (Audio) (Note) | 7.3.9 | SSIA | 0 0 0 0 1 0 0 1 |
| Service Specific Information (Multirate Extended) | 7.3.16 | SSIME | 0 0 0 1 0 1 1 1 |
| Service Specific Information (Multirate) (Note) | 7.3.10 | SSIM | 0 0 0 0 1 0 1 0 |
| Service Specific Information (SAR-assured) | 7.3.11 | SSISA | 0 0 0 0 1 0 1 1 |
| Service Specific Information (SAR-unassured) | 7.3.12 | SSISU | 0 0 0 0 1 1 0 0 |
| TAR Controlled Connection | 7.3.28 | TCC | 0 0 0 1 1 1 1 1 |
| Test Connection Indicator | 7.3.13 | TCI | 0 0 0 0 1 1 0 1 |
| Transfer Capability (FBW) | 7.3.32 | FBW | 0 0 1 0 0 0 0 0 |
| Transfer Capability (VBWS) | 7.3.33 | VBWS | 0 0 1 0 0 0 0 1 |
| Transfer Capability (VBWT) | 7.3.34 | VBWT | 0 0 1 0 0 0 1 0 |
| Transfer Capability Support (Note) | 7.3.35 | TCS | 0 0 1 0 0 0 1 1 |
| NOTE – In this Recommendation, this parameter is only used for backward compatibility, i.e., for interworking with AAL type 2 nodes that conform only to ITU-T Recs Q.2630.1 [15] or Q.2630.2 [16]. | | | |

## 7.3 Parameter specification of the AAL type 2 signalling protocol messages

### 7.3.1 Cause

The sequence of fields in the cause parameter is shown in Table 7-8.

**Table 7-8/Q.2630.3 – Sequence of fields in the cause parameter**

| Field No. | Field | Ref. |
|:---:|---|:---:|
| 1 | Cause Value | 7.4.16 |
| 2 | Diagnostics | 7.4.17 |

### 7.3.2 Connection element identifier

The sequence of fields in the connection element identifier parameter is shown in Table 7-9.

**Table 7-9/Q.2630.3 – Sequence of fields in the connection element identifier parameter**

| Field No. | Field | Ref. |
|:---:|---|:---:|
| 1 | Path Identifier | 7.4.3 |
| 2 | Channel Identifier | 7.4.4 |

| *AAL type 2 Path Identifier* | *Channel Identifier* | *Meaning* |
|---|---|---|
| Null | Ignored | All AAL type 2 paths associated with a signalling transport association |
| Value | Null | AAL type 2 path identifier "Value" |
| Value | CID | Channel "CID" in AAL type 2 path identifier "Value" |

### 7.3.3 Destination E.164 service endpoint address

The sequence of fields in the destination E.164 [10] service endpoint address parameter is shown in Table 7-10.

**Table 7-10/Q.2630.3 – Sequence of fields in the destination E.164 service endpoint address parameter**

| Field No. | Field | Ref. |
|:---:|---|:---:|
| 1 | Nature of Address | 7.4.13 |
| 2 | E.164 Address | 7.4.14 |

### 7.3.4 Destination NSAP service endpoint address

The sequence of fields in the destination NSAP [5] service endpoint address parameter is shown in Table 7-11.

**Table 7-11/Q.2630.3 – Sequence of fields in the destination NSAP service endpoint address parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | NSAP Address | 7.4.15 |

### 7.3.5 Link characteristics

The sequence of fields in the link characteristics parameter is shown in Table 7-12.

**Table 7-12/Q.2630.3 – Sequence of fields in the link characteristics parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | Maximum CPS-SDU Bit Rate | (Note 1) |
| 2 | Average CPS-SDU Bit Rate | (Note 1) |
| 3 | Maximum CPS-SDU Size | (Note 2) |
| 4 | Average CPS-SDU Size | (Note 2) |
| NOTE 1 – This field is coded as a CPS-SDU Bit Rate field (see 7.4.11). | | |
| NOTE 2 – This field is coded as a CPS-SDU Size field (see 7.4.12). | | |

### 7.3.6 Originating signalling association identifier

The sequence of fields in the originating signalling association identifier parameter is shown in Table 7-13.

**Table 7-13/Q.2630.3 – Sequence of fields in the originating signalling association identifier parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | Originating Signalling Association | (Note) |
| NOTE – This field is coded as a Signalling Association Identifier field (see 7.4.2). | | |

### 7.3.7 Served user generated reference

The sequence of fields in the served user generated reference parameter is shown in Table 7-14.

**Table 7-14/Q.2630.3 – Sequence of fields in the served user generated reference parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | Served User Generated Reference | 7.4.10 |

### 7.3.8    Served user transport

The sequence of fields in the served user transport parameter is shown in Table 7-15.

**Table 7-15/Q.2630.3 – Sequence of fields in the served user transport parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | Served User Transport | 7.4.18 |

### 7.3.9    Service specific information (Audio)

The sequence of fields in the service specific information (audio) parameter is shown in Table 7-16.

**Table 7-16/Q.2630.3 – Sequence of fields in the service specific information (audio) parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | Audio Service | 7.4.6 |
| 2 | Organizational Unique Identifier | 7.4.5 |

### 7.3.10    Service specific information (Multirate)

The sequence of fields in the service specific information (multirate) parameter is shown in Table 7-17.

**Table 7-17/Q.2630.3 – Sequence of fields in the service specific information (multirate) parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | Multirate Service | 7.4.7 |

### 7.3.11    Service specific information (SAR-assured)

The sequence of fields in the service specific information (SAR-assured) parameter is shown in Table 7-18.

**Table 7-18/Q.2630.3 – Sequence of fields in the service specific information (SAR-assured) parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | Segmentation and Reassembly (Assured Data Transfer) | 7.4.8 |

### 7.3.12 Service specific information (SAR-unassured)

The sequence of fields in the service specific information (SAR-unassured) parameter is shown in Table 7-19.

**Table 7-19/Q.2630.3 – Sequence of fields in the service specific information (SAR-unassured) parameter**

| Field No. | Field | Ref. |
|-----------|-------|------|
| 1 | Segmentation and Reassembly (Unassured Data Transfer) | 7.4.9 |

### 7.3.13 Test connection indicator

The test connection indicator parameter has no fields, i.e., the parameter length is always zero.

### 7.3.14 Path type

The sequence of fields in the path type parameter is shown in Table 7-20.

**Table 7-20/Q.2630.3 – Sequence of fields in the path type parameter**

| Field No. | Field | Ref. |
|-----------|-------|------|
| 1 | AAL Type 2 Path QoS Codepoint | 7.4.21 |

If the path type parameter is not included, the path type shall be considered to be the network default stringent QoS class.

### 7.3.15 Service specific information (Audio Extended)

The sequence of fields in the service specific information (Audio Extended) parameter is shown in Table 7-21.

**Table 7-21/Q.2630.3 – Sequence of fields in the service specific information (Audio Extended) parameter**

| Field No. | Field | Ref. |
|-----------|-------|------|
| 1 | Audio extended service | 7.4.19 |
| 2 | Organizational unique identifier | 7.4.5 |

### 7.3.16 Service specific information (Multirate Extended)

The sequence of fields in the service specific information (Multirate Extended) parameter is shown in Table 7-22.

**Table 7-22Q.2630.3 – Sequence of fields in the service specific information (Multirate Extended) parameter**

| Field No. | Field | Ref. |
|-----------|-------|------|
| 1 | Multirate extended service | 7.4.20 |

### 7.3.17 Preferred service specific information (Audio Extended)

The sequence of fields in the preferred service specific information (Audio Extended) parameter is shown in Table 7-23.

**Table 7-23/Q.2630.3 – Sequence of fields in the preferred service specific information (Audio Extended) parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | Audio extended service | 7.4.19 |
| 2 | Organizational unique identifier | 7.4.5 |

### 7.3.18 Preferred service specific information (Multirate Extended)

The sequence of fields in the preferred service specific information (Multirate Extended) parameter is shown in Table 7-24.

**Table 7-24/Q.2630.3 – Sequence of fields in the preferred service specific information (Multirate Extended) parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | Multirate extended service | 7.4.20 |

### 7.3.19 Preferred link characteristics

The sequence of fields in the preferred link characteristics parameter is shown in Table 7-25.

**Table 7-25/Q.2630.3 – Sequence of fields in the preferred link characteristics parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | Maximum CPS-SDU Bit Rate | (Note 1) |
| 2 | Average CPS-SDU Bit Rate | (Note 1) |
| 3 | Maximum CPS-SDU Size | (Note 2) |
| 4 | Average CPS-SDU Size | (Note 2) |
| NOTE 1 – This field is coded as a CPS-SDU Bit Rate field (see 7.4.11). NOTE 2 – This field is coded as a CPS-SDU Size field (see 7.4.12). | | |

### 7.3.20 Modify support for link characteristics

The modify support for link characteristics parameter has no fields, i.e., the parameter length is always zero.

### 7.3.21 Modify support for service specific information

The modify support for service specific information parameter has no fields, i.e., the parameter length is always zero.

### 7.3.22 Served user correlation ID

The sequence of fields in the served user correlation ID parameter is shown in Table 7-26.

**Table 7-26/Q.2630.3 – Sequence of fields in the served user correlation ID parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | Served User Correlation ID value | 7.4.22 |

### 7.3.23 Origination E.164 service endpoint address

The sequence of fields in the origination E.164 [10] service endpoint address parameter is shown in Table 7-27.

**Table 7-27/Q.2630.3 – Sequence of fields in the origination E.164 service endpoint address parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | Nature of Address | 7.4.13 |
| 2 | E.164 Address | 7.4.14 |

### 7.3.24 Origination NSAP service endpoint address

The sequence of fields in the origination NSAP [5] service endpoint address parameter is shown in Table 7-28.

**Table 7-28/Q.2630.3 – Sequence of fields in the origination NSAP service endpoint address parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | NSAP Address | 7.4.15 |

### 7.3.25 Automatic congestion control

The sequence of fields in the Automatic congestion control parameter is shown in Table 7-29.

**Table 7-29/Q.2630.3 – Sequence of fields in the automatic congestion control parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | AAL type 2 Node Automatic Congestion Level | 7.4.23 |

### 7.3.26 Connection priority

The sequence of fields in the connection priority parameter is shown in Table 7-30.

**Table 7-30/Q.2630.3 – Sequence of fields in the connection priority parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | Priority | 7.4.24 |

### 7.3.27 Hop counter

The sequence of fields in the hop counter parameter is shown in Table 7-31.

**Table 7-31/Q.2630.3 – Sequence of fields in the hop counter parameter**

| Field No. | Field | Ref. |
|-----------|-------|------|
| 1 | AAL type 2 Hop Counter | 7.4.25 |

### 7.3.28 TAR controlled connection

The TAR Controlled Connection parameter has no fields, i.e., the parameter length is always zero.

### 7.3.29 Preferred fixed bandwidth transfer capability

The sequence of fields in the preferred fixed bandwidth transfer capability parameter is shown in Table 7-32.

**Table 7-32/Q.2630.3 – Sequence of fields in the preferred fixed bandwidth transfer capability parameter**

| Field No. | Field | Ref. |
|-----------|-------|------|
| 1 | Peak CPS bit rate | (Note 1) |
| 2 | CPS token bucket size associated with Peak CPS bit rate | (Note 2) |
| 3 | Maximum allowed CPS packet size | 7.4.28 |
| NOTE 1 – This field is coded as a CPS Bit rate field (see 7.4.26). | | |
| NOTE 2 – This field is coded as a CPS Token Bucket Size field (see 7.4.27). | | |

### 7.3.30 Preferred variable bandwidth stringent transfer capability

The sequence of fields in the preferred variable bandwidth stringent transfer capability parameter is shown in Table 7-33.

**Table 7-33/Q.2630.3 – Sequence of fields in the preferred variable bandwidth stringent transfer capability parameter**

| Field No. | Field | Ref. |
|-----------|-------|------|
| 1 | Peak CPS bit rate | (Note 1) |
| 2 | CPS token bucket size associated with Peak CPS bit rate | (Note 2) |
| 3 | Maximum allowed CPS packet size | 7.4.28 |
| 4 | Source Traffic Type | 7.4.29 |
| NOTE 1 – This field is coded as a CPS Bit rate field (see 7.4.26). | | |
| NOTE 2 – This field is coded as a CPS Token Bucket Size field (see 7.4.27). | | |

### 7.3.31 Preferred variable bandwidth tolerant transfer capability

The sequence of fields in the preferred variable bandwidth tolerant transfer capability parameter is shown in Table 7-34.

**Table 7-34/Q.2630.3 – Sequence of fields in the preferred variable bandwidth tolerant transfer capability parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | Peak CPS bit rate | (Note 1) |
| 2 | CPS token bucket size associated with Peak CPS bit rate | (Note 2) |
| 3 | Sustainable CPS bit rate | (Note 1) |
| 4 | CPS token bucket size associated with Sustainable CPS bit rate | (Note 2) |
| 5 | Maximum allowed CPS packet size | 7.4.28 |
| NOTE 1 – This field is coded as a CPS Bit rate field (see 7.4.26).<br>NOTE 2 – This field is coded as a CPS Token Bucket Size field (see 7.4.27). | | |

### 7.3.32 Fixed bandwidth transfer capability

The sequence of fields in the fixed bandwidth transfer capability parameter is shown in Table 7-35.

**Table 7-35/Q.2630.3 – Sequence of fields in the fixed bandwidth transfer capability parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | Peak CPS bit rate | (Note 1) |
| 2 | CPS token bucket size associated with Peak CPS bit rate | (Note 2) |
| 3 | Maximum allowed CPS packet size | 7.4.28 |
| NOTE 1 – This field is coded as a CPS Bit rate field (see 7.4.26).<br>NOTE 2 – This field is coded as a CPS Token Bucket Size field (see 7.4.27). | | |

### 7.3.33 Variable bandwidth stringent transfer capability

The sequence of fields in the variable bandwidth stringent transfer capability parameter is shown in Table 7-36.

**Table 7-36/Q.2630.3 – Sequence of fields in the variable bandwidth stringent transfer capability parameter**

| Field No. | Field | Ref. |
|---|---|---|
| 1 | Peak CPS bit rate | (Note 1) |
| 2 | CPS token bucket size associated with Peak CPS bit rate | (Note 2) |
| 3 | Maximum allowed CPS packet size | 7.4.28 |
| 4 | Source Traffic Type | 7.4.29 |
| NOTE 1 – This field is coded as a CPS Bit rate field (see 7.4.26).<br>NOTE 2 – This field is coded as a CPS Token Bucket Size field (see 7.4.27). | | |

### 7.3.34  Variable bandwidth tolerant transfer capability

The sequence of fields in the variable bandwidth tolerant transfer capability parameter is shown in Table 7-37.

**Table 7-37/Q.2630.3 – Sequence of fields in the variable bandwidth tolerant transfer capability parameter**

| Field No. | Field | Ref. |
|:---:|:---|:---:|
| 1 | Peak CPS bit rate | (Note 1) |
| 2 | CPS token bucket size associated with Peak CPS bit rate | (Note 2) |
| 3 | Sustainable CPS bit rate | (Note 1) |
| 4 | CPS token bucket size associated with Sustainable CPS bit rate | (Note 2) |
| 5 | Maximum allowed CPS packet size | 7.4.28 |
| NOTE 1 – This field is coded as a CPS Bit rate field (see 7.4.26). NOTE 2 – This field is coded as a CPS Token Bucket Size field (see 7.4.27). | | |

### 7.3.35  Transfer capability support

The transfer capability support parameter has no fields, i.e., the parameter length is always zero.

### 7.4  Field specification of the AAL type 2 signalling protocol parameters

### 7.4.1  Compatibility

The structure of the compatibility field is shown in Table 7-38; the field is a fixed size field of 1 octet.

**Table 7-38/Q.2630.3 – Structure of the compatibility field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---|
| pass-on not possible | | | | general action | | | | Octet 1 |
| reserved | send notification indicator | instruction indicator | | reserved | send notification indicator | instruction indicator | | |

The following codes are used in the subfields of the compatibility information field.

a)   *Send notification indicator*

    0   Do not send notification.

    1   Send notification.

b)   *Instruction indicator*

    00   Pass on message or parameter (see Note 1).

    01   Discard parameter (see Note 2).

    10   Discard message.
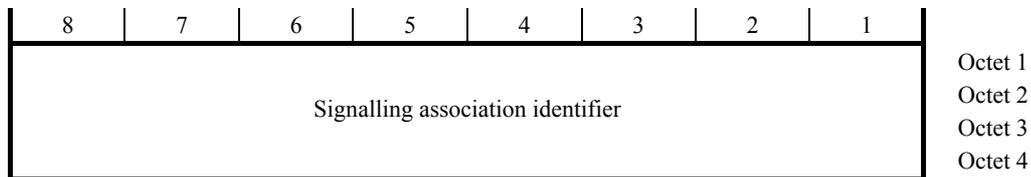
    11   Release Connection.

NOTE 1 – When used in a "pass-on not possible" instruction indicator, value "00" is interpreted so as to release the connection.

NOTE 2 – When used as message compatibility field, value "01" should not be used. If received, it is interpreted so as to discard the message.

### 7.4.2 Signalling association identifier

The structure of the signalling association identifier field is shown in Table 7-39; the field is a fixed size field of 4 octets.

**Table 7-39/Q.2630.3 – Structure of the signalling association identifier field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Octet 1 |
| | | Signalling association identifier | | | | | | Octet 2 |
| | | | | | | | | Octet 3 |
| | | | | | | | | Octet 4 |

The coding is implementation dependent.

If the signalling association identifier is used as a destination signalling association identifier that is not known, the field is set to zero indicating the value "unknown".

If the signalling association identifier is used as an originating signalling association identifier, the value zero shall not be used.

### 7.4.3 AAL type 2 path identifier

The structure of the AAL type 2 path identifier field is shown in Table 7-40; the field is a fixed size field of 4 octets.

**Table 7-40/Q.2630.3 – Structure of the AAL type 2 path identifier field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Octet 1 |
| | | AAL type 2 path identifier | | | | | | Octet 2 |
| | | | | | | | | Octet 3 |
| | | | | | | | | Octet 4 |
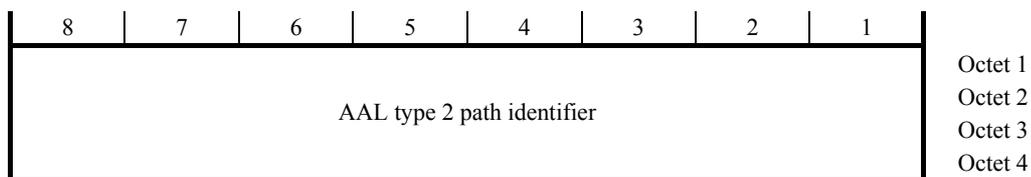
The coding is implementation dependent. It identifies unambiguously an AAL type 2 path between a pair of adjacent AAL type 2 nodes. A value of "0" in all octets indicates "Null"; therefore, the all zero code cannot be used to identify an AAL type 2 path.

NOTE – When the AAL type 2 path is a switched VCC between two adjacent AAL type 2 nodes, the procedure defined in 9.2/Q.2941.2 [27] may be used to assign the AAL type 2 path identifier field value at the time of the VCC establishment.

### 7.4.4 Channel identifier

The structure of the channel identifier field is shown in Table 7-41; the field is a fixed size field of 1 octet.

**Table 7-41/Q.2630.3 – Structure of the channel identifier field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| | | | Channel identifier | | | | | Octet 1 |
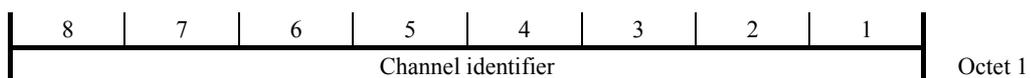
The coding reflects the Channel Identifier (CID) as specified in ITU-T Rec. I.363.2 [1]. CID values permitted in this field range from "8" to "255" inclusive. A value of "0" indicates "Null".

### 7.4.5 Organizational unique identifier

The structure of the organizational unique identifier field is shown in Table 7-42; the field is a fixed size field of 3 octets.

**Table 7-42/Q.2630.3 – Structure of the organizational unique identifier field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Octet 1 |
| | | | Organizational unique identifier | | | | | Octet 2 |
| | | | | | | | | Octet 3 |

The coding reflects the Organizational Unique Identifier (OUI) specified by IEEE 802-2001 [11] clause 5.1.

### 7.4.6 Audio service

The audio service for the AAL type 2 is defined in ITU-T Rec. I.366.2 [8]. The structure of the audio service field is shown in Table 7-43; the field is a fixed size field of 5 octets.

**Table 7-43/Q.2630.3 – Structure of the audio service field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| Profile Type | | Reserved | | | | | | Octet 1 |
| Profile identifier | | | | | | | | Octet 2 |
| FRM | CMD | MF-R2 | MF-R1 | DTMF | CAS | FAX | A-/μ-Law | Octet 3 |
| Maximum length of | | | | | | | | Octet 4 |
| frame mode data | | | | | | | | Octet 5 |

The following codes are used in the subfields of the audio service field:

a) *Profile type*

   00 The "Profile Identifier" designates a profile specified in ITU-T Rec. I.366.2 [8]; the organizational unique identifier field in the same parameter is ignored.

   01 The "Profile Identifier" designates a profile specified by an organization designated by the organizational unique identifier field in the same parameter.

   10 The "Profile Identifier" designates a custom profile; the organizational unique identifier field in the same parameter is ignored.

   11 Reserved.

b) *Profile identifier*
   The "Profile Identifier" designates a profile as specified in either ITU-T Rec. I.366.2 [8], by an organization designated by the organizational unique identifier field in the same parameter, or a custom profile depending of the value of the "Profile Type".

c) FRM    0: Transport of frame mode data disabled
          1: Transport of frame mode data enabled

   CMD    0: Transport of circuit mode data (64 kbit/s) disabled
          1: Transport of circuit mode data (64 kbit/s) enabled

   MF-R2  0: Transport of multi-frequency R2 dialled digits disabled
          1: Transport of multi-frequency R2 dialled digits enabled

   MF-R1  0: Transport of multi-frequency R1 dialled digits disabled
          1: Transport of multi-frequency R1 dialled digits enabled

DTMF   0:   Transport of dual tone multi-frequency dialled digits disabled

         1:   Transport of dual tone multi-frequency dialled digits enabled

CAS   0:   Transport of channel associated signalling disabled

         1:   Transport of channel associated signalling enabled

FAX   0:   Transport of demodulated facsimile data disabled

         1:   Transport of demodulated facsimile data enabled

A-/μ-Law 0:   Interpretation of generic PCM coding: A-Law

         1:   Interpretation of generic PCM coding: μ-Law

## 7.4.7   Multirate service

The multirate service for the AAL type 2 is defined in ITU-T Rec. I.366.2 [8]. The structure of the multirate service field is shown in Table 7-44; the field is a fixed size field of 3 octets.

**Table 7-44/Q.2630.3 – Structure of the multirate service field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| FRM | Reserved | | Multiplier n for n × 64 kbit/s | | | | | Octet 1 |
| Maximum length of | | | | | | | | Octet 2 |
| frame mode data | | | | | | | | Octet 3 |

FRM   0:   Transport of frame mode data disabled

      1:   Transport of frame mode data enabled

n   $1 \le n \le 31$ Multiplier for n × 64 kbit/s

## 7.4.8   Segmentation and reassembly (Assured data transfer)

The segmentation and reassembly service for the AAL type 2 is defined in ITU-T Rec. I.366.1 [9]. The structure of the segmentation and reassembly (assured data transfer) field is shown in Table 7-45; the field is a fixed size field of 14 octets.

**Table 7-45/Q.2630.3 – Structure of the segmentation and reassembly (assured data transfer) field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| Maximum length of | | | | | | | | Octet  1 |
| SSSAR-SDU | | | | | | | | Octet  2 |
| in the forward direction | | | | | | | | Octet  3 |
| Maximum length of | | | | | | | | Octet  4 |
| SSSAR-SDU | | | | | | | | Octet  5 |
| in the backward direction | | | | | | | | Octet  6 |
| Maximum length of SSCOP-SDU | | | | | | | | Octet  7 |
| in the forward direction | | | | | | | | Octet  8 |
| Maximum length of SSCOP-SDU | | | | | | | | Octet  9 |
| in the backward direction | | | | | | | | Octet 10 |
| Maximum length of SSCOP-UU | | | | | | | | Octet 11 |
| in the forward direction | | | | | | | | Octet 12 |
| Maximum length of SSCOP-UU | | | | | | | | Octet 13 |
| in the backward direction | | | | | | | | Octet 14 |

### 7.4.9 Segmentation and reassembly (Unassured data transfer)

The structure of the segmentation and reassembly (unassured data transfer) field is shown in Table 7-46; the field is a fixed size field of 7 octets.

**Table 7-46/Q.2630.3 – Structure of the segmentation and reassembly (unassured data transfer) field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| Maximum length of | | | | | | | | Octet 1 |
| SSSAR-SDU | | | | | | | | Octet 2 |
| in the forward direction | | | | | | | | Octet 3 |
| Maximum length of | | | | | | | | Octet 4 |
| SSSAR-SDU | | | | | | | | Octet 5 |
| in the backward direction | | | | | | | | Octet 6 |
| TED | Reserved | | | | | | | Octet 7 |

TED   0:  Transmission Error Detection disabled  
        1:  Transmission Error Detection enabled

### 7.4.10 Served user generated reference

The structure of the served user generated reference field is shown in Table 7-47; the field is a fixed size field of 4 octets.

**Table 7-47/Q.2630.3 – Structure of the served user generated reference field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Octet 1 |
| | | | Served user generated reference | | | | | Octet 2 |
| | | | | | | | | Octet 3 |
| | | | | | | | | Octet 4 |

### 7.4.11 CPS-SDU bit rate

The structure of the CPS-SDU bit rate field is shown in Table 7-48; the field is a fixed size field of 4 octets.

**Table 7-48/Q.2630.3 – Structure of the CPS-SDU bit rate field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| CPS-SDU bit rate in the forward direction | | | | | | | | Octet 1 |
| | | | | | | | | Octet 2 |
| CPS-SDU bit rate in the backward direction | | | | | | | | Octet 3 |
| | | | | | | | | Octet 4 |

This field may be used to convey the maximum CPS-SDU bit rate or the average CPS-SDU bit rate.

The maximum CPS-SDU bit rate is defined as the maximum bandwidth, available to the AAL type 2 served user in the specified direction. The maximum bandwidth is the maximum ratio of the amount of bits transported during the inter-departure time between two subsequent CPS-SDUs, and that inter-departure time. Allowed values are 0 to 2048 kbit/s. The granularity is 64 bit/s.

The average CPS-SDU bit rate is defined as the total expected amount of bits transported in the specified direction during the holding time of the connection, divided by the holding time of the connection. The average bit rate is also expected to be valid for the time interval between any two active periods. Allowed values are 0 to 2048 kbit/s. The granularity is 64 bit/s.

## 7.4.12 CPS-SDU size

The structure of the CPS-SDU size field is shown in Table 7-49; the field is a fixed size field of 2 octets.

**Table 7-49/Q.2630.3 – Structure of the CPS-SDU size field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| CPS-SDU size in the forward direction | | | | | | | | Octet 1 |
| CPS-SDU size in the backward direction | | | | | | | | Octet 2 |

This field may be used to convey the maximum CPS-SDU size or the average CPS-SDU size.

The maximum CPS-SDU size is defined as the largest CPS-SDU size, in octets, allowed to be sent in the specified direction during the holding time of the connection. Allowed values are 1 to 45.

The average CPS-SDU size is defined in the specified direction as the expected number of transported octets divided by the number of transported CPS-SDUs during the holding time of the connection. The average CPS-SDU size is also expected to be valid for the time interval between any two active periods. Allowed values are 1 to 45.

## 7.4.13 Nature of address

The structure of the nature of address field is shown in Table 7-50; the field is a fixed size field of 1 octet.

**Table 7-50/Q.2630.3 – Structure of the nature of address field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| Reserved | Nature of address code | | | | | | | Octet 1 |

The "nature of address code" has the following meaning:

| | |
|---|---|
| 0000000 | Spare |
| 0000001 | Subscriber number (national use) |
| 0000010 | Unknown (national use) (Note 1) |
| 0000011 | National (significant) number |
| 0000100 | International number |
| 0000101 | Network-specific number (national use) (Note 2) |
| 0000110 to 1101111 | Spare |
| 1110000 to 1111110 | Reserved for national use |
| 1111111 | Spare |

NOTE 1 – This codepoint is used when the type of number is indicated using the digits in the E.164 Address field. The E.164 Address field is organized according to the network dialling plan; e.g., prefix digits might be present; in addition, escape digits may also be present.

NOTE 2 – This codepoint is used to indicate an administration/service number specific to the serving network.

### 7.4.14 E.164 address

The structure of the E.164 address field is shown in Table 7-51; the field is a variable size field.

**Table 7-51/Q.2630.3 – Structure of the E.164 address field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| Field length | | | | | | | | Octet 1 |
| Reserved | | | | First hexadecimal digit of address | | | | Octet 2 |
| | | | | – – – – | | | | |
| | | | | Last hexadecimal digit of address | | | | Octet n |

### 7.4.15 NSAP address

The structure of the NSAP [5] address field is shown in Table 7-52; the field is a fixed size field of 20 octets.

**Table 7-52/Q.2630.3 – Structure of the NSAP address field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Octet 1 |
| NSAP | | | | | | | | |
| | | | | | | | | Octet 20 |

### 7.4.16 Cause value

The structure of the cause value field is shown in Table 7-53; the field is a fixed size field of 2 octets.

**Table 7-53/Q.2630.3 – Structure of the cause value field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| Reserved | | | | | | Coding standard | | Octet 1 |
| Reserved | Cause | | | | | | | Octet 2 |

Coding Standard

00 ITU-T standardized coding as described in ITU-T Recs Q.850 [6] and Q.2610 [7]

01 ISO/IEC standard (Note)

10 National standard (Note)

11 Standard defined for the network (either public or private) present on the network side of the interface (Note)

NOTE – These other coding standards should be used only when the parameter contents cannot be represented with the ITU-T standardized coding.
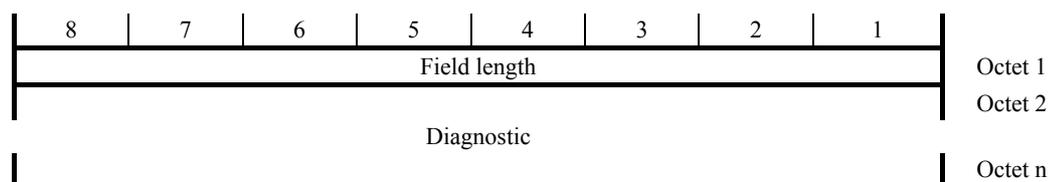
The procedures defined in clause 8 make use of ITU-T standardized codes described in ITU-T Recs Q.850 [6] and Q.2610 [7]. The codes are listed here for convenience. If there exists any difference in the names and codepoints of the following causes, the definitions in ITU-T Recs Q.850 and Q.2610 take precedence.

| *Code* | *Cause Description* |
|---|---|
| 1 | Unallocated (unassigned) number |
| 3 | No route to destination |
| 25 | Exchange routing error |
| 31 | Normal, unspecified |
| 34 | No circuit/channel available |
| 38 | Network out of order |
| 41 | Temporary failure |
| 42 | Switching equipment congestion |
| 44 | Requested circuit/channel not available |
| 47 | Resource unavailable, unspecified |
| 93 | AAL parameters cannot be supported |
| 95 | Invalid message, unspecified |
| 96 | Mandatory information element is missing |
| 97 | Message type non-existent or not implemented |
| 99 | Information element/parameter non-existent or not implemented |
| 100 | Invalid information element contents |
| 102 | Recovery on timer expiry |
| 110 | Message with unrecognized parameter, discarded |
| 111 | Protocol error, unspecified |

### 7.4.17 Diagnostics

The structure of the diagnostics field is shown in Table 7-54; the field is a variable size field.

**Table 7-54/Q.2630.3 – Structure of the diagnostics field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| Field length | | | | | | | | Octet 1 |
| Diagnostic | | | | | | | | Octet 2 |
| | | | | | | | | Octet n |

The coding is specified in ITU-T Rec. Q.2610 [7] except when associated with one of the following causes:

• Message type non-existent or not implemented;

• Information element/parameter non-existent or not implemented; or

• Message with unrecognized parameter discarded.

In these cases, the Diagnostics field is shown in Table 7-55; the field is a variable size field.

**Table 7-55/Q.2630.3 – Structure of the diagnostics field for compatibility causes**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| Field length | | | | | | | | Octet 1 |
| Message identifier | | | | | | | | Octet 2 |
| first | | Parameter identifier | | | | | | Octet 3 |
| pair | | Field number | | | | | | Octet 4 |
| second | | Parameter identifier | | | | | | Octet 5 |
| pair | | Field number | | | | | | Octet 6 |
| last | | Parameter identifier | | | | | | |
| pair | | Field number | | | | | | Octet n |

The diagnostics field for compatibility always starts – after the field length – with an octet containing the copy of the Message Identifier (of the message that gave rise to a compatibility diagnostic) followed by 0 to 125 octet pairs each containing a parameter identifier and a field number. If the field number octet is zero, the whole parameter is designated.

### 7.4.18   Served user transport

The structure of the served user transport field is shown in Table 7-56; the field is a variable size field.

**Table 7-56/Q.2630.3 – Structure of the served user transport field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| Field length | | | | | | | | Octet 1 |
| | | | | | | | | Octet 2 |
| Served user transport | | | | | | | | |
| | | | | | | | | Octet n |

The served user transport length can be from 1 to 254 octets.

### 7.4.19   Audio extended service

The Audio Extended service for the AAL type 2 is defined as "audio service" in ITU-T Rec. I.366.2 [14]. The structure of the audio extended service field is shown in Table 7-57; the field is a fixed size field of 5 octets.

**Table 7-57/Q.2630.3 – Structure of the audio extended service field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| Profile type | | Reserved | | | LB | RC | SYN | Octet 1 |
| Profile identifier | | | | | | | | Octet 2 |
| FRM | CMD | MF-R2 | MF-R1 | DTMF | CAS | FAX | A-/μ-Law | Octet 3 |
| Maximum length of | | | | | | | | Octet 4 |
| frame mode data | | | | | | | | Octet 5 |

The following codes are used in the subfields of the audio service field:

a)   *Profile type*

   00   The "Profile Identifier" designates a profile specified in ITU-T Rec. I.366.2 [14], the organizational unique identifier field in the same parameter is ignored.

   01   The "Profile Identifier" designates a profile specified by an organization designated by the organizational unique identifier field in the same parameter.

10 The "Profile Identifier" designates a custom profile, the organizational unique identifier field in the same parameter is ignored.

11 Reserved.

b) *Profile identifier*
The "Profile Identifier" designates a profile as specified in either ITU-T Rec. I.366.2 [14], by an organization designated by the organizational unique identifier field in the same parameter, or a custom profile depending of the value of the "profile Type".

c)

| | | |
|---|---|---|
| LB | 0: | Loopback disabled |
| | 1: | Loopback enabled |
| RC | 0: | Transport of rate control commands disabled |
| | 1: | Transport of rate control commands enabled |
| SYN | 0: | Transport of synchronization of change in SSCS operation disabled |
| | 1: | Transport of synchronization of change in SSCS operation enabled |
| FRM | 0: | Transport of frame mode data disabled |
| | 1: | Transport of frame mode data enabled |
| CMD | 0: | Transport of circuit mode data (64 kbit/s) disabled |
| | 1: | Transport of circuit mode data (64 kbit/s) enabled |
| MF-R2 | 0: | Transport of multi-frequency R2 dialled digits disabled |
| | 1: | Transport of multi-frequency R2 dialled digits enabled |
| MF-R1 | 0: | Transport of multi-frequency R1 dialled digits disabled |
| | 1: | Transport of multi-frequency R1 dialled digits enabled |
| DTMF | 0: | Transport of dual tone multi-frequency dialled digits disabled |
| | 1: | Transport of dual tone multi-frequency dialled digits enabled |
| CAS | 0: | Transport of channel associated signalling disabled |
| | 1: | Transport of channel associated signalling enabled |
| FAX | 0: | Transport of demodulated facsimile data disabled |
| | 1: | Transport of demodulated facsimile data enabled |
| A-/μ-Law | 0: | Interpretation of generic PCM coding: A-Law |
| | 1: | Interpretation of generic PCM coding: μ-Law |

### 7.4.20 Multirate extended service

The structure of the multirate extended service field is shown in Table 7-58; the field is a fixed size field of 3 octets.

**Table 7-58/Q.2630.3 – Structure of the multirate extended service field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| FRM | LB | Reserved | Multiplier n for n × 64 kbit/s | | | | | Octet 1 |
| Maximum length of frame mode data | | | | | | | | Octet 2<br>Octet 3 |

| | | |
|---|---|---|
| FRM | 0: | Transport of frame mode data disabled |
| | 1: | Transport of frame mode data enabled |
| LB | 0: | Loopback disabled |
| | 1: | Loopback enabled |
| n | $1 \leq n \leq 31$ | Multiplier for n × 64 kbit/s |

### 7.4.21   AAL type 2 path QoS codepoint

The structure of the AAL type 2 path QoS codepoint field is shown in Table 7-59; the field is a fixed size field of 1 octet.

**Table 7-59/Q.2630.3 – Structure of the AAL type 2 path QoS codepoint field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| AAL type 2 path QoS codepoint | | | | | | | | Octet 1 |
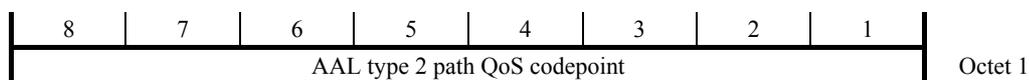
The "AAL type 2 path QoS codepoint" has the following meaning:

| | |
|---|---|
| 0: | Reserved for assignment by ITU-T |
| 1: | Stringent class |
| 2: | Tolerant class |
| 3,4: | Reserved for assignment by ITU-T |
| 5: | Stringent bi-level class |
| 6 to 127: | Reserved for assignment by ITU-T |
| 128 to 255: | Reserved for network specific assignment |

The attributes of "stringent class", "tolerant class", and "stringent bi-level class" are those defined in ITU-T Rec. I.356 [13].

### 7.4.22   Served user correlation ID value

The structure of the Served User Correlation ID value field is shown in Table 7-60; the field is a fixed size field of 1 octet.

**Table 7-60/Q.2630.3 – Structure of the served user correlation ID value field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| Served user correlation ID value | | | | | | | | Octet 1 |
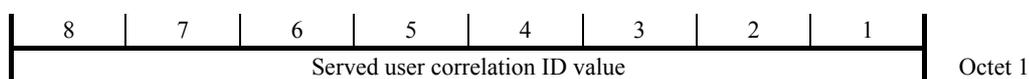
The Served User Correlation ID value adheres to the specifications in ITU-T Rec. I.366.2 [14].

### 7.4.23   AAL Type 2 node automatic congestion level

The structure of the AAL type 2 Node Automatic Congestion Level field is shown in Table 7-61; the field is a fixed size field of 1 octet.

**Table 7-61/Q.2630.3 – Structure of the AAL type 2 node automatic congestion level field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| AAL type 2 node automatic congestion level codepoint | | | | | | | | Octet 1 |
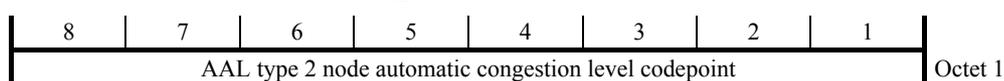
The "AAL type 2 Node Automatic Congestion Level Codepoint" has the following meaning:

| | |
|---|---|
| 0000000 | Spare |
| 0000001 | Congestion level 1 exceeded |
| 0000010 | Congestion level 2 exceeded |
| 0000011 to 1111111 | Spare |

### 7.4.24  Priority

The structure of the Priority field is shown in Table 7-62; the field is a fixed size field of 1 octet.

**Table 7-62/Q.2630.3 – Structure of the priority field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| Reserved | | | | | Priority | | | Octet 1 |

The priority codepoint has the following meaning:

| 0 0 0 | Level 1 (highest) |
|-------|-------------------|
| 0 0 1 | Level 2 |
| 0 1 0 | Level 3 |
| 0 1 1 | Level 4 |
| 1 0 0 | Level 5 (lowest) |

1 0 1  
 to     Reserved  
1 1 1  

### 7.4.25  AAL type 2 hop counter

The structure of the AAL type 2 Hop Counter field is shown in Table 7-63; the field is a fixed size field of 1 octet.

**Table 7-63/Q.2630.3 – Structure of the AAL type 2 hop counter field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| AAL type 2 hop counter codepoint | | | | | | | | Octet 1 |

The "AAL type 2 Hop Counter Codepoint" has the following meaning: The hop counter contains the binary value of the number of contiguous connection segments/bearer control associations that are allowed to complete the connection.

### 7.4.26  CPS bit rate

The structure of the CPS bit rate field is shown in Table 7-64; the field is a fixed size field of 6 octets.

**Table 7-64/Q.2630.3 – Structure of the CPS bit rate field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| CPS bit rate in the forward direction | | | | | | | | Octet 1 |
| | | | | | | | | Octet 2 |
| | | | | | | | | Octet 3 |
| CPS bit rate in the backward direction | | | | | | | | Octet 4 |
| | | | | | | | | Octet 5 |
| | | | | | | | | Octet 6 |

A CPS bit rate may be used as a Peak CPS bit rate or a Sustainable CPS bit rate according to ITU-T Rec. I.378 [19]. Allowed values are 0 to 16 384 kbit/s. The granularity is 64 bit/s.

### 7.4.27   CPS token bucket size

The structure of the CPS token bucket size field is shown in Table 7-65; the field is a fixed size field of 4 octets.

**Table 7-65/Q.2630.3 – Structure of the CPS token bucket size field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| CPS token bucket size in the forward direction | | | | | | | | Octet 1 |
| | | | | | | | | Octet 2 |
| CPS token bucket size in the backward direction | | | | | | | | Octet 3 |
| | | | | | | | | Octet 4 |

A CPS token bucket size represents a CPS token bucket size associated either with a Peak CPS bit rate or a Sustainable CPS bit rate according to ITU-T Rec. I.378 [19]. Allowed values are 48 to 4096 octets.

### 7.4.28   Maximum allowed CPS packet size

The structure of the CPS packet size field is shown in Table 7-66; the field is a fixed size field of 2 octets.

**Table 7-66/Q.2630.3 – Structure of the CPS packet size field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| CPS packet size in the forward direction | | | | | | | | Octet 1 |
| CPS packet size in the backward direction | | | | | | | | Octet 2 |

A CPS packet size may be used as maximum CPS packet size, in octets, allowed to be sent in the specified direction during the holding time of the connection according to ITU-T Rec. I.378 [19]. Allowed values are 4 to 48 octets.

### 7.4.29   Source traffic type

The structure of the source traffic type field is shown in Table 7-67; the field is a fixed size field of 1 octet.

**Table 7-67/Q.2630.3 – Structure of source traffic type field**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| Source traffic type codepoint | | | | | | | | Octet 1 |

A source traffic type may be used in the specification of a variable bandwidth stringent transfer capability according to ITU-T Rec. I.378 [19].

Each source traffic type represented by a codepoint in the Source Traffic Type field must be compliant to the definition of source traffic type in ITU-T Rec. I.378 [19].

The following codes are used for the Source Traffic Type field:

00000000   STT unknown

00000001   AMR [30] coded speech

00000010
  to         Reserved for ITU-T assignment
01111111

10000000
  to         Reserved for assignment by IMT-2000 family members
10111111

11000000
  to         Reserved for network specific assignment
11111111

## 8        Procedure of the AAL type 2 signalling protocol

Before an ATM VCC (AAL type 2 path) is put into service between a pair of adjacent AAL type 2 nodes, certain actions need to be performed. An identifier called the AAL type 2 path identifier is assigned to the ATM VCC. This identifier is used to refer to the ATM VCC in the AAL type 2 signalling protocol messages. The AAL type 2 path identifier shall uniquely identify the ATM VCC between the two adjacent AAL type 2 nodes.

On any ATM VCC used for AAL type 2 connections, all CID values from "8" to "255" are available for assignment.

Any time a new ATM VCC is put into service, the ownership of the ATM VCC shall be determined before AAL type 2 connections are established in it. In case of switched ATM VCC, the owner of the VCC shall be the AAL type 2 node that initiated the establishment of the VCC. In case of PVC and soft PVC, it is the responsibility of the management system to determine the owner of the VCC.

The nodal function is informed by layer management of a newly established AAL type 2 path by the use of the ADD-PATH.indication primitive containing the adjacent AAL type 2 node identifier, the AAL type 2 path identifier, and the ownership. The nodal function is informed by layer management of the removal of an AAL type 2 path by use of the REMOVE-PATH.indication primitive containing the adjacent AAL type 2 node identifier and the AAL type 2 path identifier.

In order to minimize the likelihood of CID collision, the following CID allocation mechanism shall be used:

•        if the AAL type 2 node owns the AAL type 2 path that carries the new connection, it allocates CID values from CID value 8 upwards; and

•        if the AAL type 2 node does not own the AAL type 2 path that carries the new connection, it allocates CID values from CID value 255 downwards.

Each AAL type 2 connection request (regardless of coming directly from an AAL type 2 served user or from an adjacent AAL type 2 node) shall contain an AAL type 2 service endpoint address which indicates the destination of the intended AAL type 2 connection instance. This information is used to route the AAL type 2 connection via the AAL type 2 network to its destination service endpoint. In capability set 3, the supported address formats are: NSAP and E.164.

It is up to the application area or the operator of a particular network to decide what addressing plan is used in the AAL type 2 network. The addressing plan in the AAL type 2 network can be a reuse of the addressing plan in the underlying ATM network but it can also be an independent addressing plan defined exclusively for the AAL type 2 network.

NOTE – Causes in the procedures defined in clause 8 specify which ITU-T standardized code should be used in cause parameters of AAL type 2 signalling protocol messages. Implementation dependent non-standardized causes may be used for AAL type 2 signalling entity internal processing and for A2SU-SAP and LM-SAP cause primitive parameters.

The following procedures may be supported as a network option:

a)      Connection priority;

b)      Automatic congestion control (see ITU-T Rec. Q.542 [18]);

c)      Hop Counter Procedure;

d)      Temporary Alternative Routing Procedure (see ITU-T Rec. E.412 [17]).

## 8.1      Compatibility

### 8.1.1      General requirements on receipt of unrecognized signalling information

It may happen that a node receives unrecognized signalling information, i.e., messages, parameter types or subfield values. This can typically be caused by the upgrading of the signalling system used by other nodes in the network. In these cases, the following compatibility procedures are invoked to ensure the predictable network behaviour.

All messages and parameters shall include a compatibility field generated by the nodal function.

The procedures to be used on receipt of unrecognized information make use of:

•       compatibility field received in the same message as the unrecognized information;

•       the cause parameter containing a cause value and diagnostics;

•       the confusion message and the release request message (maintaining the link associated signalling relationship); and

•       the release confirm message, the reset confirm message, the block confirm message, and the unblock confirm message (terminating the link associated signalling relationship).

The following causes are used:

•       "message type non-existent or not implemented";

•       "information element/parameter non-existent or not implemented"; or

•       "message with unrecognized parameter discarded".

For all the above causes a diagnostic field is included containing, dependant on the cause, the message identifier and zero, one, or more pairs of parameter identifier and field number.

The procedures are based on the following assumptions:

i)      Since nodes can be both national and international nodes, the compatibility mechanism is applicable to the national and international network.

ii)     If a node receives a confusion message, a release request message, a release confirm message, a reset confirm message, a block confirm message, or an unblock confirm message indicating an unrecognized message or parameter received, it assumes interaction with a node supporting a different functional level.

        NOTE 1 – A node may be at a different functional level due to having implemented a different capability set or another subset of the protocol specified in this Recommendation.

When an unrecognized parameter or message is received, the node will find some corresponding instructions contained in the parameter compatibility information or message compatibility field respectively. The message compatibility field contains the instructions specific for the handling of the complete message.

The instruction indicators consist of two subfields, one to indicate how to handle unrecognized parameters or messages and the other to indicate what to do when an unrecognized parameter or message cannot be passed on. The following general rules apply to the interpretation of these instruction indicators:

a)  "Reserved" subfields of the compatibility field are not examined. They may be used by future capability sets of this Recommendation; in this case, the future capability sets will set the currently defined instruction indicators to a reasonable value for nodes implementing the current capability set. This rule ensures that more types of instructions can be defined in the future without creating a backward compatibility problem.

b)  At an AAL type 2 node, the connection is released, using normal release procedures, if the instruction indicator is set to "release connection".

c)  At an AAL type 2 node if the instruction indicator is set to: "Discard message", or "Discard parameter", the message or parameter is discarded, as instructed. If the send notification indicator is set to "send notification", the appropriate message is issued towards the node that sent the unrecognized information:

    •   A confusion message is sent in response to an establish request message, an establish confirm message or in response to an unrecognized message.

    •   The appropriate confirm message is sent in response to a release request message, block request message, unblock request message, or reset request message.

    •   No response is returned in response to a confusion message, release confirm message, block confirm message, unblock confirm message, or reset confirm message.

d)  At an AAL type 2 node, if the instruction indicator is set to "pass-on", the unrecognized message or parameter is passed to the link associated signalling relationship on the other side of the AAL type 2 switch used for this connection. If the ability to "pass-on" is not possible at an AAL type 2 switch, then the instruction indicators "pass-on not possible" are examined.

    NOTE 2 – Examples of where "pass-on" might not be possible are: At AAL type 2 service endpoints, or in AAL type 2 switches in inter-operator situations, where "pass-on" might depend on bilateral agreements.

e)  For the case of an unrecognized parameter, it is possible for the instruction to require that either the unrecognized parameter or the whole message be discarded. This provides for the case where the sending node determines that it is not acceptable for the message to continue being processed without this parameter.

### 8.1.2    Procedures for the handling of the unrecognized messages or parameters

If the unrecognized signalling information is received, an ERROR.indication primitive with an appropriate cause (described in the following subclauses) is sent to layer management, except when the action taken is to pass on the message or parameter transparently.

A confusion message must not be issued in response to the following messages:

| | | |
|---|---|---|
| •  Confusion | •  Block request | •  Block confirm |
| •  Release request | •  Unblock request | •  Unblock confirm |
| •  Release confirm | •  Reset request | •  Reset confirm |

Any unrecognized parameters received in the following messages are discarded:

| | | |
|---|---|---|
| •  Confusion | •  Block confirm | •  Unblock confirm |
| •  Release confirm | •  Reset confirm | |

### 8.1.2.1    Unrecognized messages

Depending on the instructions received in the message compatibility field, a node receiving an unrecognized message will either:

a)       transfer the message transparently;

b)       discard the message;

c)       discard the message and send notification; or

d)       release the connection.

The release request in case d) and the confusion message in case c) shall include the cause "Message type non-existent or not implemented", followed by a diagnostic field containing only the message identifier.

### 8.1.2.2    Unrecognized parameters

Unexpected parameters (a parameter in the "wrong" message) are handled like unrecognized parameters.

Depending on the instructions received in the parameter compatibility information field, a node receiving an unrecognized parameter will either:

a)       transfer the parameter transparently;

b)       discard the parameter;

c)       discard the parameter and send notification;

d)       discard the message;

e)       discard the message and send notification; or

f)       release the connection.

In case c), the confusion message shall include the cause "Information element/parameter non-existent or not implemented" followed by a diagnostic field containing the message identifier and containing pairs of parameter identifier and field number for each unrecognized parameter; the field number in each pair is set to "zero".

In case e), the confusion message shall include the cause "Message with unrecognized parameter discarded", followed by a diagnostic field containing the message identifier and a parameter identifier (of the first detected unrecognized parameter which caused the message to be discarded) and a field number set to "zero". A confusion message may refer to multiple unrecognized parameters.

A node receiving a message including multiple unrecognized parameters shall process the different instruction indicators, associated with those parameters, according to the following order:

1)       release the connection;

2)       discard the message and send notification;

3)       discard the message.

A release request message shall include the cause "Information element/parameter non-existent or not implemented" followed by a diagnostic field containing the message identifier, the parameter identifier (of the first detected unrecognized parameter which caused the connection to be released), and a field number set to "zero".

If a release request message is received containing an unrecognized parameter, depending on the instructions received in the parameter compatibility field, the node will either:

•       transfer the parameter transparently;

•       discard the parameter; or

- discard the parameter and send a cause "Information element/parameter non-existent or not implemented", in the release confirm message; the diagnostic field contains the message identifier and one or more pairs of parameter identifier and field number indicating all parameters that match the cause value; the field number of all pairs contains the null value.

If a block request message is received containing an unrecognized parameter, depending on the instructions received in the parameter compatibility field, the node will either:

- discard the parameter; or

- discard the parameter and send a cause "Information element/parameter non-existent or not implemented", in the block confirm message; the diagnostic field contains the message identifier and one or more pairs of parameter identifier and field number indicating all parameters that match the cause value; the field number of all pairs contains the null value.

If an unblock request message is received containing an unrecognized parameter, depending on the instructions received in the parameter compatibility field, the node will either:

- discard the parameter; or

- discard the parameter and send a cause "Information element/parameter non-existent or not implemented", in the unblock confirm message; the diagnostic field contains the message identifier and one or more pairs of parameter identifier and field number indicating all parameters that match the cause value; the field number of all pairs contains the null value.

If a reset request message is received containing an unrecognized parameter, depending on the instructions received in the parameter compatibility field, the node will either:

- discard the parameter; or

- discard the parameter and send a cause "Information element/parameter non-existent or not implemented", in the reset confirm message; the diagnostic field contains the message identifier and one or more pairs of parameter identifier and field number indicating all parameters that match the cause value; the field number of all pairs contains the null value.

### 8.1.2.3    Unrecognized fields

There exists no specific compatibility information for each field. For all fields contained in a parameter, the compatibility information of the parameter applies.

Any value in a subfield that is marked as "spare", "reserved" or "national use" is regarded as unrecognized and the procedures as stated for unrecognized parameters apply except that the field number is coded in the diagnostics field.

### 8.1.3    Procedures for the handling of responses indicating unrecognized information has been sent

Action taken on receipt of responses indicating unrecognized information has been sent at an originating or terminating AAL type 2 node will depend on the connection state and the affected service.

The definition of any procedure that is outside the basic connection setup protocol, as defined in this Recommendation, should include procedures for handling responses that indicate that another node has received, but not recognized, information belonging to that procedure. The procedure receiving this response should take the appropriate actions.

The default action taken on receipt of a confusion message is to discard the message without disrupting normal connection processing.

## 8.2 Nodal functions

Interworking with AAL type 2 nodes that conform only to ITU-T Recs Q.2630.1 [15] or Q.2630.2 [16] is specified in Annex C; the procedures in the main body of this Recommendation exclusively describe the AAL type 2 signalling control protocol capability set 3.

### 8.2.1 Nodal functions for AAL type 2 nodes with served user interaction

#### 8.2.1.1 Connection control

##### 8.2.1.1.1 Successful connection set up

###### 8.2.1.1.1.1 Actions at the originating AAL type 2 service endpoint

When the nodal function receives an ESTABLISH.request primitive from the AAL type 2 served user, the following parameters are mandatory:

- Destination Endpoint Address; and
- Transfer Capability.

When the nodal function receives an ESTABLISH.request primitive from the AAL type 2 served user, the restrictions on the optionality of the parameters used only for interworking with CS-1 or CS-2 nodes is described in Annex C. These optional parameters are the following:

- The Preferred Transfer Capability;
- Transfer Capability Support;
- Link Characteristics;
- Preferred Link Characteristics;
- Modify Support for Link Characteristics;
- Preferred Service Specific Information;
- Modify Support for Service Specific Information;
- Service Specific Information (Audio); and
- Service Specific Information (Multirate).

No optionality restrictions apply to the other parameters.

The nodal function analyses the routing information and selects a route with sufficient AAL type 2 path resources on a path with the requested path type (or network default if the path type is not specified) to the succeeding AAL type 2 node. It then selects an AAL type 2 path from within that route which is able to accommodate the new connection.

NOTE 1 – Routing typically is based on:

- Addressing information;
- The Test Connection Indicator;
- Transfer Capability;
- Requested Path Type;
- Automatic congestion control and the congestion level in the routing tables; and
- Temporary Alternative Routing control (see ITU-T Rec. E.412 [17]).

When the nodal function selects a route, the connection priority information, if received from the AAL Type 2 served user, is used to select a route that has sufficient AAL type 2 path resources to the succeeding AAL type 2 node.

Under the normal condition, when the network is not congested and the AAL Type 2 service endpoint has the necessary resources to complete it, the connection establishment is processed without special treatments.

NOTE 2 – In times of network congestion, when the AAL Type 2 service endpoint does not have sufficient resources to complete all of the incoming connection establishment requests, as one option, the AAL Type 2 service endpoint may give preferential treatments based on the priority level.

NOTE 3 – The preferential treatment should include access to reserved network resources, e.g.:

• the highest priority connections are given access to available network resources including the resources reserved for highest priority connections;

• the second highest priority connections are given access to available network resources including the resources reserved for the second highest priority connections, except for the resources reserved for the highest priority connections, and so on.

NOTE 4 – Allocation of reserved network resources to specific priority levels is implementation specific, and is not a subject for standardization.

AAL type 2 service endpoint internal resources are allocated for the new connection from the originating AAL type 2 served user to the outgoing AAL type 2 path. The connection priority information, if received, is taken into consideration when allocating these resources.

On the selected outgoing AAL type 2 path, the CID and other resources (e.g., indicated by the Transfer Capability parameter) are allocated for the outgoing AAL type 2 link. The handling of interworking with CS-1 and CS-2 nodes is specified in Annex C.

The following parameters – if they were conveyed by the originating AAL type 2 served user – shall not be modified by the nodal function:

• the Destination Service Endpoint Address;

• the Origination Service Endpoint Address;

• the Served User Generated Reference;

• the Served User Transport;

• the Transfer Capability;

• the Preferred Transfer Capability;

• the Transfer Capability Support;

• the Link Characteristics;

• the Preferred Link Characteristics;

• the Modify Support for Link Characteristics;

• the SSCS Information;

• the Preferred SSCS Information;

• the Modify Support for SSCS Information;

• the Path Type;

• the Connection Priority; and

• the Test Connection Indicator.

The following parameters – if they were conveyed by the originating AAL type 2 served user – have significance to the served user only; therefore, they shall not be examined by the nodal function:

• the Origination Service Endpoint Address;

• the Served User Generated Reference;

• the Served User Transport;

- the SSCS Information;
- the Preferred SSCS Information; and
- the Modify Support for SSCS Information.

An outgoing protocol entity instance is invoked and the following parameters are passed to it:
- the Destination AAL type 2 Service Endpoint Address;
- the Transfer Capability;
- the AAL type 2 Path Identifier; and
- a CID value.

The nodal function shall pass the following parameters to the outgoing protocol entity instance only if they were conveyed by the originating AAL type 2 served user:
- the Origination AAL type 2 Service Endpoint Address;
- the Served User Generated Reference;
- the Served User Transport;
- the Preferred Transfer Capability;
- the Transfer Capability Support;
- the Link Characteristics;
- the Preferred Link Characteristics;
- the Modify Support for Link Characteristics;
- the SSCS Information;
- the Preferred SSCS Information;
- the Modify Support for SSCS Information;
- the Path Type;
- the Connection Priority; and
- the Test Connection Indicator.

If the Temporary Alternative Routing control is applied a "TAR controlled connection" indication shall be passed to the outgoing protocol entity instance.

If the hop counter procedure has been activated, a Hop Counter containing an initial count value shall be passed to the outgoing protocol entity instance. The initial count value of the Hop Counter shall be provisioned by the network operator on a per AAL type 2 node basis (31 maximum).

NOTE 5 – Through-connection at AAL type 2 service endpoints is not specified by this Recommendation. It may be controlled by the AAL type 2 served user.

After receiving an indication of the successful AAL type 2 connection setup from the outgoing protocol entity instance, an ESTABLISH.confirm primitive is sent to the AAL type 2 served user. If a Transfer Capability Support parameter, a Modify Support for Link Characteristics, or a Modify Support for SSCS Information parameter was received from the outgoing protocol instance, the respective parameter shall be included in the ESTABLISH.confirm primitive.

### 8.2.1.1.1.2    Actions at the destination AAL type 2 service endpoint

Upon receiving an indication from an incoming protocol entity instance requesting a new connection, the nodal function checks the availability of the CID value and other resources (e.g., indicated by the Transfer Capability parameter), in the incoming AAL type 2 path.

NOTE 1 – In case of interworking, the Transfer Capability and the Preferred Transfer Capability may be generated by the AAL type 2 service endpoint (see Annex C).

The following parameters – if they were conveyed by the incoming protocol entity instance – shall not be modified by the nodal function:

•       the Destination Service Endpoint Address;

•       the Origination Service Endpoint Address;

•       the Served User Generated Reference;

•       the Served User Transport;

•       the Transfer Capability;

•       the Preferred Transfer Capability;

•       the Transfer Capability Support;

•       the Link Characteristics;

•       the Preferred Link Characteristics;

•       the Modify Support for Link Characteristics;

•       the SSCS Information;

•       the Preferred SSCS Information;

•       the Modify Support for SSCS Information;

•       the Path Type;

•       the Connection Priority; and

•       the Test Connection Indicator.

The following parameters – if they were conveyed by the incoming protocol entity instance – have significance to the served user only; therefore, they shall not be examined by the nodal function:

•       the Origination Service Endpoint Address;

•       the Served User Generated Reference;

•       the Served User Transport;

•       the SSCS Information;

•       the Preferred SSCS Information; and

•       the Modify Support for SSCS Information.

If the Test Connection Indicator parameter is present, a "locally blocked" or "remotely blocked" AAL type 2 path shall be acceptable for the incoming connection.

If the CID and the other resources are available for the new connection, they are allocated to the new connection and then the AAL type 2 service endpoint address is examined. The nodal function determines that the destination AAL type 2 service endpoint has been reached.

When the nodal function checks the availability of resources in the incoming AAL type 2 path, the Connection Priority information, if received, is taken into consideration.

Under the normal condition, when the network is not congested and the AAL Type 2 service endpoint has the necessary resources to complete it, the connection establishment is processed without special treatments (see Notes in 8.2.1.1.1.1).

If a Temporary Alternative Routing (TAR) control parameter or a Hop Counter parameter is received, they shall be ignored.

AAL type 2 service endpoint internal resources are allocated for the new connection from the incoming AAL type 2 path to the destination AAL type 2 served user. The connection priority information, if received, is taken into consideration when allocating these resources.

The nodal function acknowledges the successful AAL type 2 connection establishment towards the incoming protocol entity instance. The nodal function shall pass the following parameters to the incoming protocol entity instance only if they were conveyed by the incoming protocol entity instance:

•       the Transfer Capability Support;

•       the Modify Support for Link Characteristics; and

•       the Modify Support for SSCS Information.

An ESTABLISH.indication primitive is sent to the AAL type 2 served user to inform it of the successfully established new connection. The nodal function shall pass the following parameters to the destination AAL type 2 served user only if they were conveyed by the incoming protocol entity instance:

•       the Origination AAL type 2 Service Endpoint Address;

•       the Served User Generated Reference;

•       the Served User Transport;

•       the Transfer Capability;

•       the Preferred Transfer Capability;

•       the Transfer Capability Support;

•       the Link Characteristics;

•       the Preferred Link Characteristics;

•       the Modify Support for Link Characteristics;

•       the SSCS Information;

•       the Preferred SSCS Information;

•       the Modify Support for SSCS Information;

•       the Path Type;

•       the Connection Priority; and

•       the Test Connection Indicator.

NOTE 2 – Through-connection at AAL type 2 service endpoints is not specified by this Recommendation. It may be controlled by the AAL type 2 served user.

### 8.2.1.1.2   Unsuccessful/abnormal connection setup

### 8.2.1.1.2.1      Actions at the originating AAL type 2 service endpoint

If the AAL type 2 path selection or the allocation of a CID and other resources for the outgoing AAL type 2 link described in 8.2.1.1.1 fails, a RELEASE.confirm primitive is returned to the AAL type 2 served user with one of the following causes:

•       "Unallocated (unassigned) number";

•       "No route to destination";

•       "No circuit/channel available";

•       "Resource unavailable, unspecified";

•       "Network out of order"; or

•       "Temporary failure".

NOTE – Path selection failure may be due to the unavailability of an AAL type 2 path with the requested path type.

If AAL type 2 service endpoint internal resources are not available for the new connection, a RELEASE.confirm primitive is sent to the AAL type 2 served user with the cause "Switching equipment congestion".

If the AAL Type 2 service endpoint cannot complete a high priority connection establishment request even after application of the preferential treatment, a RELEASE.confirm primitive is sent to the AAL type 2 served user with the cause "Resource unavailable, unspecified".

Upon receiving a negative acknowledgement for the connection setup request from the outgoing protocol entity instance, all the resources associated with this AAL type 2 link are released and made available for new traffic. The association to the outgoing protocol entity instance is released.

Features that enable a further connection attempt, involving the selection of a different AAL type 2 path within the same route or of an alternative route, may be implemented. Such reattempts may use the CEID parameter returned in the Release Confirm (RLC) message and may select a different AAL type 2 path within the same route only. If the CEID parameter specifies an AAL Type 2 path with insufficient resources available for the connection attempt, no connection attempt is made on that path.

If no further connection attempt is made, the AAL type 2 service endpoint internal resources are released and a RELEASE.confirm primitive is sent to the AAL type 2 served user with the cause received from the outgoing protocol entity instance.

When an indication is received from the outgoing protocol entity that the establishment request has been rejected, and there has been a change in the level of congestion of the adjacent node, the routing tables in the nodal function shall be updated accordingly. The absence of an Automatic Congestion Control parameter indicates that there is no reported congestion in the adjacent node, whilst if the Automatic Congestion Control parameter is present it indicates whether congestion level 1 or 2 has been exceeded. After the routing tables have been updated, the Automatic Congestion Control parameter is discarded.

Upon receiving an indication from the outgoing protocol entity instance that a timer has expired, the association to the outgoing protocol entity instance is released and a reset procedure is started (see 8.2.1.2.1.1 case 3 a). The AAL type 2 service endpoint internal resources are released. A RELEASE.confirm primitive is sent to the AAL type 2 served user with the cause received from the outgoing protocol entity instance, i.e., "Recovery on timer expiry".

#### 8.2.1.1.2.2 Actions at the destination AAL type 2 service endpoint

If resources on the incoming AAL type 2 path are not available, the nodal function requests the incoming protocol entity instance to reject the AAL type 2 connection with one of the following causes as applicable:

- "Resource unavailable, unspecified"; or
- "Requested circuit/channel not available".

If the nodal function detects that the destination is not reachable it may issue a redirection request by rejecting the AAL type 2 connection with the cause "No route to destination" and include an alternative AAL type 2 path identifier in a Connection Element Identifier parameter.

If the nodal function is aware that the SSCS parameters are not supported, it requests the incoming protocol entity instance to reject the AAL type 2 connection with the cause "AAL parameters cannot be supported".

The association between the nodal function entity and its incoming protocol entity instance is released.

If an AAL type 2 path is "locally blocked" and an indication from an incoming protocol entity instance of the request for a new connection other than a test connection is received, the following actions are taken:

1)      The indication of the request for a new connection establishment is ignored and the incoming protocol entity instance is instructed to terminate and enter state "Idle"; the association with the incoming protocol entity instance is released and an ERROR.indication primitive with the CEID and the cause "Temporary failure" is sent to layer management.

2)      The blocking procedure specified in 8.2.1.2.2.1 case b) is initiated for the AAL type 2 path on which the new connection was requested to be established.

If an AAL type 2 path is "remotely blocked" and an indication from an incoming protocol entity instance of the request for a new connection other than a test connection is received, the following actions are taken:

1)      The AAL type 2 path is set to "remotely unblocked".

        NOTE – This procedure shall not be considered as the normal way to remove the "remotely blocked" condition.

2)      The incoming connection establishment request is processed normally, i.e., as if the AAL type 2 path was not "remotely blocked" to begin with.

If AAL type 2 service endpoint internal resources are not available for the new connection, a negative acknowledgement for the connection setup request shall be returned to the incoming protocol entity instance with the cause "Switching equipment congestion". The resources allocated to the incoming AAL type 2 path are released and the association between the incoming protocol entity instance and the nodal function is released.

If the AAL Type 2 service endpoint cannot complete a high priority connection establishment request even after application of the preferential treatment, a negative acknowledgement for the connection setup request shall be returned to the incoming protocol entity instance with the cause "Resource unavailable, unspecified". The resources allocated to the incoming AAL type 2 path are released and the association between the incoming protocol entity instance and the nodal function is released.

Upon receiving an indication from an incoming protocol entity instance requesting a new connection and the connection request is to be rejected, the nodal function checks the level of congestion of the node. If either of the two congestion thresholds is exceeded, an Automatic Congestion Control parameter is passed to the protocol entity with the rejection indication. This parameter indicates the level of congestion (congestion level 1 or 2) to the adjacent AAL Type 2 node.

### 8.2.1.1.3    Normal connection release

#### 8.2.1.1.3.1        Actions at the AAL type 2 service endpoint that originates the release

When the nodal function at an AAL type 2 service endpoint receives a RELEASE.request primitive from the AAL type 2 served user, it requests the protocol entity instance to release the connection. The request carries the cause of the release which shall be "Normal, unspecified" in case of normal connection release or "AAL parameters cannot be supported" if the AAL type 2 served user determines that it cannot support the SSCS parameters.

The Cause parameters shall not be modified by the nodal function.

When a release is to be initiated, the nodal function checks the level of congestion of the node. If either of the two congestion thresholds is exceeded, an Automatic Congestion Control parameter is passed to the protocol entity with the release indication. This parameter indicates the level of congestion (congestion level 1 or 2) to the adjacent AAL Type 2 node.

Upon acknowledgement of the successful connection release from the protocol entity instance, all the resources associated with this AAL type 2 link are released and made available for new traffic, and the AAL type 2 service endpoint internal resources are released. The association to the protocol entity instance is released.

### 8.2.1.1.3.2 Actions at the AAL type 2 service endpoint that receives the release

When the nodal function at an AAL type 2 service endpoint receives a request from a protocol entity instance to clear the connection, all the resources associated with this AAL type 2 link are released and made available for new traffic, and the AAL type 2 service endpoint internal resources are released. The release is confirmed to the protocol entity instance and a RELEASE.indication primitive with the cause received from the protocol entity instance is sent to the AAL type 2 served user. The Cause parameters shall not be modified by the nodal function. The association between the nodal function and the protocol entity instance is released.

When a Release indication containing an Automatic Congestion Control parameter is received from the incoming or outgoing protocol entity, and there has been a change in the level of congestion of the adjacent node, the routing tables in the nodal function shall be updated according to the indicated congestion level. The absence of an Automatic Congestion Control parameter indicates that there is no reported congestion in the adjacent node, whilst if the Automatic Congestion Control parameter is present it indicates whether congestion level 1 or 2 has been exceeded. After the routing tables have been updated, the Automatic Congestion Control parameter is discarded.

### 8.2.1.1.4 Abnormal connection release procedures

When the nodal function at an AAL type 2 service endpoint receives an indication from the protocol entity instance that a timer has expired, the association to the protocol entity instance is released and a maintenance protocol entity instance is ordered to start a reset procedure.

### 8.2.1.1.5 Successful modification

NOTE 1 – Modification of connection resources and SSCS layer resources are mandatory capabilities in this Recommendation (as in ITU-T Rec. Q.2630.2 [16]). Modify Support parameters and the Transfer Capability Support parameter are only required for interworking with CS-1 and CS-2 nodes (see Annex C).

NOTE 2 – The effect of SSCS information in AAL type 2 CS-3 nodes is restricted to the allocation, configuration and management of the respective SSCS layer resources in AAL type 2 CS-3 service endpoints.

#### 8.2.1.1.5.1 Actions at the AAL type 2 service endpoint originating the modification request

When the nodal function receives a MODIFY.request primitive from the AAL type 2 served user, the following restrictions on the optionality of the parameters of the primitive apply:

• A Transfer Capability parameter or an SSCS Information parameter must be present.

• If a Transfer Capability parameter is present, this parameter has to refer to the same AAL type 2 transfer capability as the AAL type 2 Transfer Capability parameter in the ESTABLISH.request primitive.

  NOTE 1 – For example, if the AAL type 2 Transfer Capability parameter in the ESTABLISH.request primitive indicated a Variable Bandwidth Stringent Transfer Capability, the AAL type 2 Transfer Capability parameter in the MODIFY.request primitive, if present, may only indicate a Variable Bandwidth Stringent Transfer Capability.

• If an SSCS Information parameter is present, this parameter has to refer to the same SSCS Information as the SSCS Information parameter in the ESTABLISH.request primitive.

  NOTE 2 – For example, if the SSCS Information parameter in the ESTABLISH.request primitive indicated an audio service specific information, the SSCS Information parameter in the MODIFY.request primitive, if present, may only indicate an audio service specific information.

- If an SSCS Information parameter is present, it must be either an "SSCS Information (Audio Extended)" parameter or an "SSCS Information (Multirate Extended)" parameter.

When the nodal function receives a MODIFY.request primitive from the AAL type 2 served user, the restrictions on the optionality of the Link Characteristics parameter that is used only for interworking with CS-1 or CS-2 nodes are described in Annex C.

When the nodal function receives a MODIFY.request primitive from the AAL type 2 served user that conveys a Transfer Capability parameter, it checks the availability of resources indicated by the AAL type 2 connection resource in the AAL type 2 path. If the resources are available for the connection, they are reserved for the connection.

The protocol entity instance is informed of the modification request. The nodal function shall pass the following parameters to the protocol entity instance only if they were conveyed by the AAL type 2 served user:

- the Served User Correlation ID;
- the Transfer Capability;
- the Link Characteristics; and
- the SSCS Information.

The following parameters – if they were conveyed by the originating AAL type 2 served user – shall not be modified by the nodal function:

- the Served User Correlation ID;
- the Transfer Capability;
- the Link Characteristics; and
- the SSCS Information.

The following parameters – if they were conveyed by the originating AAL type 2 served user – have significance to the served user only; therefore, they shall not be examined by the nodal function:

- the Served User Correlation ID; and
- the SSCS Information.

After receiving an indication of the successful modification from the protocol entity instance and AAL type 2 connection resources were requested to be modified, the reserved additional resources are allocated to the connection or resources no longer required for this AAL type 2 connection are freed.

A MODIFY.confirm primitive is then sent to the AAL type 2 served user. If a Served User Correlation ID parameter was received from the protocol entity instance, it shall be included in the MODIFY.confirm primitive. The Served User Correlation ID parameter has significance to the served user only; therefore, it shall not be examined by the nodal function.

### 8.2.1.1.5.2 Actions at the AAL type 2 service endpoint receiving the modification request

Upon receiving an indication from a protocol entity instance requesting modification of the AAL type 2 connection resource, i.e., a Transfer Capability parameter is conveyed, the nodal function checks the availability of resources indicated by the AAL type 2 connection resource information in the incoming AAL type 2 path. If the resources are available for the connection, they are reserved for the connection.

NOTE – In case of interworking, the Transfer Capability may be generated by the AAL type 2 service endpoint (see Annex C).

A MODIFY.indication primitive is sent to the AAL type 2 served user to inform it of the modification of AAL type 2 connection resource. The nodal function shall pass the following

parameters to the AAL type 2 served user only if they were conveyed by the protocol entity instance:

- the Served User Correlation ID;
- the Transfer Capability;
- the Link Characteristics; and
- the SSCS Information.

The following parameters – if they were conveyed by the originating AAL type 2 served user – have significance to the served user only; therefore, they shall not be examined by the nodal function:

- the Served User Correlation ID; and
- the SSCS Information.

Upon receiving a MODIFY.response from the served user and AAL type 2 connection resources were requested to be modified, the reserved additional resources are allocated to the connection or resources no longer required for this AAL type 2 connection are freed. The nodal function acknowledges the successful AAL type 2 connection resource modification towards the protocol entity instance. If a Served User Correlation ID parameter was contained in the MODIFY.response primitive, this parameter is passed to the protocol entity. The Served User Correlation ID parameter has significance to the served user only; therefore, it shall not be examined by the nodal function.

### 8.2.1.1.6  Unsuccessful/abnormal modification

#### 8.2.1.1.6.1   Actions at the AAL type 2 service endpoint originating the modification request

If resources on the AAL type 2 path are not available, a MODIFY-REJECT.confirm primitive is returned to the AAL type 2 served user with the cause "Resource unavailable, unspecified'.

Upon receiving a negative acknowledgement for the modification request from the protocol entity instance, all additional resources reserved for the modification request are freed. A MODIFY-REJECT.confirm primitive is sent to the AAL type 2 served user with the cause received from the protocol entity instance. The Cause parameters shall not be modified by the nodal function.

Upon receiving an indication from the outgoing protocol entity instance that a timer has expired, the association to the outgoing protocol entity instance is released and a reset procedure is started (see 8.2.1.2.1.1 case 3 a). The AAL type 2 service endpoint internal resources are released. A RELEASE.indication primitive is sent to the AAL type 2 served user with the cause received from the outgoing protocol entity instance, i.e., "Recovery on timer expiry".

#### 8.2.1.1.6.2   Actions at the AAL type 2 service endpoint receiving the modification request

If the resources on the AAL type 2 path are not available, the nodal function requests the protocol entity instance to reject the AAL type 2 modification request with the cause "Resource unavailable, unspecified".

### 8.2.1.1.7  Connection release during modification

The release procedures take precedence over the modification procedures.

#### 8.2.1.1.7.1   Actions at the AAL type 2 service endpoint

When the nodal function receives a RELEASE.request primitive from the AAL type 2 served user or an indication of connection release from the protocol entity instance during the modification procedures, the nodal function will continue with normal connection release procedures.

### 8.2.1.2    Maintenance control

### 8.2.1.2.1  Reset

The reset procedure is invoked under abnormal conditions such as when the current status of the channels is unknown or ambiguous, for example, an AAL type 2 switching system that has suffered memory mutilation will not know the status of channels in one or several AAL type 2 paths. All the affected channels and any associated resources (e.g., bandwidth, etc.) between the two adjacent AAL type 2 nodes shall be released. The resources are made available for new traffic.

The reset procedure covers the following three cases:

1)      Case 1: Reset all channels used for user plane traffic (see Note) in all AAL type 2 paths associated with a signalling transport association between two adjacent AAL type 2 nodes.

2)      Case 2: Reset all channels used for user plane traffic (see Note) in a single AAL type 2 path between two adjacent AAL type 2 nodes represented by an AAL type 2 Path Identifier.

3)      Case 3: Reset a single channel between two adjacent AAL type 2 nodes.

NOTE – Channels used for user plane traffic refers to channels that are under the control of the AAL type 2 signalling entity. They are identified by CID values "8" … "255". Other channels are unaffected by the reset procedure.

The reset procedure should be initiated when:

a)      Signalling anomalies are detected by the AAL type 2 signalling entity. The following anomalies are detected by the protocol procedures and are indicated to the nodal function:

   •    Timer "Timer_ERQ" expiry – Action: Reset the single AAL type 2 channel associated with the outgoing protocol entity instance.

   •    Timer "Timer_REL" expiry – Action: Reset the single AAL type 2 channel associated with the incoming or outgoing protocol entity instance.

   •    Timer "Timer_MOD" expiry – Action: Reset the single AAL type 2 channel associated with the incoming or outgoing protocol entity instance.

b)      Maintenance action is required to recover from abnormal conditions such as loss or ambiguity of association information (e.g., caused by memory mutilation) between SAID(s) and the channel status of either a specific channel in a specific AAL type 2 path, all channels in a specific AAL type 2 path, or all AAL type 2 paths associated with a signalling transport association between two AAL type 2 signalling nodes. Action: Reset a single AAL type 2 channel in a specific AAL type 2 path, all AAL type 2 channels in a single AAL type 2 path or all AAL type 2 channels in all AAL type 2 paths associated with a signalling transport association between two adjacent AAL type 2 nodes respectively.

The reset procedures take precedence over the modification procedures.

### 8.2.1.2.1.1    Actions at reset initiating AAL type 2 node

Reset procedures can be initiated to reset:

1)      all AAL type 2 paths associated with a signalling transport association between two adjacent AAL type 2 nodes,

2)      a specific AAL type 2 path;

3)      a single AAL type 2 channel.

For case 1), layer management passes a RESET.request together with the indication "All AAL type 2 paths associated with a signalling transport association" to the nodal function which in turn invokes a maintenance protocol entity and passes a request for reset to that entity together with an indication that all AAL type 2 paths associated with a signalling transport association must be reset.

For case 2), layer management passes a RESET.request together with the AAL type 2 path identifier to the nodal function which in turn invokes a maintenance protocol entity and passes a request for reset together with the AAL type 2 path identity.

For case 3) there are two possible subcases, one due to timer expiry and the other due to layer management action:

a)      After the expiry of Timer_ERQ, Timer_REL, or Timer_MOD, the nodal function invokes a maintenance protocol entity by passing a request for a reset together with the identity of the AAL type 2 path and the channel.

b)      Layer management invokes the nodal function which in turn invokes a maintenance protocol entity by passing a request for a reset together with the identity of the AAL type 2 path and the channel.

In cases 1), 2), and 3 b), the nodal function requests any affected incoming or outgoing protocol entity instances to terminate and enter state "Idle". The associations to the incoming or outgoing protocol entity instances are released. The affected AAL type 2 served users are informed with a RELEASE.indication primitive with the cause "Temporary failure".

For cases 1) and 2), the remote blocking state for the affected path(s) is set to "remotely unblocked".

Upon receiving a reset confirmation from the maintenance protocol entity instance, the nodal function will make the affected resources available for new connections, and the AAL type 2 node internal resources are released. The association to the maintenance protocol entity instance is released. In case 3 a), a RESET.indication primitive with a CEID parameter is sent to layer management; in all other cases, a RESET.confirm primitive is sent to the layer management.

NOTE – The local blocking states are not affected.

### 8.2.1.2.1.2      Actions at reset responding node

Upon receiving a reset indication from the maintenance protocol entity, the nodal function analyses the received information to determine which AAL type 2 channels are to be reset.

1)      If an indication that all AAL type 2 paths associated with a signalling transport association must be reset is received, then all AAL type 2 channels associated with a signalling transport association between the two adjacent AAL type 2 nodes are reset.

2)      If an indication that all the channels within the identified AAL type 2 path must be reset is received, all AAL type 2 channels within that path are reset.

3)      If an indication that a specific channel within an AAL type 2 path must be reset is received, only that channel is reset.

In cases 1) and 2), for "locally blocked" AAL type 2 paths, blocking procedures (refer to 8.2.1.2.2.1 case b)) are initiated prior to the sending of the reset confirmation.

If resources have been assigned to any of the channels that are reset, the nodal functions make the affected resources available for new connections, and the AAL type 2 node internal resources are released. It also returns a reset confirmation to the maintenance protocol entity. The association between the nodal function and the maintenance protocol entity instance is released. The nodal function informs layer management about the receipt of the reset request by sending a RESET.indication primitive with the same CEID parameter as has been received in the RES message (reset request).

The nodal function also requests the affected incoming or outgoing protocol entity instances (if any) to terminate and enter state "Idle". The associations to the incoming or outgoing protocol entity instances are released. The affected AAL type 2 served user is informed with a RELEASE.indication primitive with the cause "Temporary failure".

### 8.2.1.2.1.3 Abnormal reset procedures

Upon receiving a negative acknowledgement with a cause "Switching equipment congestion" from the maintenance protocol entity instance, the nodal function repeats the request for the reset.

Upon receiving a negative acknowledgement with another cause from the maintenance protocol entity instance, an ERROR.indication primitive including the cause received from the maintenance protocol entity instance and the CEID parameter is sent to layer management.

Upon receiving a STOP-RESET.request primitive with adjacent AAL type 2 node identifier and connection element identifier parameters from layer management, the nodal function will make the affected resources available for new connections. The nodal function requests the maintenance protocol entity instance to terminate and enter state "Idle". The association between the nodal function and the maintenance protocol entity instance is released.

### 8.2.1.2.2 Blocking and unblocking of AAL type 2 paths

The AAL type 2 path blocking procedure is provided to prevent an AAL type 2 path from being selected for carrying new connections other than test connections. Existing connections on the AAL type 2 path are not affected.

Blocking can be initiated by either signalling endpoint that controls an AAL type 2 path. When blocking is invoked, both ends of the AAL type 2 path are put into a blocked state. A blocked AAL type 2 path cannot be selected for new, non-test traffic by either AAL type 2 node.

An acknowledgment is required for each blocking and unblocking request. The acknowledgment is not sent until the appropriate action – blocking or unblocking – has been taken.

Unblocking can only be initiated by the same AAL type 2 node which initiated the blocking procedures. It is performed by sending an unblocking request. At either end, the blocked state is removed and the AAL type 2 path is made available again for all new connections.

An AAL type 2 path is considered "unblocked" if it is both "locally unblocked" and "remotely unblocked".

The blocking and unblocking procedures do not affect the modification procedures.

#### 8.2.1.2.2.1 Initiating blocking

Blocking can be initiated either by layer management, by the reset procedure, or by the connection set up procedure.

Case a): When a BLOCK.request primitive is received from layer management for an AAL type 2 path that is currently "locally unblocked", the AAL type 2 path becomes "locally blocked". The AAL type 2 path is made unavailable for the selection to accommodate new non-test connections.

Case b): A request for blocking can also be received from the reset procedure (8.2.1.2.1.2) or from the connection set up procedure (8.2.1.1.2.2).

In both cases, a maintenance protocol entity is then invoked and the AAL type 2 path identifier and a request for blocking is passed to it.

When confirmation of the blocking is received from the maintenance protocol entity, a BLOCK.confirm primitive is sent to layer management and the association to the maintenance protocol entity instance is released.

#### 8.2.1.2.2.2 Initiating unblocking

When an UNBLOCK.request is received from layer management for an AAL type 2 path that is currently "locally blocked", a maintenance protocol entity is invoked and the AAL type 2 path identifier and a request for unblocking is passed to it.

When confirmation of the unblocking is received from the maintenance protocol entity, the AAL type 2 path becomes "locally unblocked" and the AAL type 2 path is made available again to accommodate new connections (if it is not "remotely blocked"). An UNBLOCK.confirm is sent to layer management and the association to the maintenance protocol entity instance is released.

### 8.2.1.2.2.3 Receiving blocking

When an indication of blocking is received from a maintenance protocol entity for an AAL type 2 path that is currently "remotely unblocked", the AAL type 2 path becomes "remotely blocked" and the AAL type 2 path is made unavailable to accommodate new non-test connections. A response is then sent to the maintenance protocol entity indicating the acceptance of the blocking and the association to the maintenance protocol entity instance is released.

### 8.2.1.2.2.4 Receiving unblocking

When an indication of unblocking is received from a maintenance protocol entity for an AAL type 2 path that is currently "remotely blocked", the AAL type 2 path becomes "remotely unblocked" and the AAL type 2 path is made available to accommodate new connections (if it is not "locally blocked"). A response is then issued to the maintenance protocol entity indicating the acceptance of the unblocking and the association to the maintenance protocol entity instance is released.

### 8.2.1.2.2.5 Abnormal blocking and unblocking procedures

a)    If an indication for blocking is received from a maintenance protocol entity for an AAL type 2 path which is already "remotely blocked", a blocking confirmation is sent to the maintenance protocol entity and the association to the maintenance protocol entity instance is released. No further actions are performed.

b)    If an indication for unblocking is received from a maintenance protocol entity for an AAL type 2 path which is "remotely unblocked", an unblocking confirmation is sent to the maintenance protocol entity and the association to the maintenance protocol entity instance is released. No further actions are performed.

c)    If a BLOCK.request primitive is received from layer management for an AAL type 2 path that is already "locally blocked", the procedure in 8.2.1.2.2.1 is performed.

d)    If an UNBLOCK.request primitive is received from layer management for an AAL type 2 path that is already "locally unblocked", the procedure in 8.2.1.2.2.2 is performed.

e)    If an indication of an error is received from the maintenance protocol entity, a BLOCK.confirm primitive or an UNBLOCK.confirm primitive with the cause received from the maintenance protocol entity instance is sent to layer management. The association to the maintenance protocol entity is released.

### 8.2.1.2.3 Transmission fault handling

Fully digital transmission systems are provided between all AAL type 2 nodes. They have some inherent fault indication features that give an indication to the switching system when faults are detected on the transmission path level and/or on the virtual path level. On receipt of a fault indication from layer management, the routing function in the switching system inhibits selection of the AAL type 2 path (or paths) concerned for the period that the fault condition persists. No special action is required for active connections.

### 8.2.1.2.4 AAL type 2 signalling entity signalling congestion control

On receipt of a CONGESTION.indication primitive from the generic signalling transport service, the AAL type 2 signalling entity should alter traffic load (e.g., connection attempts) toward the affected AAL type 2 nodes to align with the congestion level indicated by the primitive.

### 8.2.1.2.5 Adjacent AAL type 2 node availability

On receipt of an OUT-OF-SERVICE.indication primitive from the generic signalling transport service, the following action is required: All AAL type 2 paths to the affected adjacent AAL type 2 node are marked as unavailable in the routing function prohibiting new (test or user) connection establishments to that AAL type 2 node. Already established connections need not be released even though signalling messages cannot be sent to the affected node.

On receipt of an IN-SERVICE.indication primitive from the generic signalling transport service, the following action is required: All AAL type 2 paths to the affected adjacent AAL type 2 node, that are both "locally unblocked" and "remotely unblocked", are again marked available in the routing function and any of the unallocated channels can be used for connections immediately consistent with the congestion level in the primitive. Reset procedures that may have started during the period of signalling isolation continue and ensure that affected channels are returned to state "Idle". Connections that are in state "Established" are unaffected.

### 8.2.1.3 Error handling

A message received indicating an AAL type 2 path or CID value that is not controlled by the nodal function shall be discarded and layer management shall be informed with an ERROR.indication primitive with a cause "Invalid information element contents".

If a parameter is present more than once in a message where this parameter is allowed only once, only the first parameter shall be processed; all subsequent instances of the parameter shall be ignored.

When receiving a message which does not contain the minimum set of parameters required to continue processing, a protocol error is reported to layer management with an ERROR.indication primitive with a cause "Mandatory information element is missing" and the message is discarded.

### 8.2.2 Nodal functions for AAL type 2 nodes without served user interaction

### 8.2.2.1 Connection control

### 8.2.2.1.1 Successful connection setup

Upon receiving notification from an incoming protocol entity instance requesting a new connection, the nodal function checks the availability of the CID value and other resources (e.g., indicated by Transfer Capability parameter), in the incoming AAL type 2 path.

NOTE 1 – In case of interworking, the Transfer Capability and the Preferred Transfer Capability may be generated by the AAL type 2 switch (see Annex C).

If the Test Connection Indicator parameter is present, "locally blocked" or "remotely blocked" AAL type 2 paths shall be acceptable for the incoming connection.

If the CID and the other resources are available for the incoming AAL type 2 link, the resources are allocated to the new connection.

If the Hop Counter is received, and the hop counter procedure is activated, the nodal functions shall decrement the Hop Counter value by 1. If the result is greater than 0, the nodal function shall pass the updated Hop Counter to the outgoing protocol entity instance when it is invoked. If the Hop Counter is received, and the hop counter procedure is not activated, the nodal functions shall pass the Hop Counter unmodified to the outgoing protocol entity instance when it is invoked.

NOTE 2 – If the result is 0, see 8.2.2.1.2.

The AAL type 2 service endpoint address is then examined. The nodal function determines that the AAL type 2 connection needs to be routed further to reach the destination AAL type 2 service endpoint and analyses the routing information. It selects a route with sufficient AAL type 2 path resources on a path with the requested path type (or network default if the path type is not specified)

to the next AAL type 2 node. It then selects an AAL type 2 path from within the route which is able to accommodate the new connection.

NOTE 3 – Routing typically is based on:

• Addressing information;

• Transfer Capability;

• Test Connection Indicator;

• Requested Path Type;

• Automatic congestion control and the congestion level in the routing tables; and

• Temporary Alternative Routing (TAR) control (see ITU-T Rec. E.412 [17]).

When the nodal function selects a route, the Connection Priority information, if received from the incoming protocol entity instance is used to select a route that has sufficient AAL type 2 path resources to the succeeding AAL type 2 node.

If the "TAR controlled connection" indication is received, the nodal functions shall not apply network management Temporary Alternative Routing (TAR) to the same connection.

If a Hop Counter is not received, and the hop counter procedure is activated, the nodal function shall pass the Hop Counter containing an initial count value to the outgoing protocol entity instance when it is invoked. The initial count value shall be provisioned by the network operator on a per AAL type 2 node basis (31 maximum).

AAL type 2 node internal resources are allocated for the new connection from the incoming AAL type 2 path to the outgoing AAL type 2 path. The connection priority information, if received, is taken into consideration when allocating these resources.

Under the normal condition, when the network is not congested and the AAL Type 2 node has the necessary resources to complete it, the connection establishment is processed without special treatments.

NOTE 4 – In times of network congestion, when the AAL Type 2 node does not have sufficient resources to complete all of the incoming connection establishment requests, as one option, the AAL Type 2 node may give preferential treatments based on the priority level.

NOTE 5 – The preferential treatment should include access to reserved network resources, e.g.:

• the highest priority connections are given access to available network resources including the resources reserved for highest priority connections;

• the second highest priority connections are given access to available network resources including the resources reserved for the second highest priority connections, except for the resources reserved for the highest priority connections, and so on;

NOTE 6 – Allocation of reserved network resources to specific priority levels is implementation specific, and is not a subject for standardization.

On the selected outgoing AAL type 2 path, the CID and other resources (e.g., indicated by Transfer Capability, Link Characteristics, or SSCS information) are allocated for the outgoing AAL type 2 link. The handling of Transfer Capability, Link Characteristics, and SSCS information is specified in Annex C.

The following parameters – if they were conveyed by the incoming protocol entity instance – shall not be modified by the nodal function:

• the Destination Service Endpoint Address;

• the Origination Service Endpoint Address;

• the Served User Generated Reference;

• the Served User Transport;

• the Transfer Capability;

- the Preferred Transfer Capability;
- the Transfer Capability Support;
- the Link Characteristics;
- the Preferred Link Characteristics;
- the Modify Support for Link Characteristics;
- the SSCS Information;
- the Preferred SSCS Information;
- the Modify Support for SSCS Information;
- the Path Type;
- the Connection Priority; and
- the Test Connection Indicator.

The following parameters – if they were conveyed by the incoming protocol entity instance – have significance to the served user only; therefore, they shall not be examined by the nodal function:

- the Origination Service Endpoint Address;
- the Served User Generated Reference;
- the Served User Transport;
- the SSCS Information;
- the Preferred SSCS Information; and
- the Modify Support for SSCS Information.

An outgoing protocol entity instance is invoked and the following parameters are passed to it:

- the Destination AAL type 2 Service Endpoint Address;
- the AAL type 2 Path Identifier;
- a CID value; and
- the Transfer Capability.

The nodal function shall pass the following parameters to the outgoing protocol entity instance only if they were conveyed by the incoming protocol entity instance:

- the Origination AAL type 2 Service Endpoint Address;
- the Served User Generated Reference;
- the Served User Transport;
- the Preferred Transfer Capability;
- the Transfer Capability Support;
- the Link Characteristics;
- the Preferred Link Characteristics;
- the Modify Support for Link Characteristics;
- the SSCS Information;
- the Preferred SSCS Information;
- the Modify Support for SSCS Information;
- the Path Type;
- the Connection Priority; and
- the Test Connection Indicator.

A received "TAR controlled connection" indication shall be passed to the invoked outgoing protocol entity instance unchanged; alternatively, if the "TAR controlled connection" indication is not received and the nodal function applies network management Temporary Alternative Routing to the connection, the nodal function shall pass a "TAR controlled connection" parameter to the invoked outgoing protocol entity instance.

If the Hop Counter has been received or generated by the nodal function, it is passed to the invoked outgoing protocol entity instance.

Through-connection in both directions will then be completed.

After receiving an indication of the successful AAL type 2 connection setup from the outgoing protocol entity instance, the incoming protocol entity instance is informed of the successful AAL type 2 connection setup. If one or more of the parameters Transfer Capability Support, Modify Support for Link Characteristics, or Modify Support for SSCS Information parameter, was received from the outgoing protocol instance they shall be conveyed to the incoming protocol entity instance.

### 8.2.2.1.2  Unsuccessful/abnormal connection setup

If resources on the incoming AAL type 2 path are not available, the nodal function requests the incoming protocol entity instance to reject the connection with one of the following causes as applicable:

•        "Resource unavailable, unspecified"; or

•        "Requested circuit/channel not available".

The association between the nodal function entity and its incoming protocol entity instance is released.

If an AAL type 2 path is "locally blocked" and an indication from an incoming protocol entity instance of the request for a new connection other than a test connection is received, the following actions are taken:

1)        The indication of the request for a new connection establishment is ignored and the incoming protocol entity instance is instructed to terminate and enter state "Idle"; the association with the incoming protocol entity instance is released and an ERROR.indication primitive with the CEID and the cause "Temporary failure" is sent to layer management.

2)        The blocking procedure specified in 8.2.1.2.2.1 case b) is initiated for the AAL type 2 path on which the new connection was requested to have been established.

If an AAL type 2 path is "remotely blocked" and an indication from an incoming protocol entity instance of the request for a new connection other than a test connection is received, the following actions are taken:

1)        The AAL type 2 path is set to "remotely unblocked".

        NOTE 1 – This procedure shall not be considered as the normal way to remove the "remotely blocked" condition.

2)        The incoming connection establishment request is processed normally, i.e., as if the AAL type 2 path was not "remotely blocked" to begin with.

If the Hop Counter is received, the nodal functions shall decrement the Hop Counter value by 1. If the result equals 0, the nodal function shall request the incoming protocol entity instance to reject the connection with cause value "exchange routing error". The association between the nodal function entity and its incoming protocol entity instance is released and all the resources associated with the incoming AAL type 2 link are released and made available for new traffic.

In all cases where the request  from an incoming protocol entity instance to establish a new connection has to be rejected, the nodal function checks the level of congestion of the node. If either of the two congestion thresholds is exceeded, an Automatic Congestion Control parameter is passed

to the protocol entity with the rejection indication. This parameter indicates the level of congestion (congestion level 1 or 2) to the adjacent AAL Type 2 node.

If AAL type 2 node internal resources are not available for the new connection, a negative acknowledgement for the connection setup request shall be returned to the incoming protocol entity instance with the cause "Switching equipment congestion". The resources allocated to the incoming AAL type 2 path are released and the association between the incoming protocol entity instance and the nodal function is released.

If the AAL Type 2 node cannot complete a high priority connection establishment request even after application of the preferential treatment, a negative acknowledgement for the connection setup request shall be returned to the incoming protocol entity instance with the cause "Resource unavailable, unspecified". The resources allocated to the incoming AAL type 2 path are released and the association between the incoming protocol entity instance and the nodal function is released.

If the AAL type 2 path selection or the allocation of a CID and other resources for the outgoing AAL type 2 link described in 8.2.2.1.1 fails, a negative acknowledgement for the connection setup request shall be returned to the incoming protocol entity instance with one of the following causes:

• "Unallocated (unassigned) number";

• "No route to destination";

• "No circuit/channel available";

• "Resource unavailable, unspecified";

• "Network out of order"; or

• "Temporary failure".

NOTE 2 – Path selection failure may be due to the unavailability of an AAL type 2 path with the requested path type.

The resources allocated to the preceding AAL type 2 path are released and the association between the incoming protocol entity instance and the nodal function is released.

Upon receiving a negative acknowledgement from the outgoing protocol entity instance, all resources associated with the outgoing AAL type 2 link are released and made available for new traffic. The association to the outgoing protocol entity instance is released.

Features that enable a further connection attempt, involving the selection of a different AAL type 2 path within the same route or of an alternative route, may be implemented. Such reattempts may use the CEID parameter returned in the Release Confirm (RLC) message and may select a different AAL type 2 path within the same route only. If the CEID parameter specifies an AAL Type 2 path with insufficient resources available for the connection attempt, no connection attempt is made on that path.

If no further connection attempt is made, the AAL type 2 node internal resources are released, the rejection of the connection establishment is forwarded to the incoming protocol entity instance with the cause received from the outgoing protocol entity instance; a Connection Element Identifier parameter possibly received in the Release Confirm (RLC) message is not forwarded to the incoming protocol entity instance. All the resources associated with the incoming AAL type 2 link are freed. The association to the incoming protocol entity instance is released.

When an indication is received from the outgoing protocol entity that the establishment request has been rejected, and there has been a change in the level of congestion of the adjacent node, the routing tables in the nodal function shall be updated accordingly. The absence of an Automatic Congestion Control parameter indicates that there is no reported congestion in the adjacent node, whilst if the Automatic Congestion Control parameter is present it indicates whether congestion

level 1 or 2 has been exceeded. After the routing tables have been updated, the Automatic Congestion Control parameter is discarded.

Upon receiving an indication from the outgoing protocol entity instance that a timer has expired, the association to the outgoing protocol entity instance is released and a reset procedure is started (see 8.2.1.2.1.1 case 3 a)). The AAL type 2 node internal resources are released. The rejection of the connection establishment is forwarded to the incoming protocol entity instance with the cause received from the outgoing protocol entity instance (i.e., "Recovery on timer expiry") and all the resources associated with the incoming AAL type 2 link are released and made available for new traffic. The association to the incoming protocol entity instance is released.

### 8.2.2.1.3  Normal connection release

When the nodal function has received a request from a (first) protocol entity instance to release the connection, an acknowledgement is returned to that protocol entity instance and all the resources associated with the AAL type 2 link being governed by the protocol entity instance are released and made available for new traffic. The association to the protocol entity instance is released.

When a Release indication containing an Automatic Congestion Control parameter is received from the incoming or outgoing protocol entity, and there has been a change in the level of congestion of the adjacent node, the routing tables in the nodal function shall be updated according to the indicated congestion level. The absence of an Automatic Congestion Control parameter indicates that there is no reported congestion in the adjacent node, whilst if the Automatic Congestion Control parameter is present it indicates whether congestion level 1 or 2 has been exceeded. After the routing tables have been updated, the Automatic Congestion Control parameter is discarded.

The AAL type 2 node internal resources are released.

When a release is to be forwarded, the nodal function checks the level of congestion of the node. If either of the two congestion thresholds is exceeded, an Automatic Congestion Control parameter is passed to the protocol entity with the release indication. This parameter indicates the level of congestion (congestion level 1 or 2) to the adjacent AAL Type 2 node.

The request to release the connection is forwarded to the companion incoming or outgoing (second) protocol entity instance with the Cause parameter received from the first protocol entity instance. The Cause parameter shall not be modified by the nodal function.

After receiving the acknowledgement of the successful connection release from the second protocol entity instance, all the resources associated with the AAL type 2 link being governed by the protocol entity instance are released and made available for new traffic. The association to the protocol entity instance is released.

### 8.2.2.1.4  Abnormal connection release procedures

### 8.2.2.1.4.1  Actions at the AAL type 2 switch that initiates the release

When the nodal function receives an indication from the second protocol entity instance that a timer has expired, the association to that protocol entity instance is released and a reset procedure is started (see 8.2.2.2.1.1, case 3 a).

### 8.2.2.1.5  Successful modification

NOTE 1 – In this clause the following conventions apply:
- The term "AAL type 2 connection resource information" refers to Transfer Capability.
- The term "modify receiving" refers to the AAL type 2 connection element identifier for which the Modify Request (MOD) message is received and the Modify Acknowledge (MOA) or Modify Reject (MOR) message is sent; conversely, the term "modify sending" refers to the AAL type 2 connection element identifier for which the Modify Request (MOD) message is sent and the Modify Acknowledge (MOA) or Modify Reject (MOR) message is received.

NOTE 2 – The effect of SSCS information in AAL type 2 CS-3 nodes is restricted to the allocation, configuration and management of the respective SSCS layer resources in AAL type 2 CS-3 service endpoints.

Upon receiving an indication from a protocol entity instance requesting modification of the AAL type 2 connection resource, i.e., a Transfer Capability parameter is conveyed, the nodal function checks the availability of the requested internal resources on the indicated AAL type 2 path. If the modification is requesting additional internal resources and they are available, they are reserved for the connection.

NOTE 3 – In case of interworking, the Transfer Capability may be generated by the AAL type 2 switch (see Annex C).

The nodal function checks the availability of the requested resources on the modify sending AAL type 2 path. If the modification is requesting additional resources and they are available, they are reserved for the connection.

The companion (modify sending) protocol entity instance is informed of the modification. The nodal function shall pass the following parameters to the protocol entity instance only if they were conveyed by the AAL type 2 served user:

• the Served User Correlation ID;

• the Transfer Capability;

• the Link Characteristics; and

• the SSCS Information.

The following parameters – if they were received from the modify receiving protocol entity – shall not be modified by the nodal function:

• the Served User Correlation ID;

• the Transfer Capability;

• the Link Characteristics; and

• the SSCS Information.

The following parameters – if they were received from the modify receiving protocol entity– have significance to the served user only; therefore, they shall not be examined by the nodal function:

• the Served User Correlation ID; and

• the SSCS Information.

After receiving an indication of the successful AAL type 2 connection resource modification from the modify sending protocol entity instance and AAL type 2 connection resources were requested to be modified, the nodal function allocates the reserved additional resources to the modify receiving and modify sending connection or frees resources no longer required for this AAL type 2 connection.

The modify receiving protocol entity instance is informed of the successful modification. The nodal function shall pass the Served User Correlation ID parameter to the modify receiving protocol entity instance only if it was conveyed by the modify sending protocol entity instance. The Served User Correlation ID parameter has significance to the served user only; therefore, it shall not be examined by the nodal function.

### 8.2.2.1.6  Unsuccessful/abnormal modification

If additional resources on the modify receiving AAL type 2 path are not available, the nodal function requests the modify receiving protocol entity instance to reject the AAL type 2 modification request with the cause "Resource unavailable, unspecified".

If the resources on the modify sending AAL type 2 path are not available, the nodal function requests the modify receiving protocol entity instance to reject the AAL type 2 modification request with the cause "Resource unavailable, unspecified". The additional resources reserved for the modify receiving AAL type 2 path are freed.

Upon receiving a negative acknowledgement for the modification request from the modify sending protocol entity instance, the nodal function frees all the additional resources reserved for the modification request. The rejection of the modification is forwarded to the modify receiving protocol entity instance with the cause received from the modify sending protocol entity instance. The Cause parameters shall not be modified by the nodal function.

Upon receiving an indication from the modify sending protocol entity instance that a timer has expired (in this case Timer_MOD), the association to the modify sending protocol entity instance is released and a reset procedure is started (see 8.2.2.2.1.1 case 3 a)). The AAL type 2 node internal resources for this AAL type 2 connection are released. The nodal function requests the modify receiving protocol entity instance to release the connection with the cause "Recovery on timer expiry". All resources associated with the modify receiving AAL type 2 link are freed. The association to the modify receiving protocol entity instance is released.

### 8.2.2.1.7 Connection release during modification

The release procedures take precedence over the modification procedures.

When the nodal function receives an indication of connection release from the modify receiving or modify sending protocol entity instance during the modification procedures, the nodal function will continue with normal connection release procedures.

### 8.2.2.2 Maintenance control

### 8.2.2.2.1 Reset

Refer to 8.2.1.2.1.

### 8.2.2.2.1.1 Actions at reset initiating node

Reset procedures can be initiated to reset:

1)      all AAL type 2 paths between two adjacent AAL type 2 nodes associated with a signalling transport association;

2)      a specific AAL type 2 path;

3)      a single AAL type 2 channel.

For case 1), layer management passes a RESET.request together with the indication "All AAL type 2 paths associated with a signalling transport association" to the nodal function which in turn invokes a maintenance protocol entity and passes the request for reset to that entity together with an indication that all AAL type 2 paths associated with a signalling transport association must be reset.

For case 2), layer management passes a RESET.request together with the AAL type 2 path identifier to the nodal function which in turn invokes a maintenance protocol entity and passes a request for reset to that entity together with the identity of the AAL type 2 path.

For case 3) there are two possible subcases, one due to timer expiry and the other due to layer management action:

a)      After the expiry of Timer_ERQ, Timer_REL, or Timer_MOD, the nodal function invokes a maintenance protocol entity by passing a request for a reset together with the identity of the AAL type 2 path and the channel.

b)      Layer management invokes the nodal function which in turn invokes a maintenance protocol entity by passing a request for a reset together with the identity of the AAL type 2 path and the channel.

In cases 1), 2), and 3 b), the nodal function requests any affected incoming or outgoing protocol entity instances to terminate and enter state "Idle". The associations to the incoming or outgoing protocol entity instances are released.

For cases 1) and 2), the remote blocking state for the affected path(s) is set to "remotely unblocked".

Upon receiving a reset confirmation from the maintenance protocol entity instance, the nodal function will make the affected resources available for new connections, and the AAL type 2 node internal resources are released. The association to the maintenance protocol entity instance is released. In case 3 a), a RESET.indication primitive with a CEID parameter is sent to layer management; in all other cases, a RESET.confirm primitive is sent to the layer management.

NOTE – The local blocking states are not affected.

### 8.2.2.2.1.2 Actions at reset responding node

Upon receiving a reset indication from the maintenance protocol entity, the nodal functions analyses the received information to determine which AAL type 2 channels are to be reset.

1) If an indication that all AAL type 2 paths associated with a signalling transport association must be reset is received, then all AAL type 2 channels associated with a signalling transport association between the two adjacent AAL type 2 nodes are reset.

2) If an indication that all the channels within the identified AAL type 2 path must be reset is received, all AAL type 2 channels within that path are reset.

3) If an indication that a specific channel within an AAL type 2 path must be reset is received, only that channel is reset.

In cases 1) and 2), for "locally blocked" AAL type 2 paths, blocking procedures (refer to 8.2.1.2.2 case b)) are initiated prior to the sending of the reset confirmation.

If resources have been assigned to one of the channels that are reset, the nodal functions make the affected resources available for new connections, and the AAL type 2 node internal resources are released. It also returns a reset confirmation to the maintenance protocol entity. The association between the nodal function and the maintenance protocol entity instance is released. The nodal function informs layer management about the receipt of the reset request by sending a RESET.indication primitive with the same CEID parameter as has been received in the RES message (Reset Request).

The nodal function also requests the affected incoming or outgoing protocol entity instances (if any) to terminate and enter state "Idle". The associations to the incoming or outgoing protocol entity instances are released.

### 8.2.2.2.1.3 Abnormal reset procedures

Refer to 8.2.1.2.1.3.

### 8.2.2.2.2 Blocking and unblocking of AAL type 2 path

Refer to 8.2.1.2.2.

### 8.2.2.2.3 Transmission fault handling

Refer to 8.2.1.2.3.

### 8.2.2.2.4 AAL type 2 signalling entity signalling congestion control

Refer to 8.2.1.2.4.

### 8.2.2.2.5 Adjacent AAL type 2 node availability

Refer to 8.2.1.2.5.

### 8.2.2.3 Error handling

Refer to 8.2.1.3.

### 8.3 Protocol entity

The following rules relating to Signalling Association Identifiers (SAID) apply:

- The AAL type 2 signalling system that does not issue the value of such a field is not allowed to modify it, but shall use it in the destination signalling association identifier field in the header of a message directed towards the issuer.

- When a message is received at the generic signalling transport service access point (GST-SAP), the destination signalling association identifier field of the incoming message is used to distribute the messages to the appropriate protocol entity instance.

- If a received message contains a destination signalling association identifier set to the "unknown" value and an originating signalling association identifier, a new incoming protocol entity instance or a new maintenance protocol entity instance is created and marked with a newly allocated signalling association identifier. The originating signalling association identifier parameter in the first response message issued by the new protocol entity instance will inform the peer protocol entity instance of the newly allocated signalling association identifier.

- If a new protocol entity instance is created by the nodal function, a signalling association identifier is allocated for it and the signalling association identifier is conveyed to the peer AAL type 2 signalling entity as the originating signalling association identifier parameter in the first message issued by the new protocol entity instance. The DSAID field in the header in this message is set to "unknown".

- If a protocol entity instance sends a message to its peer, the message includes the signalling association identifier of the peer in the destination signalling association identifier field.

- If a new maintenance protocol entity instance is created as a result of an incoming maintenance message, no signalling association identifier is allocated for it and no originating signalling association identifier parameter is conveyed to the peer AAL type 2 signalling entity in the first (and only) message issued by the new maintenance protocol entity instance.

The sequence control parameter of the TRANSFER.request primitive across the GST-SAP is allocated on a cyclic basis per protocol entity instance.

Example message sequences are shown in Appendix I where usage of originating and destination signalling association identifiers is also described.

All messages are sent in a TRANSFER.request primitive. All messages are received in a TRANSFER.indication primitive.

Appendix I provides examples for modification.

### 8.3.1 General protocol error handling

If a message is received that is too short to contain a complete message (i.e., less than 6 octets), it shall be ignored.

The message is discarded and layer management informed with an ERROR.indication in the following cases:

• If the parameter length points beyond the end of the message – cause "Message with unrecognized parameter discarded" is indicated.

• If the field length points beyond the end of the parameter – cause "Message with unrecognized parameter discarded" is indicated.

• If an unrecognized message containing a destination signalling association identifier set to the "unknown" value – cause "Message type non-existent or not implemented" is indicated.

   NOTE – If an unrecognized message containing a valid destination signalling association identifier is received, the message is conveyed to the addressed protocol entity instance as if it were a recognized message.

• If the message contains a destination signalling association identifier with an illegal/invalid value – cause "Invalid information element contents" is indicated.

• If the message is considered unexpected by the signalling procedures – cause "Invalid message, unspecified" is indicated.

• If a mandatory originating signalling association identifier parameter is not present – cause "Mandatory information element is missing" is indicated.

• If the originating signalling association identifier field is set to "zero" – cause "Invalid information element contents" is indicated.

### 8.3.2 Outgoing protocol procedures

#### 8.3.2.1 Successful connection setup

When an outgoing protocol entity instance in state "Idle" receives a request for a new connection from the nodal function, a free Signalling Association Identifier (SAID) is allocated for the outgoing protocol entity instance.

Upon allocating an SAID, an ERQ message (establish request) is sent to the adjacent AAL type 2 node, entering state "Outgoing establishment pending" and starting Timer_ERQ. The ERQ message contains a destination signalling association identifier field set to the "unknown" value and an originating signalling association identifier parameter in addition to those parameters given by the nodal function.

If an ECF (establish confirm) message is received in state "Outgoing establishment pending", Timer_ERQ is stopped, the nodal function is informed and state "Established" is entered.

#### 8.3.2.2 Unsuccessful connection setup

If the SAID allocation specified in section 8.3.2.1 fails, the nodal function is informed by passing the cause "Resource unavailable, unspecified".

If the ERQ message (establish request) is longer than the signalling transport allows, the nodal function is informed by passing the cause ""Protocol error, unspecified". The SAID allocated to this particular outgoing protocol entity instance is released and made available for new traffic and state "Idle" is entered.

NOTE – If AAL type 2 signalling is used in an MTP3 signalling network (e.g., via the Signalling Transport Converter on MTP3 and MTP3b, see ITU-T Rec. Q.2150.1), it is possible that the ERQ message (establish request) may be longer than the minimum transport capability of 272 octets. This is due to the potential size of the Served User Transport (SUT) parameter. However, AAL type 2 signalling is specified to be deployed only in MTP3b networks.

If Timer_ERQ expires, the nodal function is informed by passing the cause "Recovery on timer expiry". The SAID allocated to this particular outgoing protocol entity instance is released and made available for new traffic and state "Idle" is entered.

If an RLC (release confirm) message is received in state "Outgoing establishment pending", the nodal function is informed about the rejection of the establishment request (including the cause and the Automatic Congestion Control parameter, if present, from the RLC message).

Timer_ERQ is stopped. The SAID allocated to this particular outgoing protocol entity instance is released and made available for new traffic and state "Idle" is entered.

### 8.3.2.3    Normal connection release

In state "Established", an REL message (Release Request) containing a cause parameter can be received. The protocol entity instance informs the nodal function with the received cause and the Automatic Congestion Control parameter, if present. It then enters state "Incoming Release Pending". After the nodal function acknowledges the release, an RLC message (Release Confirm) is sent to the peer protocol entity instance (without a cause parameter). The SAID allocated to the protocol entity instance is released and made available for new traffic and state "Idle" is entered.

In state "Established", the nodal function can request the release of the connection. In this case an REL message is sent, Timer_REL is started and state "Outgoing release pending" is entered. The REL message contains the cause received from the nodal function.

If an RLC message is received, Timer_REL is stopped and the nodal function is informed. The SAID allocated to the protocol entity instance is released and made available for new traffic and state "Idle" is entered.

### 8.3.2.4    Release request collision

If an REL message (Release Request) is received in state "Outgoing Release Pending", an RLC message (Release Confirm) is immediately sent back to the peer protocol entity instance and state "Release Collision" is entered.

When an RLC message is received in state "Release collision", Timer_REL is stopped and the nodal function is informed. The SAID allocated to the protocol procedure entity instance is released and made available for new traffic and state "Idle" is entered.

### 8.3.2.5    Abnormal connection release procedures

If Timer_REL expires in states "Outgoing release pending" or "Release collision", the nodal function is informed with a cause "Recovery on timer expiry". The SAID allocated to the protocol entity instance is released and made available for new traffic and state "Idle" is entered.

If in any state except state "Idle" a request to terminate an outgoing protocol procedure entity instance from the nodal function is received, all timers are stopped. The SAID allocated to the protocol entity instance is released and made available for new traffic and state "Idle" is entered.

### 8.3.2.6    Successful modification

When an outgoing protocol entity instance in state "Established" receives a request for modification from the nodal function, an MOD message (Modify Request) is sent to the adjacent AAL type 2 node, entering state "Outgoing Modification Pending" and starting Timer_MOD. The MOD message contains the DSAID which was received during the connection establishment phase and the parameter given by the nodal function, i.e., the Transfer Capability, Link Characteristics and/or SSCS information and the Served User Correlation ID if it was received from the nodal function.

If an MOA (Modify Acknowledge) message is received in state "Outgoing Modification Pending", Timer_MOD is stopped, the nodal function is informed of the successful modification, and the outgoing protocol entity instance returns to state "Established".

Upon receiving an MOD message (Modify Request) in state "Established" with the DSAID which was received during the connection establishment phase, the outgoing protocol entity instance

informs the nodal function of the request for the modification and state "Incoming Modification Pending" is entered.

After receiving an acknowledgement from the nodal function that the connection modification is accepted, an MOA message (Modify Acknowledge) is sent to the preceding AAL type 2 node, and the outgoing protocol entity instance returns to state "Established".

### 8.3.2.7    Unsuccessful modification

If Timer_MOD expires, the nodal function is informed by passing the cause "Recovery on timer expiry". The SAID allocated to this particular outgoing protocol entity instance is released and made available for new traffic and state "Idle" is entered.

If an MOR (Modify Reject) message is received in state "Outgoing Modification Pending", the nodal function is informed about the rejection of the modification request. Timer_MOD is stopped and the outgoing protocol entity instance returns to state "Established".

When an outgoing protocol entity instance in state "Incoming Modification Pending" receives a request to reject the requested modification from the nodal function, an MOR message is issued towards the adjacent AAL type 2 node with the cause provided by the nodal function. The MOD message contains the DSAID which was received during the connection establishment phase. The outgoing protocol entity instance returns to state "Established".

### 8.3.2.8    Connection release during modification

In state "Outgoing Modification Pending" or "Incoming Modification Pending", an REL message (Release Request) containing a cause parameter can be received. The normal connection release procedures specified in 8.3.2.3 shall apply.

In state "Outgoing Modification Pending" or "Incoming Modification Pending", the nodal function can request the release of the connection. The normal connection release procedures specified in 8.3.2.3 shall apply.

### 8.3.2.9    Modification request collision

If an MOD message is received in state "Outgoing Modify Pending", an MOR message is immediately sent back to the peer protocol entity instance and "Modification Collision" state is entered.

Clauses 8.3.2.7 and 8.3.2.8 shall apply with the replacement of "Modification Collision" with "Outgoing Modify Pending".

### 8.3.2.10   Unrecognized information procedures

When an unrecognized message, parameter, or subfield value is received, the message, the parameter, or the subfield value respectively is conveyed to the nodal function for appropriate action.

When a request to pass on an unrecognized message, parameter, or subfield value is received from the nodal function, the unrecognized message is passed on and an unrecognized parameter or subfield value is sent in the recognized message being constructed respectively.

When a request to send a CFN message (confusion) is received from the nodal function in any state except "Idle" and "Outgoing establishment pending", the message is sent. The CFN message (confusion) contains a cause parameter provided by the nodal function.

When a request to send a cause parameter in an RLC message (release confirm) as a response to an unrecognized parameter or subfield value received in an REL message (release request) is received from the nodal function in any State except "Incoming release pending" and "Outgoing release pending", the cause parameter provided by the nodal function is sent in the RLC message (release confirm).

When a CFN message (confusion) is received in any state except "Idle", the message is conveyed to the nodal function for appropriate action.

When a cause parameter is received in an RLC message (release confirm) in state "Outgoing release pending", the cause parameter is conveyed to the nodal function for appropriate action.

## 8.3.2.11   State transition model

### 8.3.2.11.1 State transition

The state transition diagram for the outgoing protocol procedure is shown in Figure 8-1.



**Figure 8-1/Q.2630.3 – State transition diagram for the outgoing protocol procedure**

### 8.3.2.11.2 SDL diagrams for the outgoing protocol procedures

The SDL diagram for the outgoing protocol procedure is shown in Figure 8-2 (parts 1 to 6).

The SDL diagrams contained in Figure 8-2 (parts 1 to 6) are an introduction to the procedures described in detail in 8.3.2.
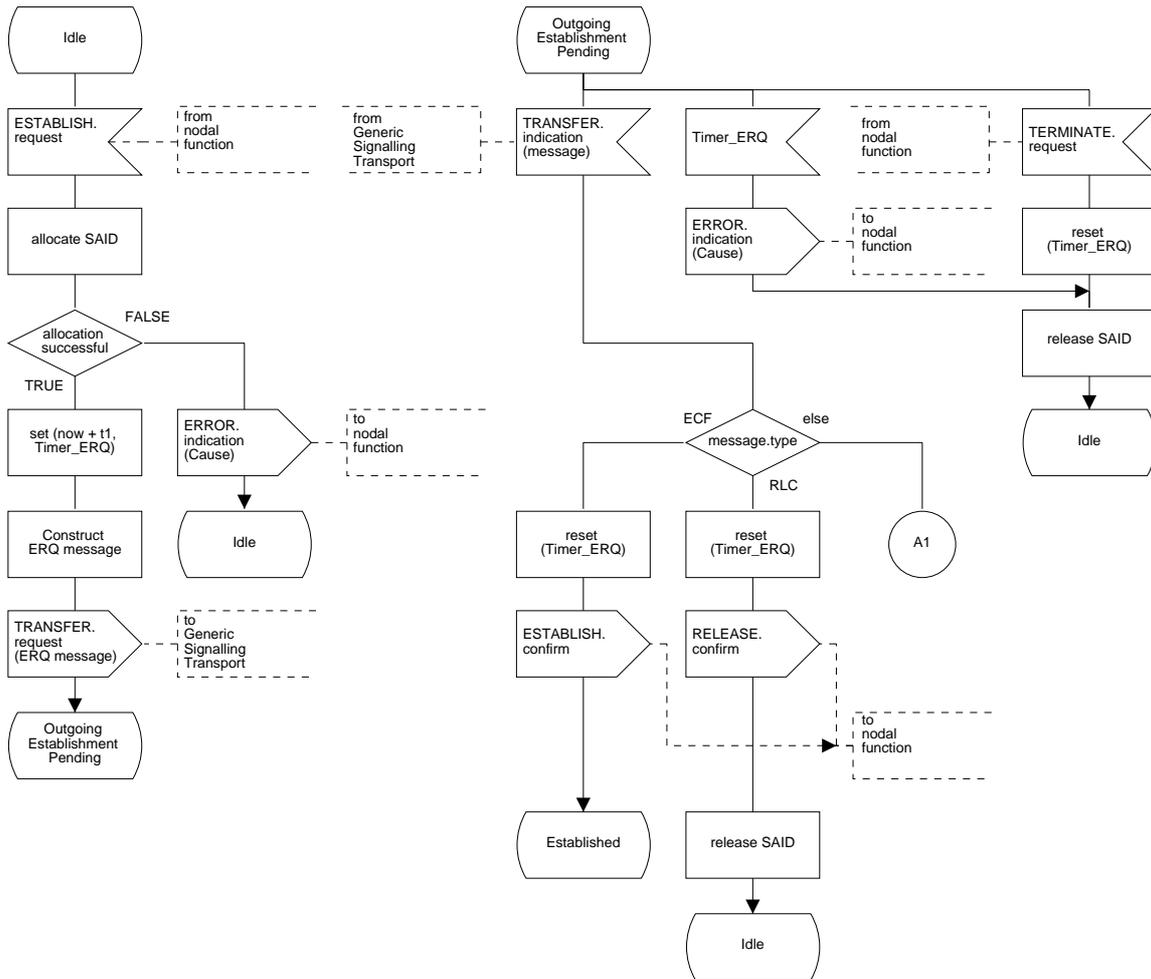
**Figure 8-2/Q.2630.3 (part 1 of 6) – SDL diagram for the outgoing protocol procedure**
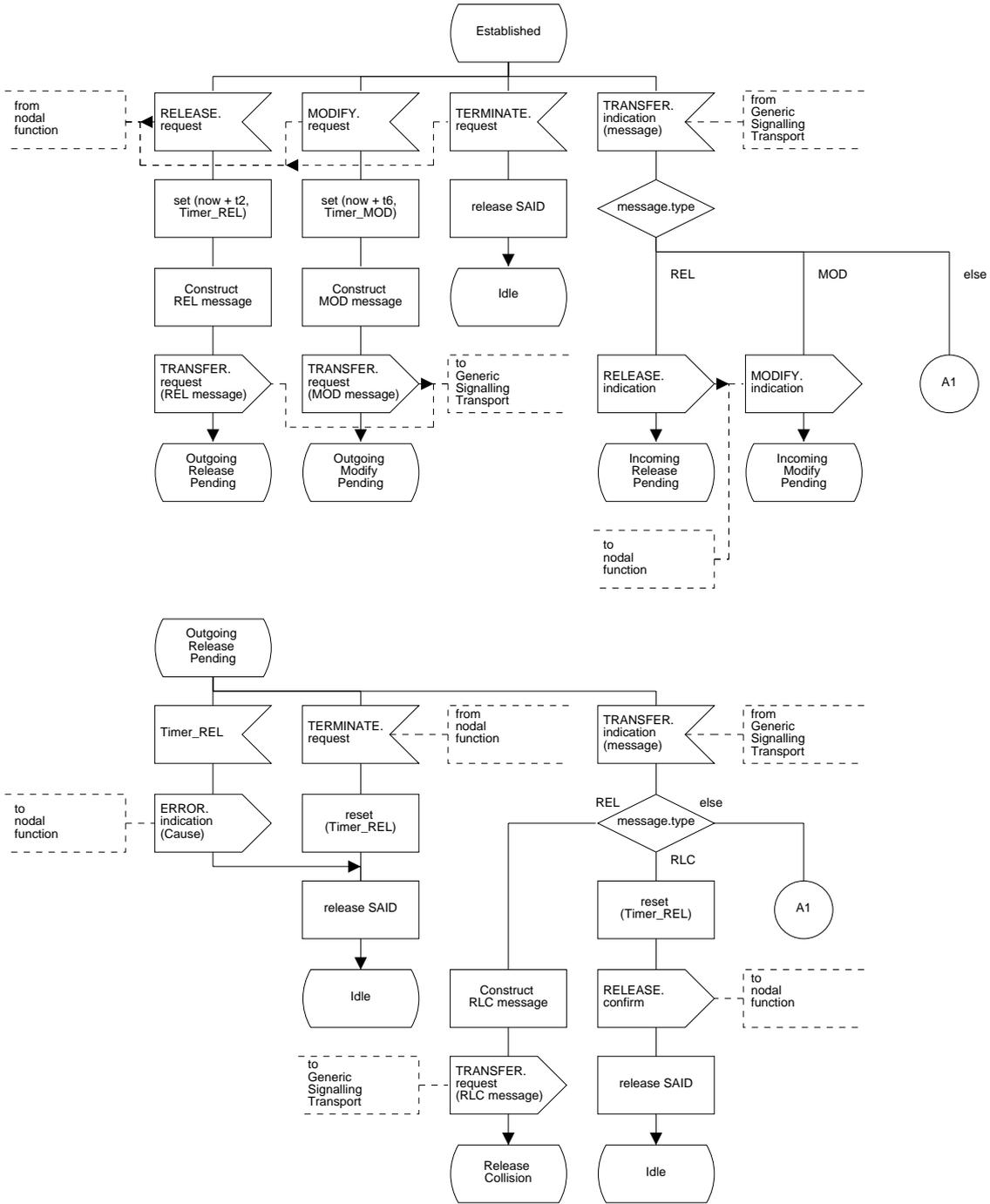
**Figure 8-2/Q.2630.3 (part 2 of 6) – SDL diagram for the outgoing protocol procedure**
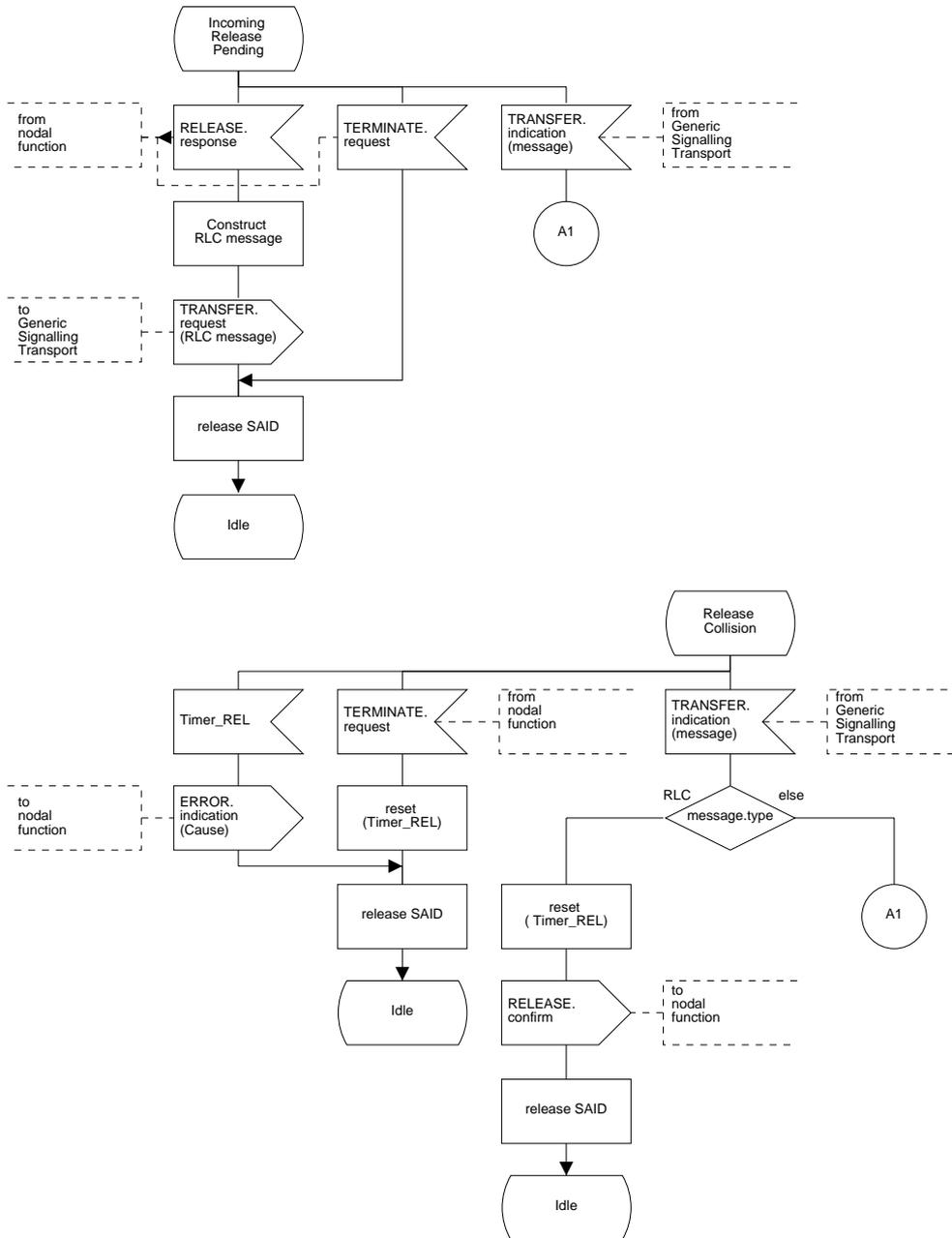
**Figure 8-2/Q.2630.3 (part 3 of 6) – SDL diagram for the outgoing protocol procedure**
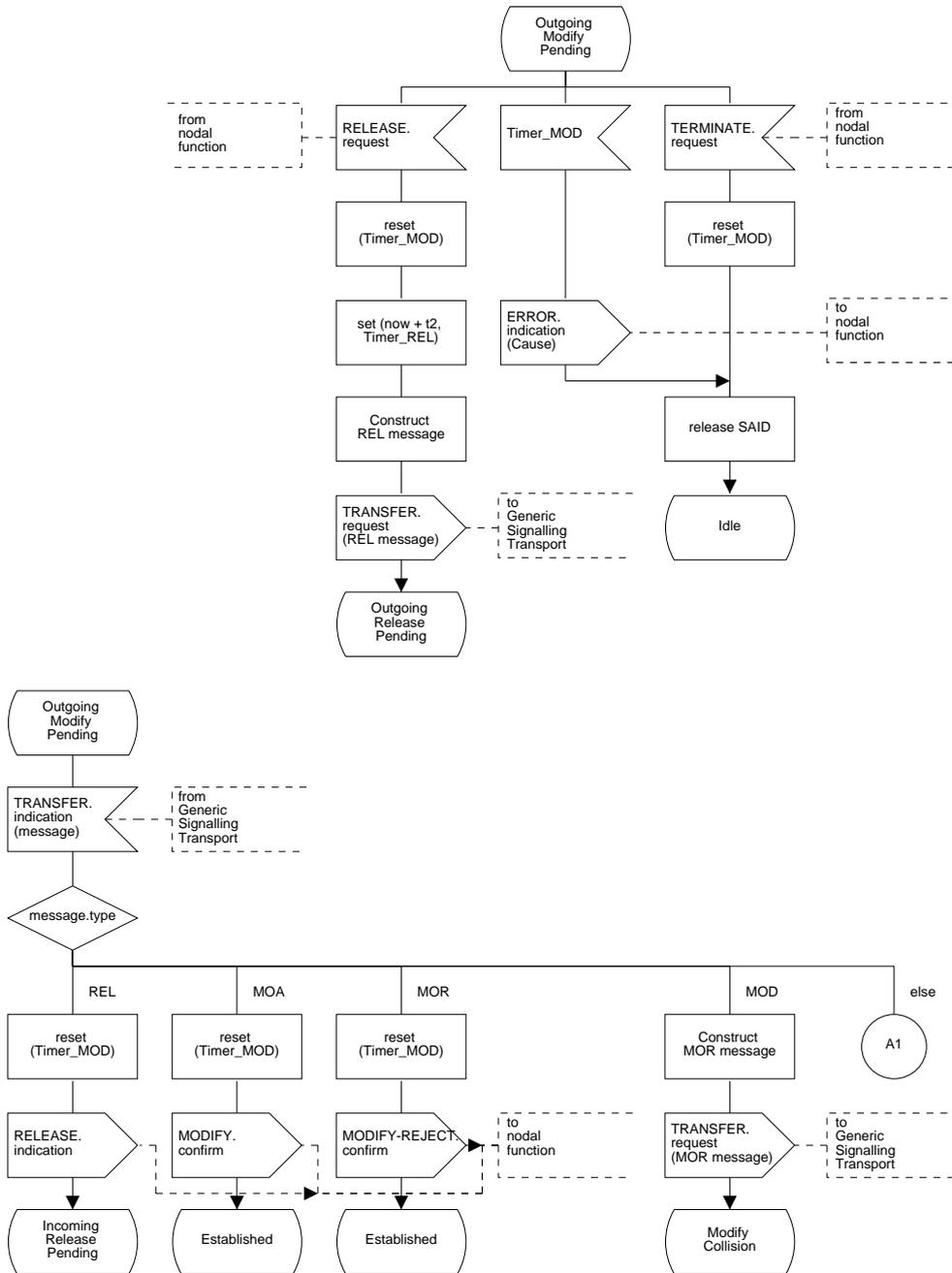
**Figure 8-2/Q.2630.3 (part 4 of 6) – SDL diagram for the outgoing protocol procedure**

**Figure 8-2/Q.2630.3 (part 5 of 6) – SDL diagram for the outgoing protocol procedure**

**Figure 8-2/Q.2630.3 (part 6 of 6) – SDL diagram for the outgoing protocol procedure**

### 8.3.3 Incoming protocol procedures

#### 8.3.3.1 Successful connection setup

Upon receiving an ERQ message (establish request) in state "Idle" with the DSAID set to "unknown", a Signalling Association Identifier (SAID) is allocated for the new incoming protocol entity instance.

The incoming protocol entity instance informs the nodal function of the request for a new connection and state "Incoming establishment pending" is entered.

After receiving an acknowledgement from the nodal function that the connection establishment is accepted, an ECF message (establish confirm) is sent to the preceding AAL type 2 node and state "Established" is entered.

#### 8.3.3.2 Unsuccessful connection setup

If a Signalling Association Identifier (SAID) allocation for the incoming protocol entity instance fails, an RLC message (release confirm) is returned containing the cause "Resource unavailable, unspecified".

If a request to terminate the connection establishment from the nodal function is received, the SAID allocated to this particular incoming protocol entity instance is released and made available for new traffic and state "Idle" is entered.

If the nodal function informs the incoming protocol entity instance that the connection establishment is not accepted, an RLC message is issued towards the preceding AAL type 2 node with the cause and optionally the Automatic Congestion Control parameter provided by the nodal function. The SAID allocated to this particular incoming protocol entity instance is released and made available for new traffic and state "Idle" is entered.

#### 8.3.3.3 Normal connection release

Refer to 8.3.2.3.

#### 8.3.3.4 Release request collision

Refer to 8.3.2.4.

#### 8.3.3.5 Abnormal connection release procedures

Refer to 8.3.2.5.

#### 8.3.3.6 Successful modification

Refer to 8.3.2.6.

#### 8.3.3.7 Unsuccessful modification

Refer to 8.3.2.7.

#### 8.3.3.8 Connection release during modification

Refer to 8.3.2.8.

#### 8.3.3.9 Modification request collision

Refer to 8.3.2.9.

#### 8.3.3.10 Unrecognized information procedures

Refer to 8.3.2.10.

### 8.3.3.11    State transition model

### 8.3.3.11.1 State transition

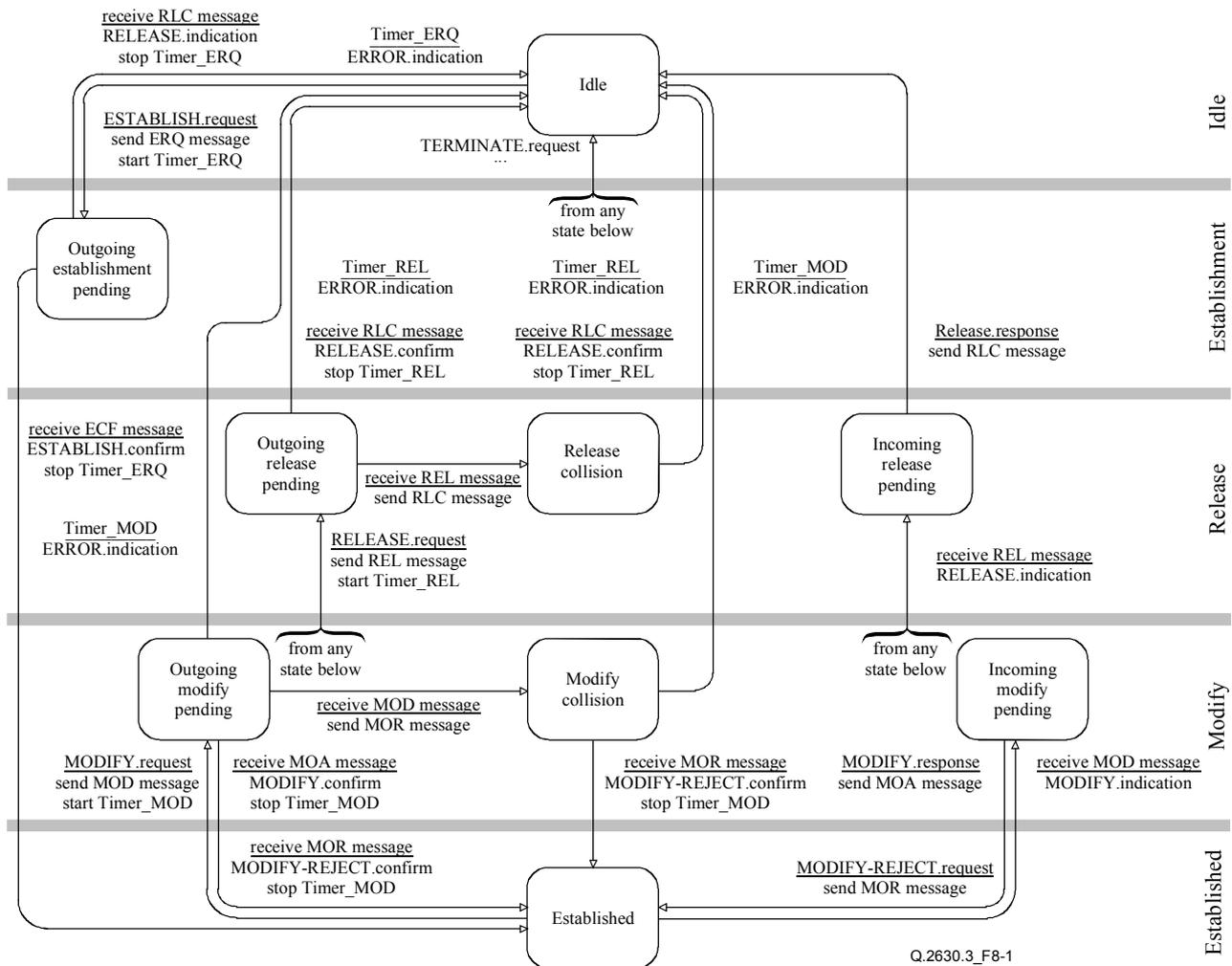The state transition diagram for the incoming protocol procedure is shown in Figure 8-3.
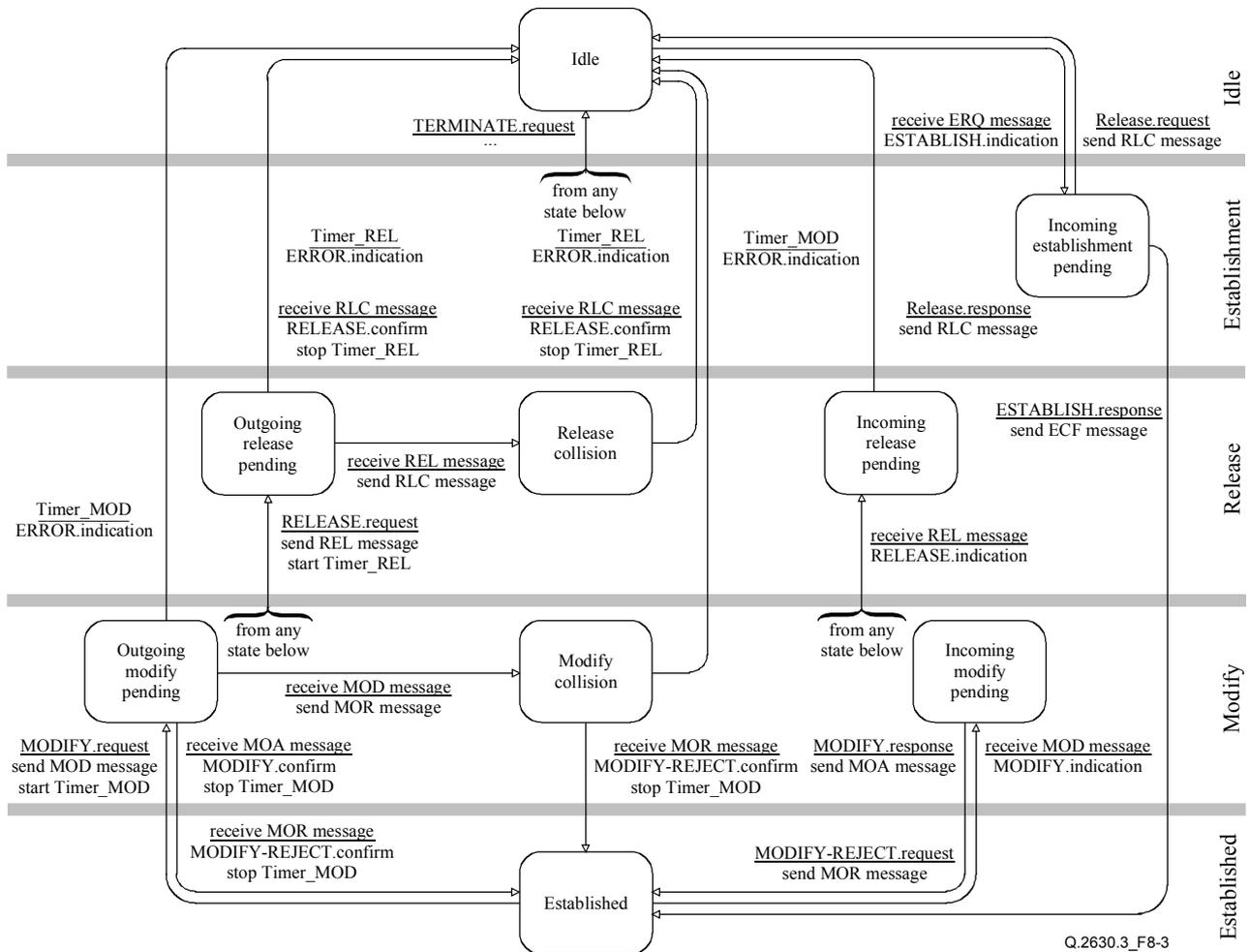


**Figure 8-3/Q.2630.3 – State transition diagram for the incoming protocol procedure**

### 8.3.3.11.2 SDL diagrams for the incoming protocol procedures

The SDL diagram for the incoming protocol procedure is shown in Figure 8-4 (parts 1 to 6).

The SDL diagrams contained in Figure 8-4 (parts 1 to 6) are an introduction to the procedures described in detail in 8.3.3.
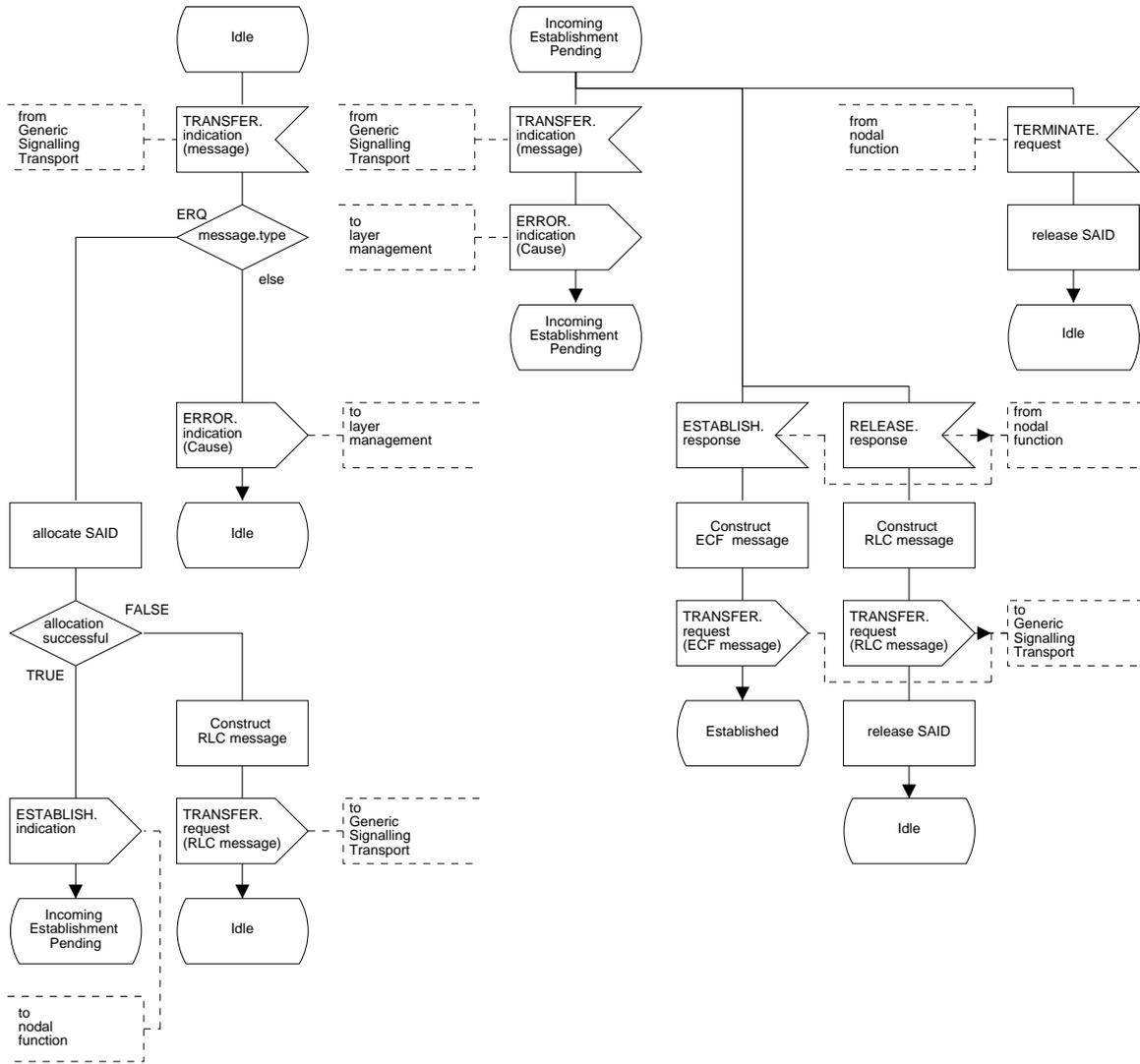
**Figure 8-4/Q.2630.3 (part 1 of 6) – SDL diagram for the incoming protocol procedure**

**Figure 8-4/Q.2630.3 (part 2 of 6) – SDL diagram for the incoming protocol procedure**

**Figure 8-4/Q.2630.3 (part 3 of 6) – SDL diagram for the incoming protocol procedure**

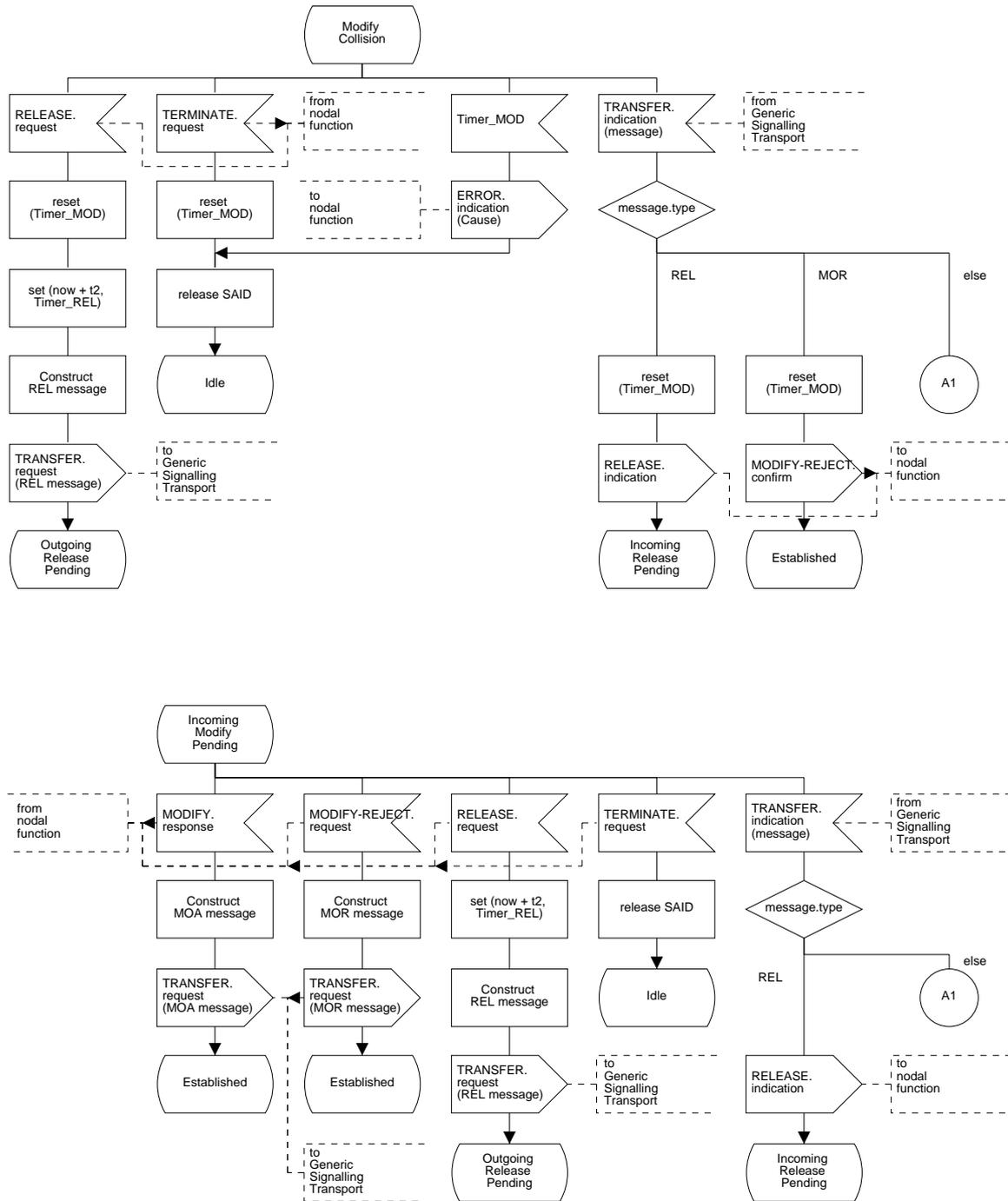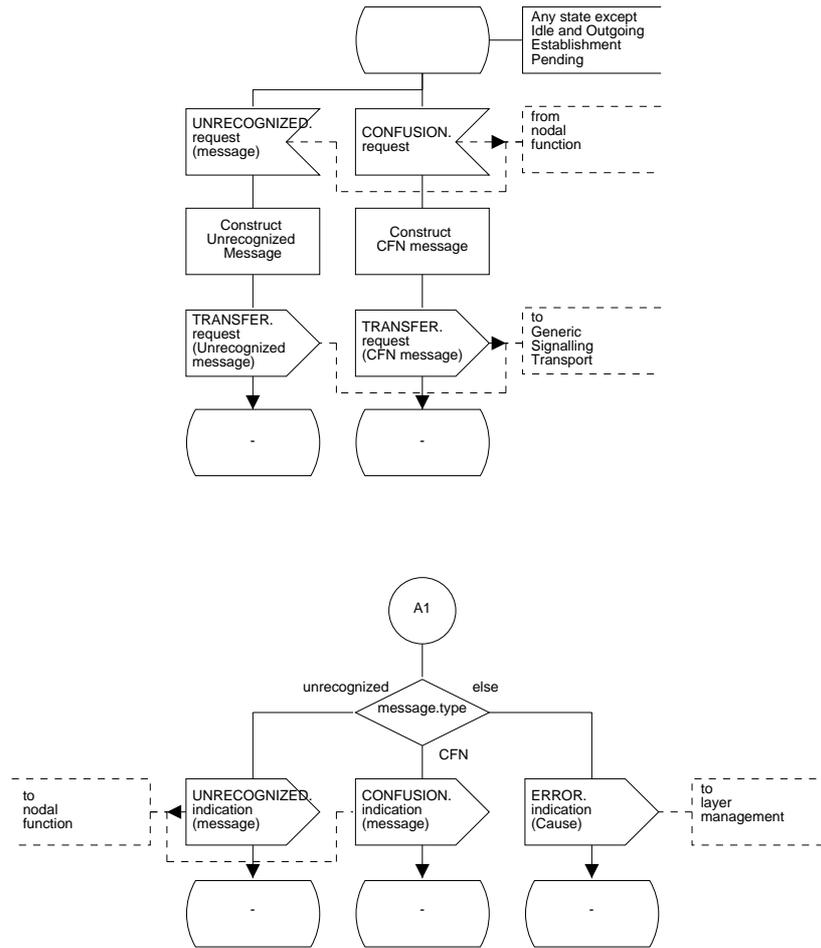**Figure 8-4/Q.2630.3 (part 4 of 6) – SDL diagram for the incoming protocol procedure**

Modify
Collision

RELEASE.
request

reset
(Timer_MOD)

set (now + t2,
Timer_REL)

Construct
REL message

TRANSFER.
request
(REL message)

to
Generic
Signalling
Transport

Outgoing
Release
Pending

TERMINATE.
request

from
nodal
function

reset
(Timer_MOD)

to
nodal
function

release SAID

Idle

Timer_MOD

ERROR.
indication
(Cause)

TRANSFER.
indication
(message)

from
Generic
Signalling
Transport

message.type

REL          MOR          else

reset
(Timer_MOD)

reset
(Timer_MOD)

A1

RELEASE.
indication

MODIFY-REJECT.
confirm

to
nodal
function

Incoming
Release
Pending

Established

Incoming
Modify
Pending

from
nodal
function

MODIFY.
response

MODIFY-REJECT.
request

RELEASE.
request

TERMINATE.
request

TRANSFER.
indication
(message)

from
Generic
Signalling
Transport

Construct
MOA message

Construct
MOR message

set (now + t2,
Timer_REL)

release SAID

message.type

TRANSFER.
request
(MOA message)

TRANSFER.
request
(MOR message)

Construct
REL message

Idle

REL          else

A1

Established

Established

TRANSFER.
request
(REL message)

to
Generic
Signalling
Transport

RELEASE.
indication

to
nodal
function

to
Generic
Signalling
Transport

Outgoing
Release
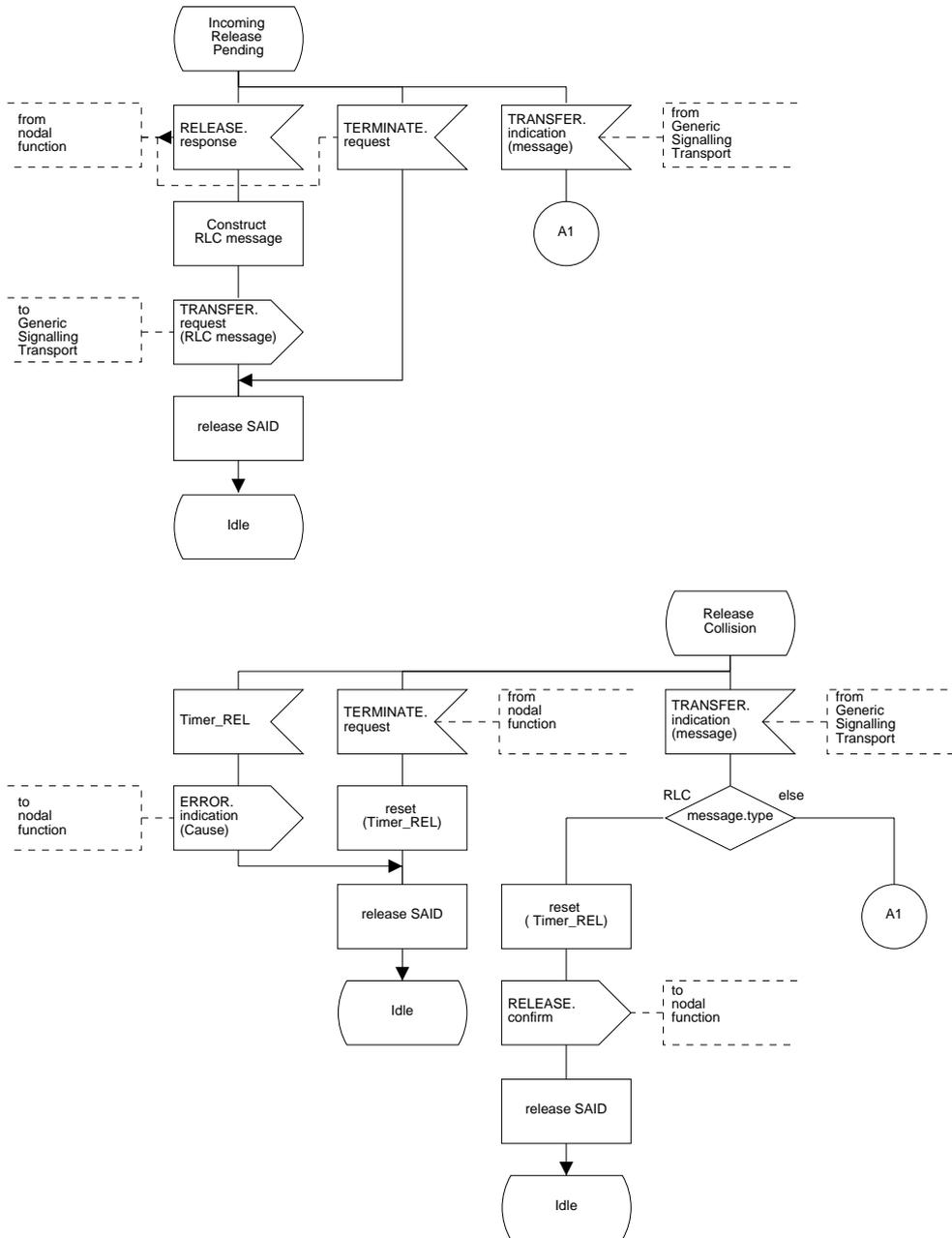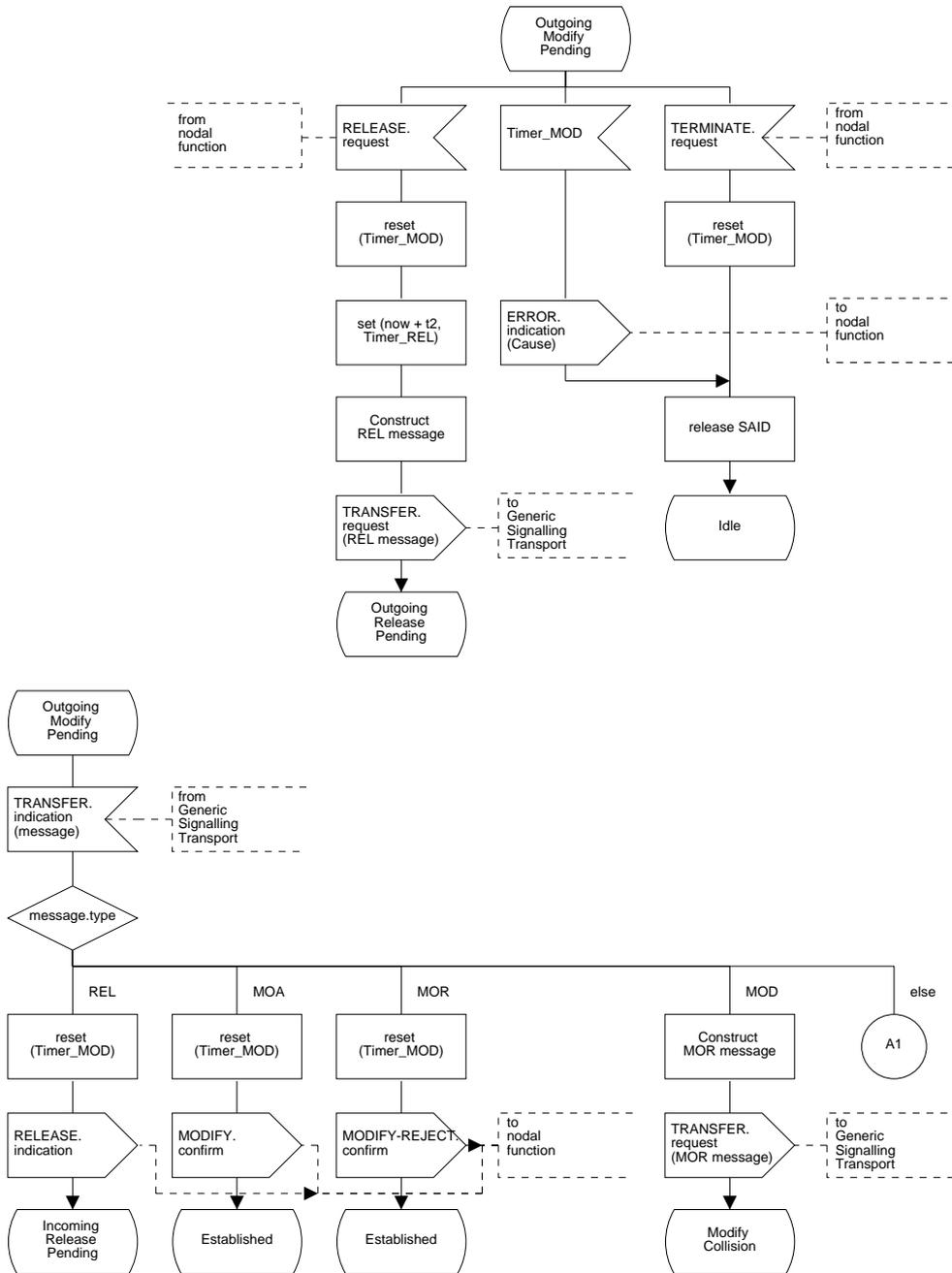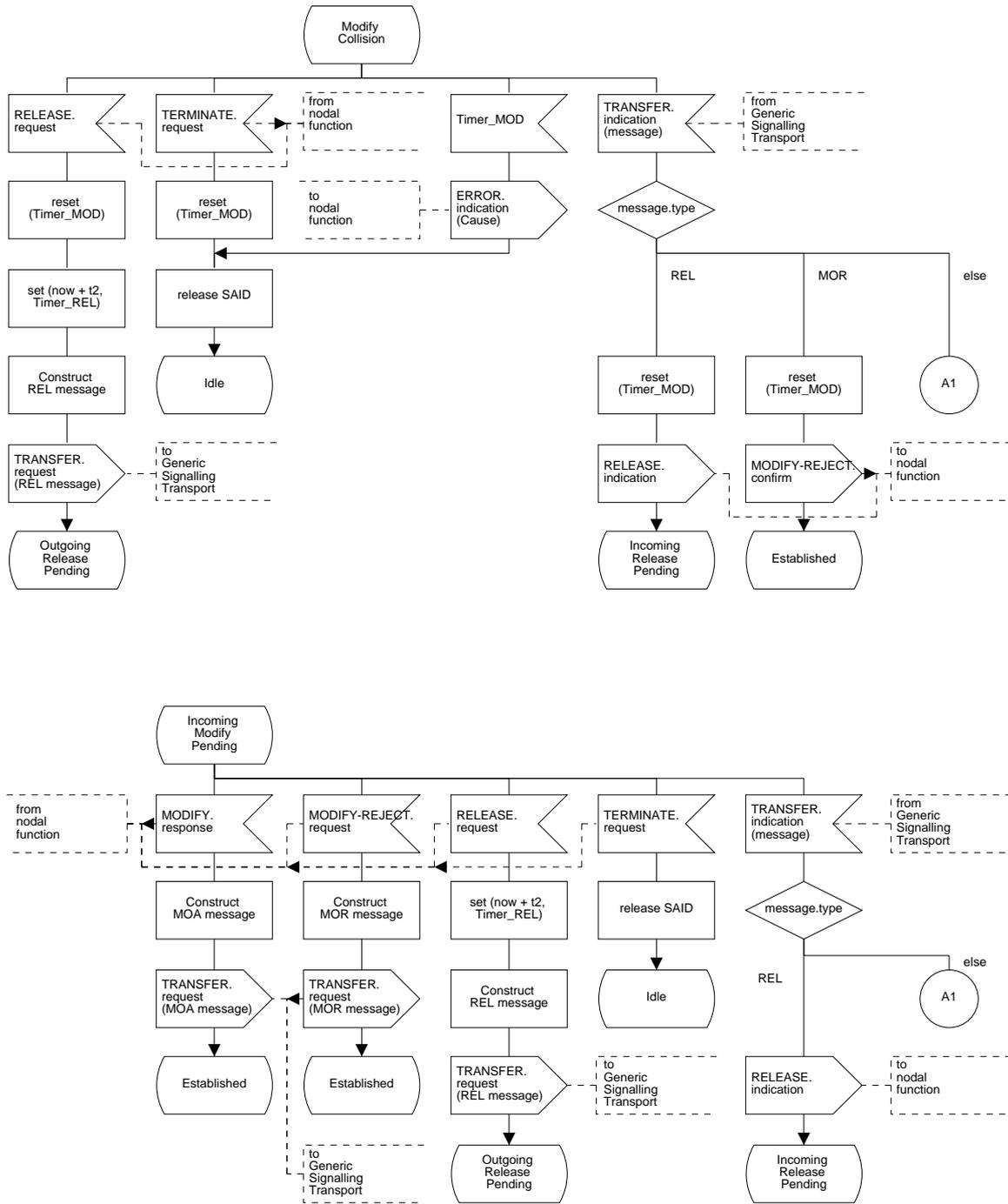Pending

Incoming
Release
Pending

**Figure 8-4/Q.2630.3 (part 5 of 6) – SDL diagram for the incoming protocol procedure**

**Figure 8-4/Q.2630.3 (part 6 of 6) – SDL diagram for the incoming protocol procedure**
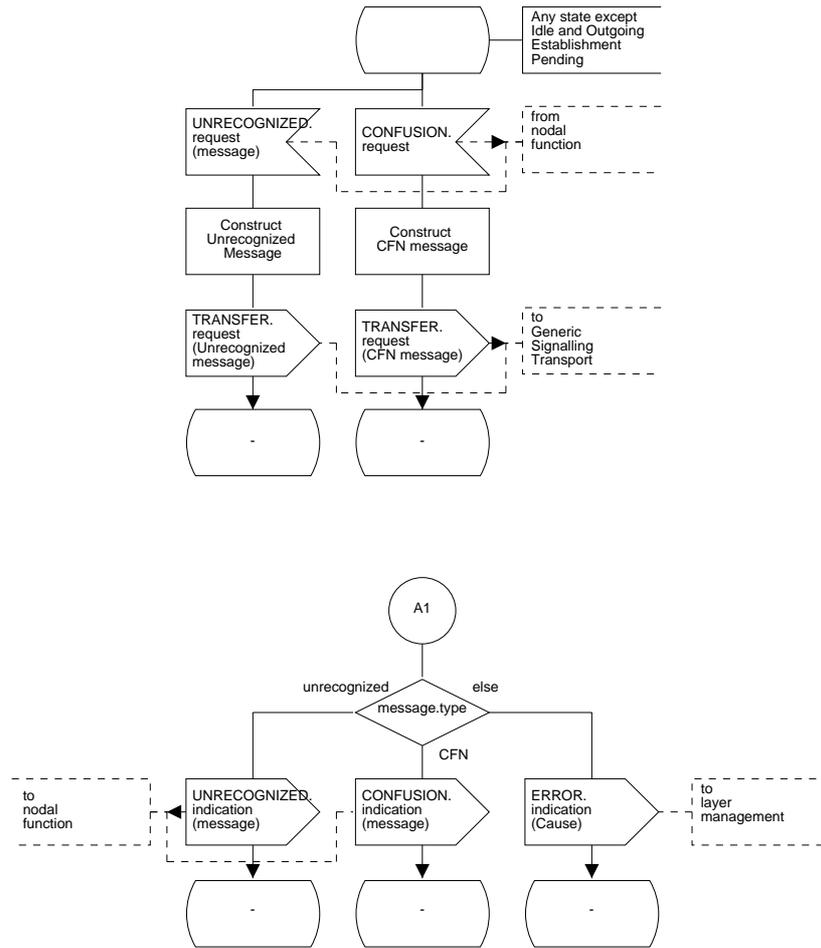
### 8.3.4    Maintenance protocol procedures

#### 8.3.4.1    Reset

##### 8.3.4.1.1    Sending reset

When a request for reset is received from the nodal function, a maintenance protocol entity instance is created and an SAID allocated to it.

If the request indicates all AAL type 2 paths associated with a signalling transport association are to be reset, a RES message (Reset Request) containing the Connection Element Identifier parameter – with both the Path Identifier and the Channel Identifier coded with a "Null" value – is sent to the adjacent AAL type 2 node.

If the request contains the identity of an AAL type 2 path with the channel identifier coded with a "Null" value, a RES message containing the connection element identifier parameter – with the path identifier set to indicate the path and the channel identifier coded with the "Null" value – is sent to the adjacent AAL type 2 node.

If the request contains the identity of a path and a channel, a RES message containing the connection element identifier parameter – with the path identifier set to indicate the path and the channel identifier set to indicate the channel – is sent to the adjacent AAL type 2 node.

When the RES message is sent, Timer_RES is started and state "Outgoing reset pending" is entered.

If an RSC message (reset confirm) is received in state "Outgoing reset pending", a reset confirmation is passed to the nodal function and Timer_RES is stopped. The SAID allocated to the maintenance protocol entity instance is released and made available for new traffic. The maintenance protocol entity instance enters state "Idle".

##### 8.3.4.1.2    Receiving reset

When a RES message (reset request) is received, a maintenance protocol entity instance will be invoked.

If the Path Identifier field in the CEID parameter included in the RES message is coded with the "Null" value, an indication that all AAL type 2 paths associated with the signalling transport association must be reset is passed to the nodal function.

If the path identifier field in the CEID parameter included in the RES message is coded with a "non-Null" value but the channel identifier field with a "Null" value, an indication that all channels within the AAL type 2 path must be reset is passed to the nodal function.

If the RES message contains the CEID parameter with both a "non-Null" path identifier field and a "non-Null" channel identifier field, an indication that the channel within the identified path must be reset is passed to the nodal function.

After notifying the nodal function, state "Incoming reset pending" is entered.

When a Reset response is received from the nodal function, a RSC message (reset confirm) is sent to the peer protocol entity instance. The maintenance protocol entity instance enters state "Idle".

##### 8.3.4.1.3    Exceptional reset procedures

If the SAID allocation fails, the nodal function is informed with a cause "Switching equipment congestion" and the maintenance protocol entity instance enters state "Idle".

When Timer_RES expires in state "Outgoing reset pending", the RES message is sent again, the nodal function is informed with a cause "Recovery on timer expiry", state "Outgoing reset continuing" is entered, and Timer_RES is started again.

When Timer_RES expires in state "Outgoing reset continuing", the RES message is sent again and Timer_RES is started again; the nodal function is not informed.

When an RSC message (reset confirm) is received in state "Outgoing reset continuing", a reset confirmation is passed to the nodal function and Timer_RES is stopped. The SAID allocated to the maintenance protocol entity instance is released and made available for new traffic. The maintenance protocol entity instance enters state "Idle".

When a request to terminate the repetition of the reset procedure is received, Timer_RES is stopped. The SAID allocated to the maintenance protocol entity instance is released and made available for new traffic. The maintenance protocol entity instance enters state "Idle".

#### 8.3.4.1.4  State transition model

The state transition diagram for the reset procedure is shown in Figure 8-5.
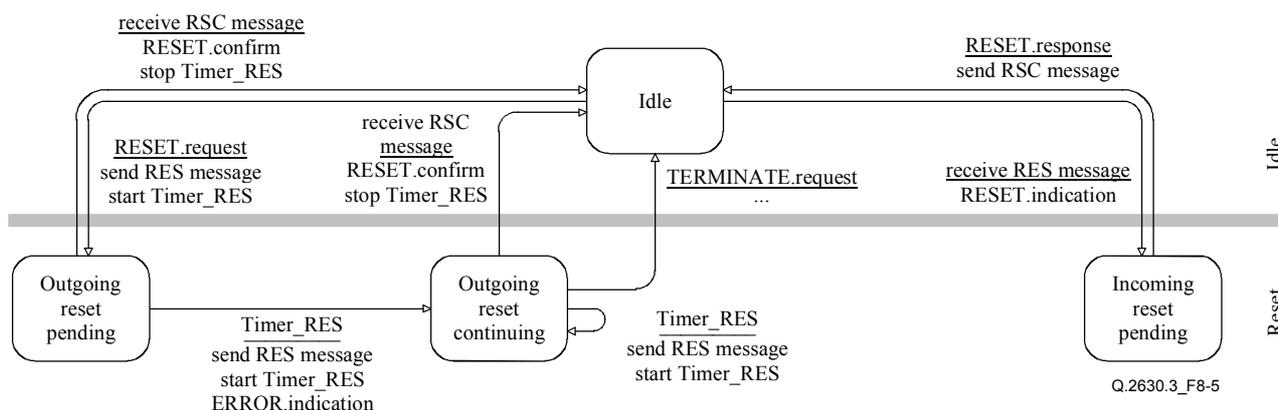


**Figure 8-5/Q.2630.3 – State transition diagram for the maintenance control procedure (reset)**

### 8.3.4.2    Blocking and unblocking of AAL type 2 paths

#### 8.3.4.2.1    Sending blocking/unblocking

When a request for blocking is received from the nodal function, a new maintenance protocol entity instance is created, a new SAID is allocated and a BLO message (block request) is sent to the peer AAL type 2 signalling entity. The BLO message contains a connection element identifier with the path identifier coded to indicate the AAL type 2 path to be blocked (as instructed from the nodal function) and the channel identifier coded with the "Null" value. Timer_BLO is started and state "Outgoing block pending" is entered.

When a BLC message (block confirm) is received from the peer AAL type 2 signalling entity in state "Outgoing block pending", a confirmation of blocking is sent to the nodal function and Timer_BLO is stopped. The SAID allocated to the maintenance procedure entity instance is released and made available for new traffic and state "Idle" is entered.

When a request for unblocking is received from the nodal function, a new maintenance protocol entity instance is created, a new SAID is allocated and an UBL message (unblock request) is sent to the peer AAL type 2 signalling entity. The UBL message contains a connection element identifier with the path identifier coded to indicate the AAL type 2 path to be unblocked (as instructed from the nodal function) and the channel identifier coded with the "Null" value. Timer_UBL is started and state "Outgoing unblock pending" is entered.

When a UBC message (unblock confirm) is received from the peer AAL type 2 signalling entity in state "Outgoing unblock pending", a confirmation of unblocking is sent to the nodal function and Timer_UBL is stopped. The SAID allocated to the maintenance protocol entity instance is released and made available for new traffic and state "Idle" is entered.

### 8.3.4.2.2 Receiving blocking/unblocking

When a BLO message (block request) is received from the peer AAL type 2 signalling entity, a new maintenance protocol entity instance is created, an indication of the blocking is sent to the nodal function and state "Incoming block pending" is entered.

When a response to the blocking is received from the nodal function in state "Incoming block pending", a BLC message (block confirm) is sent to the peer AAL type 2 signalling entity and state "Idle" is entered.

When a UBL message (unblock request) is received from the peer AAL type 2 signalling entity, a new maintenance protocol entity instance is created, an indication of the unblocking is sent to the nodal function and state "Incoming unblock pending" is entered.

When a response to the unblocking is received from the nodal function in state "Incoming unblock pending", a UBC message (unblock confirm) is sent to the peer AAL type 2 signalling entity and state "Idle" is entered.

### 8.3.4.2.3 Exceptional blocking and unblocking procedures

If the SAID allocation fails, the nodal function is informed with a cause "Switching equipment congestion" and the maintenance protocol entity instance enters state "Idle".

If Timer_BLO expires, the nodal function is informed with a cause "Recovery on timer expiry", the SAID is released, and state "Idle" is entered.

If Timer_UBL expires, the nodal function is informed with a cause "Recovery on timer expiry", the SAID is released, and state "Idle" is entered.

### 8.3.4.2.4 State transition

The state transition diagram for the path blocking procedure is shown in Figure 8-6.
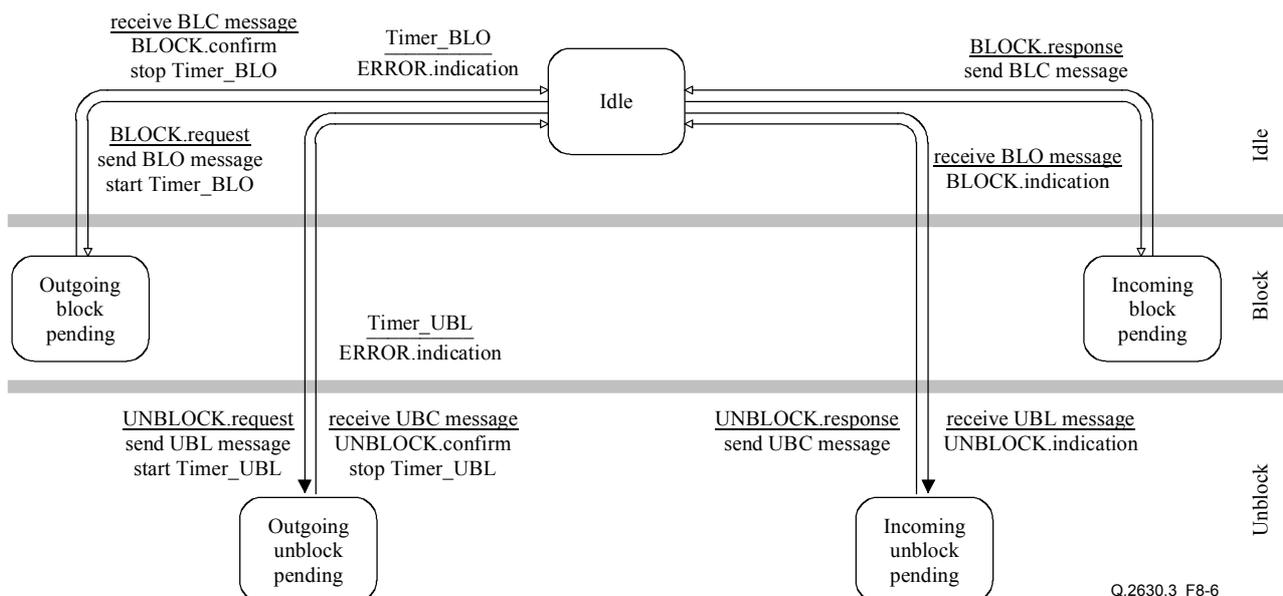


**Figure 8-6/Q.2630.3 – State transitions of the maintenance control procedure (blocking and unblocking)**

### 8.3.4.3 Unrecognized information procedures

When an unrecognized message, parameter, or subfield value is received, the message, the parameter, or the subfield value respectively is conveyed to the nodal function for the appropriate action.

If a request to send a notification of receipt of unrecognized information is received from the nodal function, the BLC message (block confirm), UBC message (unblock confirm), or RSC message (reset confirm) shall contain the cause received from the nodal function.

When a cause parameter is received in a BLC message (block confirm), UBC message (unblock confirm), or RSC message (reset confirm), the cause parameter is conveyed to the nodal function for the appropriate action.

### 8.3.4.4 SDL diagrams for the maintenance control procedures

The SDL diagram for the maintenance control procedure is shown in Figure 8-7 (parts 1 to 4).

The SDL diagrams contained in Figure 8-7 (parts 1 to 4) are an introduction to the procedures described in detail in 8.3.4.

**Figure 8-7/Q.2630.3 (part 1 of 4) – SDL diagram for the maintenance control procedure**

```
                                    ┌─────────┐
                                    │   Idle  │
                                    └─────────┘
                                         │
  ┌ ─ ─ ─ ─ ┐              ┌──────────────────┐
    from                   │  TRANSFER.       │
    Generic    ─ ─ ─ ─ ─ ─ │  indication      │
    Signalling             │  (message)       │
    Transport              └──────────────────┘
  └ ─ ─ ─ ─ ┘                        │
                                ╱─────────╲
                               ╱ message.  ╲
                               ╲  type      ╱
                                ╲─────────╱
                     ┌───────────────┼───────────────┐
                    RES             BLO             UBL
                     │               │               │
          ┌───────────────┐ ┌───────────────┐ ┌───────────────┐
          │ RESET.        │ │ BLOCK.        │ │ UNBLOCK.      │
          │ indication    │ │ indication    │ │ indication    │
          └───────────────┘ └───────────────┘ └───────────────┘
                  │                 │                 │
          ┌───────────────┐ ┌───────────────┐ ┌───────────────┐
          │   Incoming    │ │   Incoming    │ │   Incoming    │
          │    Reset      │ │    Block      │ │    Unblock    │
          │   Pending     │ │   Pending     │ │   Pending     │
          └───────────────┘ └───────────────┘ └───────────────┘
                  │                 │                 │
          ┌ ─ ─ ─ ─ ─ ─ ┐  ┌ ─ ─ ─ ─ ─ ─ ┐  ┌ ─ ─ ─ ─ ─ ─ ┐
            to               to               to
            nodal            nodal            nodal
            function         function         function
          └ ─ ─ ─ ─ ─ ─ ┘  └ ─ ─ ─ ─ ─ ─ ┘  └ ─ ─ ─ ─ ─ ─ ┘
```
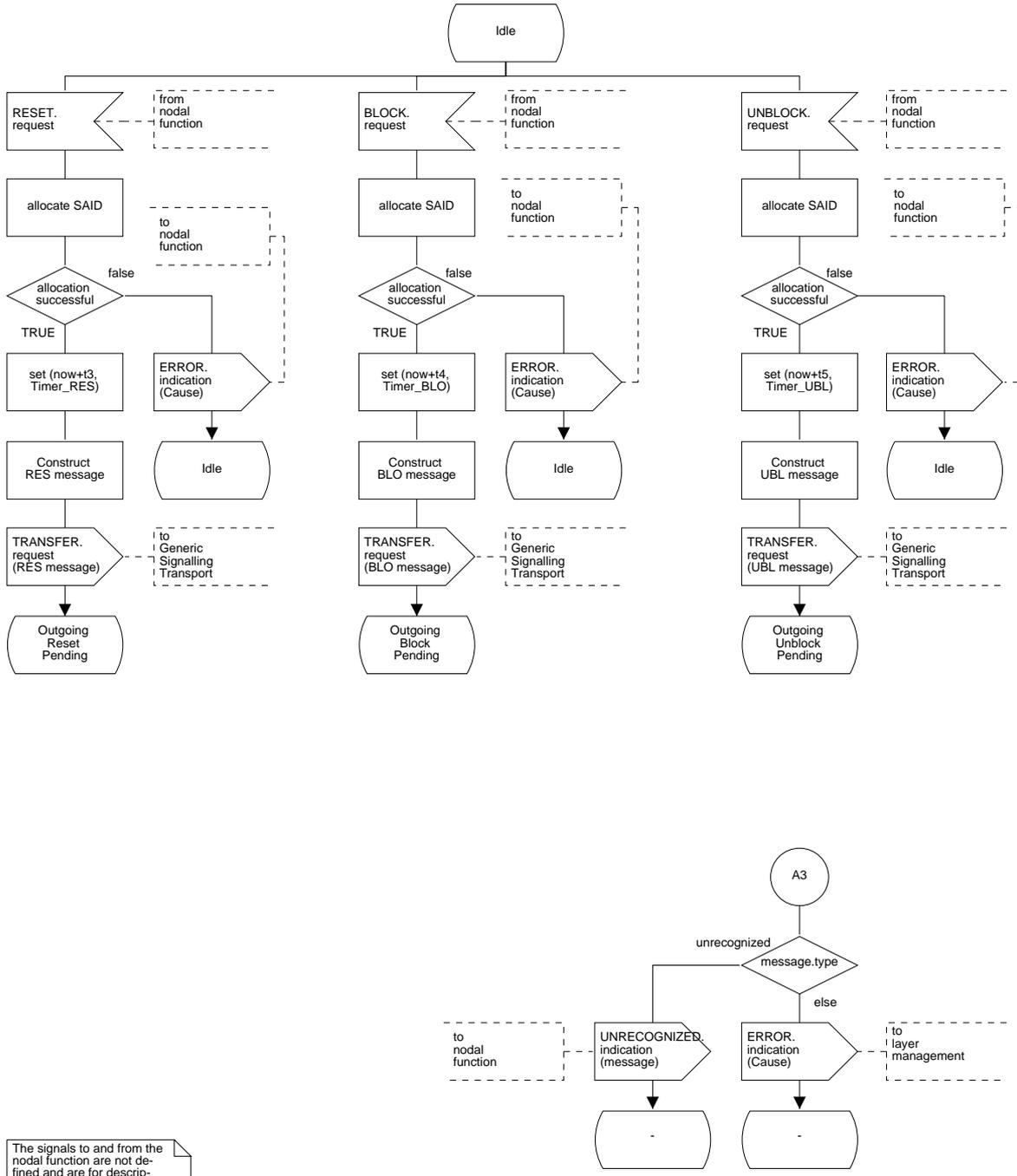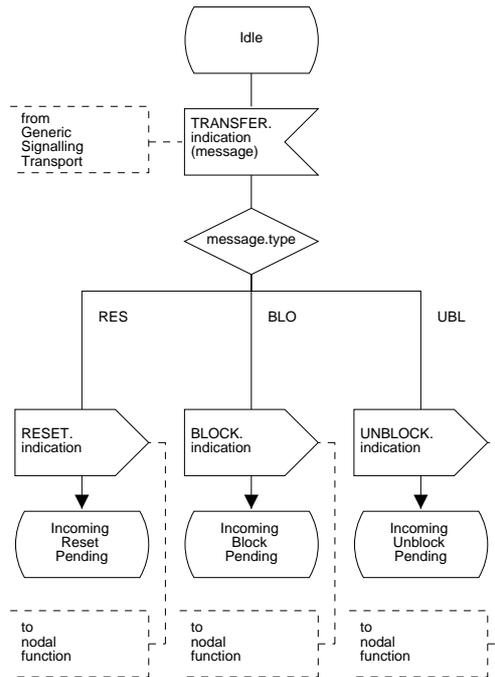
**Figure 8-7/Q.2630.3 (part 2 of 4) – SDL diagram for the maintenance control procedure**
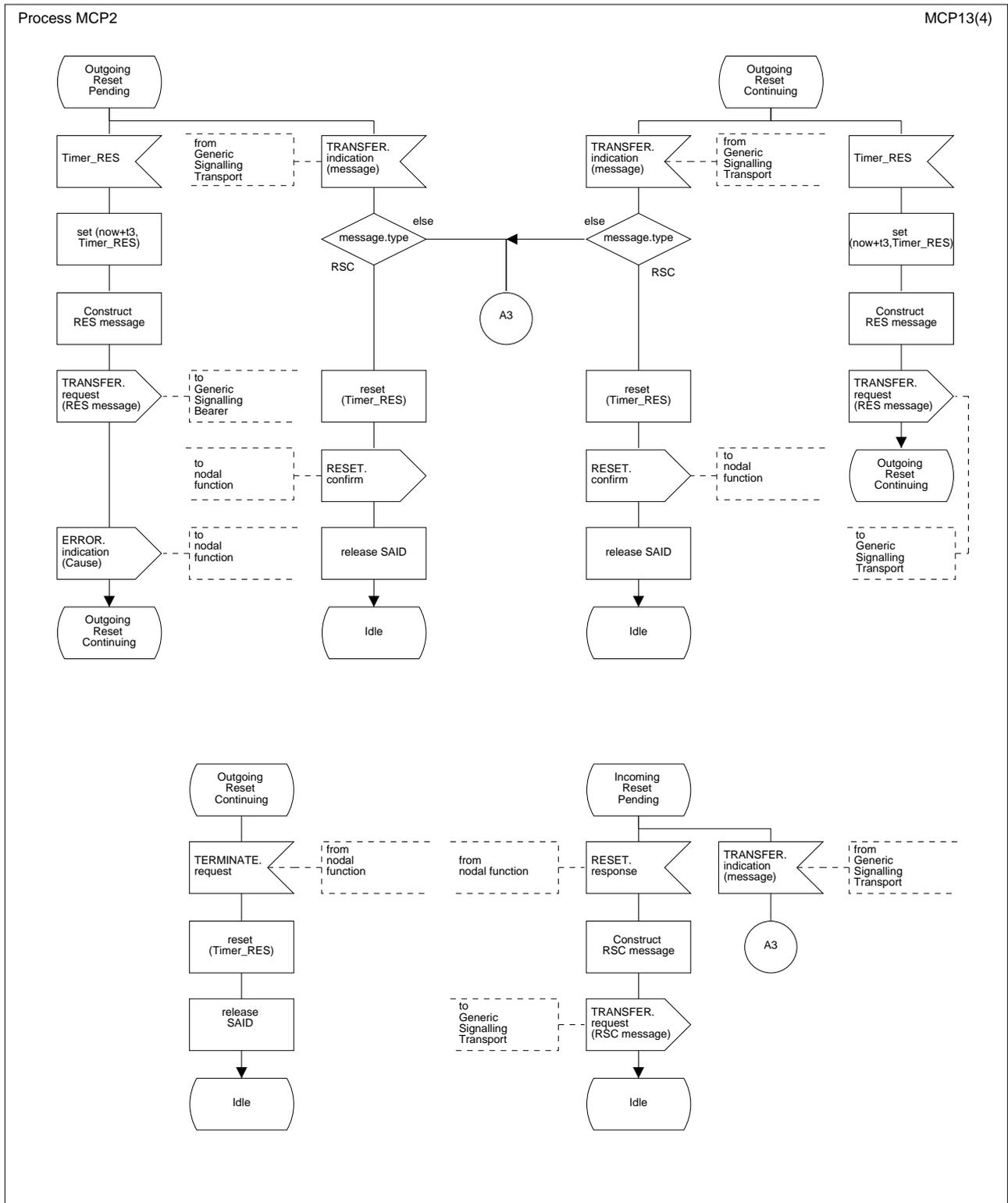
**Figure 8-7/Q.2630.3 (part 3 of 4) – SDL diagram for the maintenance control procedure**
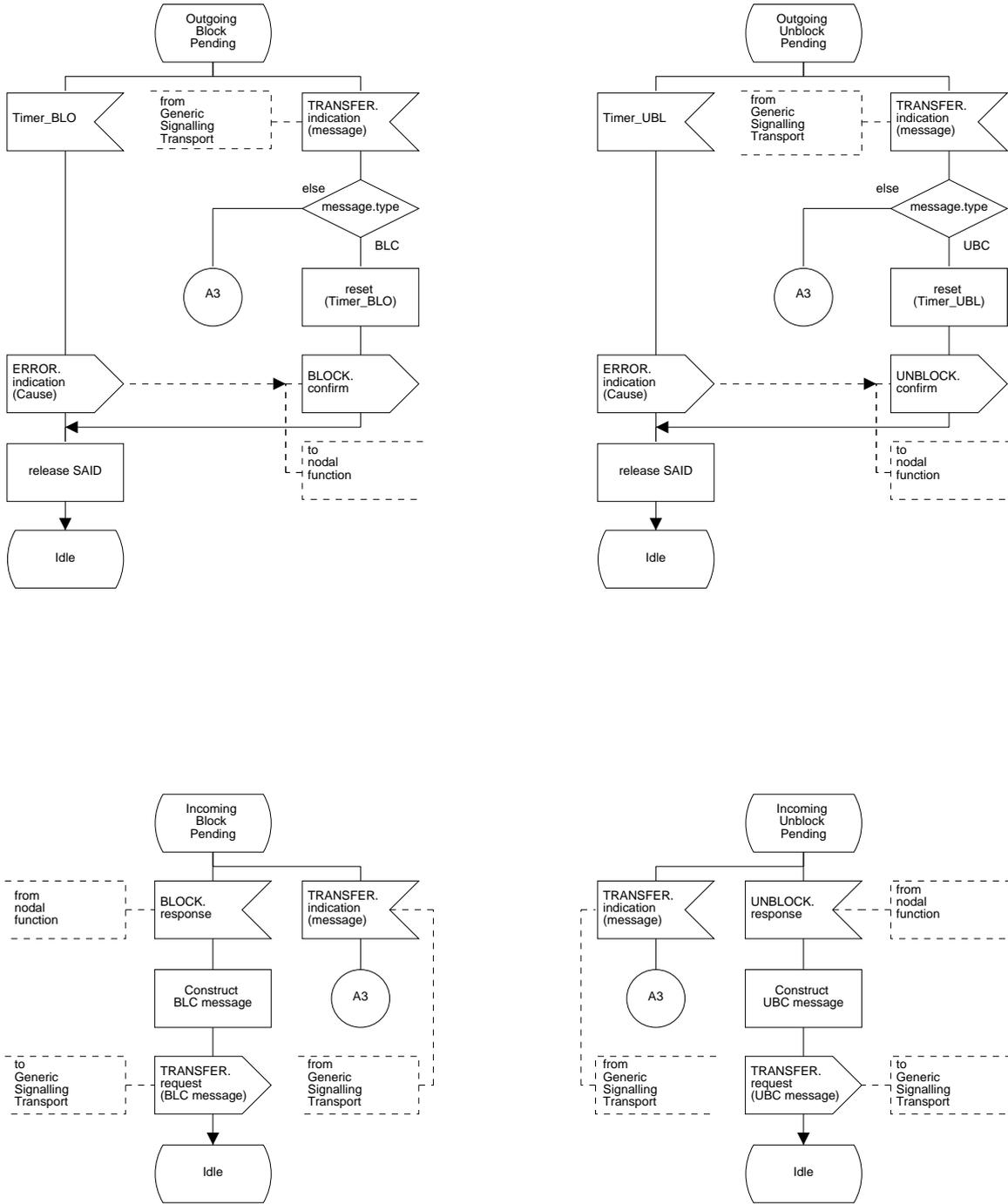
**Figure 8-7/Q.2630.3 (part 4 of 4) – SDL diagram for the maintenance control procedure**

## 8.4 List of timers

The timers used in the procedures described in 8.3 are listed in Table 8-1 together with a timeout value range, their cause for setting the timer, resetting the timer, and the action at expiry of the timer.

**Table 8-1/Q.2630.3 – List of timers**

| Timer | Time-out value | Cause for initiation | Normal termination | At expiry |
|---|---|---|---|---|
| Timer_ERQ | 5-30 s (t1) | When an ERQ message is sent | At the receipt of ECF message | Release all resources and the connection, send RES message. |
| Timer_REL | 2-60 s (t2) | When an REL message is sent | At the receipt of RLC message | Release resources, send RES message. |
| Timer_RES | 2-60 s (t3) | When an RES message is sent | At the receipt of RSC message | Repeat RES message, restart Timer_RES, at first expiry: inform the nodal function. |
| Timer_BLO | 2-60 s (t4) | When a BLO message is sent | At the receipt of BLC message | Alert maintenance system, inform the nodal function. |
| Timer_UBL | 2-60 s (t5) | When an UBL message is sent | At the receipt of UBC message | Alert maintenance system, inform the nodal function. |
| Timer_MOD | 5-30 s (t6) | When a MOD message is sent | At the receipt of MOA message | Release all resources and the connection, send RES message. |
| NOTE – In the diagnostic field associated with a cause field indicating "Recovery on timer expiry", the timer number is included. Timer_ERQ is coded as the IA5 character "1"; Timer_MOD is coded as the IA5 character "6". | | | | |

# Annex A

# Support for non-switched scenario

## A.1 Introduction

The AAL type 2 signalling protocol described in this Recommendation can be deployed in support of a non-switched scenario as depicted in Figure A.1.
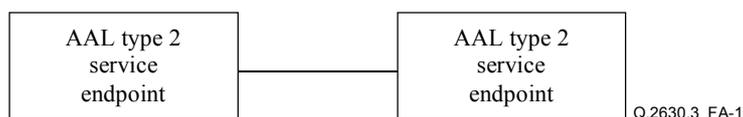


**Figure A.1/Q.2630.3 – Non-switched scenario**

In this scenario, AAL type 2 paths are typically provisioned – with each originating AAL type 2 service endpoint having one signalling transport association with each neighbouring AAL type 2 service endpoint. There is no AAL type 2 switch used in this scenario.

This annex describes the subset of the signalling requirements needed to support the non-switched scenario. Because most signalling procedures are link-by-link, there are few differences from the switched scenario. Since the non-switched scenario is a subset of the switched scenario, there are no additional requirements to support non-switched.

Subclauses below correspond with similarly numbered subclauses in the body of ITU-T Rec. Q.2630.1 [15].

## A.2    References

Clause 2/Q.2630.1 [15] applies.

## A.3    Definitions

Clause 3/Q.2630.1 [15] applies.

## A.4    Abbreviations

Clause 4/Q.2630.1 [15] applies.

## A.5    General framework of the AAL type 2 signalling protocol

The AAL type 2 signalling protocol provides the signalling capability to establish, release and maintain AAL type 2 point-to-point connections across a single ATM VCC that carries AAL type 2 links. These services are accessible via the AAL type 2 User Service Access Point (A2SU-SAP).

Two peer AAL type 2 signalling entities rely on the generic signalling transport service to provide assured data transfer between them and service availability indications. These services are accessible via the Generic Signalling Transport Service Access Point (GST-SAP).

NOTE – Primitives over the A2SU-SAP, GST-SAP, and LM-SAP are used for descriptive purpose only. They do not imply a specific implementation.

Both peer AAL type 2 signalling entities provide the same set of services.

The AAL type 2 signalling entity is subdivided into protocol entities and nodal functions as shown in Figure A.5-1. At each AAL type 2 service endpoint, the AAL type 2 signalling entity communicates with the AAL type 2 served user.

Q.2630.3_FA-5.1
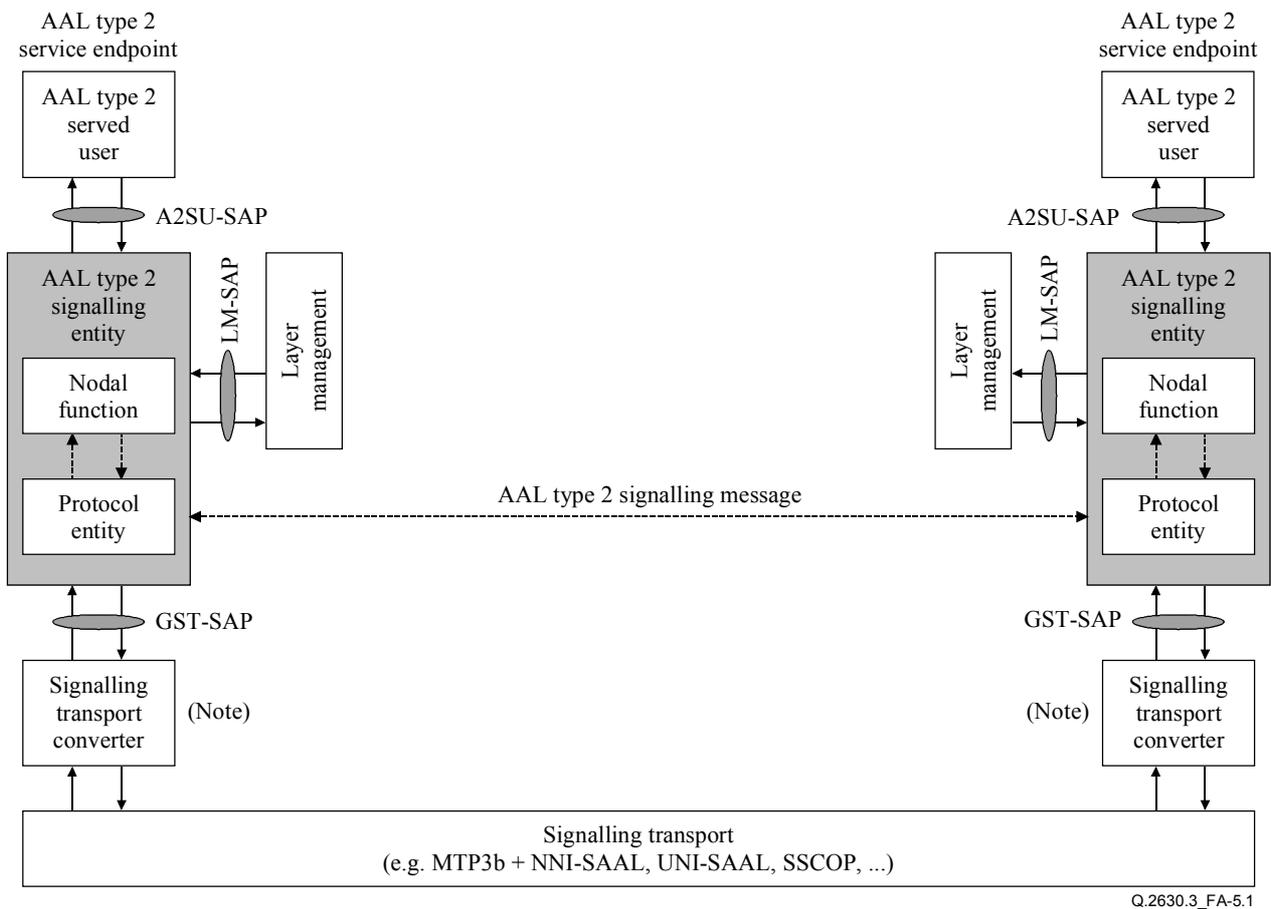
NOTE – A signalling transport converter instance is associated with each AAL type 2 signalling transport.

**Figure A.5-1/Q.2630.3 – AAL type 2 signalling protocol reference
architecture for the non-switched scenario**

Protocol Entities define the interactions between two adjacent AAL type 2 nodes. AAL type 2 messages are exchanged between peer protocol entities using the generic signalling transport service.

The AAL type 2 signalling is independent of the signalling transport, although an assured data transport is required and a message size limit applies. To adapt the signalling transport services to a specific signalling transport service, a signalling bearer converter may be needed. The specification of signalling bearer converters is beyond the scope of this Recommendation (see ITU-T Recs Q.2150.0 [12], Q.2150.1 [22], and Q.2150.2 [23]).

The protocol entity is divided into several procedures as shown in Figure A.5-2.



Q.2630_FA-5.2
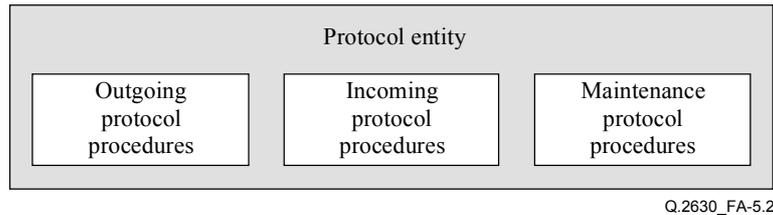
**Figure A.5-2/Q.2630.3 – Internal structure of the AAL type 2 signalling protocol entity**

The outgoing protocol procedures provide the mechanism to initiate an AAL type 2 connection request. The incoming protocol procedures are applied when a request for an AAL type 2 connection is received from a peer entity. Both of these procedures provide for the orderly release of an AAL type 2 connection. The maintenance protocol procedures provide the mechanisms to align the status of the AAL type 2 resources within the two adjacent AAL type 2 nodes and procedures to block and unblock an AAL type 2 path.

The unrecognized information procedures in the nodal function as well as in the protocol entities provide the forward compatibility mechanism which enables extension of the protocol in the future.

The nodal function keeps track of the AAL type 2 path resources.

**A.5.1    Interface between the AAL type 2 signalling entity and the AAL type 2 served user**

Clause 5.1/Q.2630.1 [15] applies, except for the following:

In the ESTABLISH.request primitive, AAL type 2 Service Endpoint Address (DA2EA) is not included.

**A.5.2    Service provided by the generic signalling transport service**

Clause 5.2/Q.2630.1 [15] applies except for the following:

CONGESTION.indication primitive does not apply.

**A.5.3    Interface between the AAL type 2 signalling entities and layer management**

Clause 5.3/Q.2630.1 [15] applies.

**A.6      Forward and backward compatibility**

Clause 6/Q.2630.1 [15] applies.

**A.7      Format and coding of AAL type 2 signalling protocol**

Clause 7/Q.2630.1 [15] applies.

**A.7.1    Coding conventions for the AAL type 2 signalling protocol**

Clause 7.1/Q.2630.1 [15] and its subclauses apply.

**A.7.2    Format and coding of the AAL type 2 signalling protocol messages**

**A.7.2.1    AAL type 2 signalling protocol messages**

Clause 7.2.1/Q.2630.1 [15] applies.

### A.7.2.2 Parameters of the AAL type 2 signalling protocol messages

Clause 7.2.2/Q.2630.1 [15] applies as modified below:

The parameters of the AAL type 2 signalling protocol messages are shown in Table A.7-1. The indications of "mandatory" and "optional" are for information only. The authoritative definition is given in A.8. If any difference between the indications in this clause and the definitions in A.8 exists, the definitions in A.8 take precedence.

Multiple presence of the same parameter in a single message is not permitted.

**Table A.7-1/Q.2630.3 (part 1 of 2) – Parameters of the AAL type 2**
**signalling protocol messages**

| AAL type 2 parameter | AAL type 2 message | | | |
|---|---|---|---|---|
| | ERQ | ECF | REL | RLC |
| Cause | – | – | M | (Note 4) |
| Connection Element ID | M | – | – | – |
| Destination Signalling Association Identifier (Note 1) | (Note 2) | M | M | M |
| Link Characteristics | O | – | – | – |
| Originating Signalling Association Identifier | M | M | – | – |
| Served User Generated Reference | O | – | – | – |
| Served User Transport | O | – | – | – |
| Service Specific Information (Audio) | (Note 3) | – | – | – |
| Service Specific Information (Multirate) | (Note 3) | – | – | – |
| Service Specific Information (SAR-assured) | (Note 3) | – | – | – |
| Service Specific Information (SAR-unassured) | (Note 3) | – | – | – |
| Test Connection Indicator | O | – | – | – |

M  Mandatory parameter
O  Optional parameter
–  Parameter not present

NOTE 1 – This row designates the Destination Signalling Association Identifier field in the message header.

NOTE 2 – The Destination Signalling Association Identifier field contains the value "unknown".

NOTE 3 – At most one of these parameters is present in an instance of the message.

NOTE 4 – The "Cause" parameter is present in the Release Confirm message if:

a)  the RLC is used to reject a connection establishment; or

b)  the cause reports unrecognized unknown information received in the REL message.

**Table A.7-1/Q.2630.3 (part 2 of 2) – Parameters of the AAL Type 2
Signalling Protocol messages**

| AAL type 2 parameter | AAL type 2 message | | | | | | |
|---|---|---|---|---|---|---|---|
| | **RES** | **RSC** | **BLO** | **BLC** | **UBL** | **UBC** | **CFN** |
| Cause | – | (Note 4) | – | (Note 4) | – | (Note 4) | M |
| Connection Element ID | M | – | M (Note 3) | – | M (Note 3) | – | – |
| Destination Signalling Association Identifier (Note 1) | (Note 2) | M | (Note 2) | M | (Note 2) | M | M |
| Originating Signalling Association Identifier | M | – | M | – | M | – | – |
| M Mandatory parameter <br> O Optional parameter <br> – Parameter not present <br><br> NOTE 1 – This row designates the Destination Signalling Association Identifier field in the message header. <br><br> NOTE 2 – The Destination Signalling Association Identifier field contains the value "unknown". <br><br> NOTE 3 – The Channel Identifier field is set to "Null". <br><br> NOTE 4 – The "Cause" parameter is present only if the cause reports unrecognized information received. | | | | | | | |

The identifiers of the AAL type 2 message parameters are defined in Table A.7-2.

**Table A.7-2/Q.2630.3 – Identifiers of the AAL Type 2 message parameters**

| AAL type 2 Parameter | Ref. | Acronym | Identifier |
|---|---|---|---|
| Cause | 7.3.1 | CAU | 0 0 0 0 0 0 0 1 |
| Connection Element ID | 7.3.2 | CEID | 0 0 0 0 0 0 1 0 |
| Link Characteristics | 7.3.5 | ALC | 0 0 0 0 0 1 0 1 |
| Originating Signalling Association Identifier | 7.3.6 | OSAID | 0 0 0 0 0 1 1 0 |
| Served User Generated Reference | 7.3.7 | SUGR | 0 0 0 0 0 1 1 1 |
| Served User Transport | 7.3.8 | SUT | 0 0 0 0 1 0 0 0 |
| Service Specific Information (Audio) | 7.3.9 | SSIA | 0 0 0 0 1 0 0 1 |
| Service Specific Information (Multirate) | 7.3.10 | SSIM | 0 0 0 0 1 0 1 0 |
| Service Specific Information (SAR-assured) | 7.3.11 | SSISA | 0 0 0 0 1 0 1 1 |
| Service Specific Information (SAR-unassured) | 7.3.12 | SSISU | 0 0 0 0 1 1 0 0 |
| Test Connection Indicator | 7.3.13 | TCI | 0 0 0 0 1 1 0 1 |

## A.7.3    Parameter specification of the AAL type 2 signalling protocol messages

Applicable parameters are specified in 7.3/Q.2630.1 [15] except:

•    For 7.3.3 "Destination E.164 service endpoint address" and 7.3.4 "Destination NSAP service endpoint address" which are not applicable.

### A.7.4 Field specification of the AAL type 2 signalling protocol parameters

Applicable fields are specified in 7.4/Q.2630.1 [15] except:

a)      In 7.4.12/Q.2630.1 [15] add the following sentence: "Optionally, it is possible to increase the CPS-SDU size to 64 octets".

b)      Subclauses 7.4.13/Q.2630.1, 7.4.14/Q.2630.1 and 7.4.15/Q.2630.1 are not applicable.

c)      In 7.4.16/Q.2630.1 [15], cause "Unallocated (unassigned) number" is not applicable.

### A.8 Procedure of the AAL type 2 signalling protocol

Before an ATM VCC (AAL type 2 path) is put into service between a pair of adjacent AAL type 2 nodes, certain actions need to be performed. An identifier called the AAL type 2 path identifier is assigned to the ATM VCC. This identifier is used to refer to the ATM VCC in the AAL type 2 signalling protocol messages. The AAL type 2 path identifier shall uniquely identify the ATM VCC between the two adjacent AAL type 2 nodes.

On any ATM VCC used for AAL type 2 connections, all CID values from "8" to "255" are available for assignment.

Any time a new ATM VCC is put into service, the ownership of the ATM VCC shall be determined before AAL type 2 connections are established in it. In case of switched ATM VCC, the owner of the VCC shall be the AAL type 2 node that initiated the establishment of the VCC. In case of PVC and soft PVC, it is the responsibility of the management system to determine the owner of the VCC.

The nodal function is informed by layer management of a newly established AAL type 2 path by the use of the ADD-PATH.indication primitive containing the adjacent AAL type 2 node identifier, the AAL type 2 path identifier, and the ownership. The nodal function is informed by layer management of the removal of an AAL type 2 path by use of the REMOVE-PATH.indication primitive containing the adjacent AAL type 2 node identifier and the AAL type 2 path identifier.

In order to minimize the likelihood of CID collision, the following CID allocation mechanism shall be used:

•      if the AAL type 2 node owns the AAL type 2 path that carries the new connection, it allocates CID values from CID value 8 upwards; and

•      if the AAL type 2 node does not own the AAL type 2 path that carries the new connection, it allocates CID values from CID value 255 downwards.

NOTE – Causes in the procedures defined in clause 8/Q.2630.1 [15] specify which ITU-T standardized code should be used in cause parameters of AAL type 2 signalling protocol messages. Implementation dependent non-standardized causes may be used for AAL type 2 signalling entity internal processing and for A2SU-SAP and LM-SAP cause primitive parameters.

The service endpoint address, the served user generated reference, the served user transport parameter, the link characteristics, the SSCS information, and the test connection indicator shall not be modified by the nodal function. The served user generated reference and the served user transport are parameters with significance to the served user only; therefore, they shall not be examined by the nodal function.

### A.8.1 Compatibility

Clause 8.1 applies with the following modifications:

a)      In 8.1.1/Q.2630.1 [15] "General requirements on receipt of unrecognized signalling information", bullet item d) and the Note below it are not applicable.

b) In 8.1.2.1/Q.2630.1 [15] "Unrecognized messages", the bullet item "transfer the message transparently" is not applicable.

c) In 8.1.2.2/Q.2630.1 [15] "Unrecognized parameters", the bullet item "transfer the parameter transparently" appears twice and is not applicable in either location.

### A.8.2 Nodal functions

#### A.8.2.1 Nodal functions for AAL type 2 nodes with served user interaction

Clause 8.2.1/Q.2630.1 [15] applies with the modifications below.

a) Subclause 8.2.1.1.1.1/Q.2630.1 "Actions at the originating AAL type 2 service endpoint" is replaced by the following paragraphs:

When the nodal function receives an ESTABLISH.request primitive from the AAL type 2 served user, it determines the availability of a route with enough AAL type 2 path resources and selects an AAL type 2 path to the succeeding AAL type 2 service endpoint.

Selection of an AAL type 2 path typically is based on:

• the test connection indicator;

• link information (link characteristics); and

• other information (such as SSCS information).

AAL type 2 node internal resources are allocated for the new connection from the originating AAL type 2 served user to the outgoing AAL type 2 path.

On the selected outgoing AAL type 2 path, the CID and other resources (e.g. indicated by link characteristic or SSCS information) are allocated for the outgoing AAL type 2 link.

An outgoing protocol entity instance is invoked and the following parameters are passed to it: the AAL type 2 Path Identifier, and a CID value. The nodal function shall pass the following parameters to the outgoing protocol entity instance only if they were conveyed by the originating AAL type 2 served user: the link characteristics, the SSCS information, the served user generated reference, the served user transport, and the test connection indicator.

NOTE 1 – Through-connection at AAL type 2 service endpoints is not specified by this Recommendation. It may be controlled by the AAL type 2 served user.

After receiving an indication of the successful AAL type 2 connection setup from the outgoing protocol entity instance, an ESTABLISH.confirm primitive is sent to the AAL type 2 served user.

b) Subclause 8.2.1.1.1.2/Q.2630.1 "Actions at the destination AAL type 2 service endpoint" is replaced by the following paragraphs:

Upon receiving an indication from an incoming protocol entity instance requesting a new connection, the nodal function checks the availability of the CID value and other resources, e.g., indicated by link characteristic or SSCS information in the incoming AAL type 2 path.

If the test connection indicator parameter is present, a "locally blocked" or "remotely blocked" AAL type 2 path shall be acceptable for the incoming connection.

If the CID and the other resources are available, they are allocated to the new connection.

AAL type 2 node internal resources are allocated for the new connection from the incoming AAL type 2 path to the destination AAL type 2 served user.

The nodal function acknowledges the successful AAL type 2 connection establishment towards the incoming protocol entity instance.

An ESTABLISH.indication primitive is sent to the AAL type 2 served user to inform it of the successfully established new connection. The nodal function shall pass the following parameters to the outgoing protocol entity instance only if they were conveyed by the incoming protocol entity instance: the SSCS information, the served user transport, the served user generated reference, and the test connection indicator.

NOTE 2 – Through-connection at AAL type 2 service endpoints is not specified by this Recommendation. It may be controlled by the AAL type 2 served user.

c)      Subclause 8.2.1.1.2.1/Q.2630.1 "Actions at the originating AAL type 2 service endpoint" is replaced by the following paragraphs:

If the AAL type 2 path selection or the CID and other resources allocation described in 8.2.1.1.1.1 fails, a RELEASE.confirm primitive is returned to the AAL type 2 served user with one of the following causes:

*   "No route to destination";
*   "No circuit/channel available";
*   "Resource unavailable, unspecified";
*   "Network out of order"; or
*   "Temporary failure".

If AAL type 2 node internal resources are not available for the new connection, a RELEASE.confirm primitive is sent to the AAL type 2 served user with the cause "Switching equipment congestion".

Upon receiving a negative acknowledgement for the connection setup request from the outgoing protocol entity instance, all the resources associated with this AAL type 2 link are released and made available for new traffic. The association to the outgoing protocol entity instance is released. Features that enable a further connection attempt, involving the selection of a different AAL type 2 path within the same route, may be implemented. If no further connection attempt is made, the AAL type 2 node internal resources are released and a RELEASE.confirm primitive is sent to the AAL type 2 served user with the cause received from the outgoing protocol entity instance.

Upon receiving an indication from the outgoing protocol entity instance that a timer has expired, the association to the outgoing protocol entity instance is released and a reset procedure is started (see 8.2.1.2.1.1 case 3 a). The AAL type 2 node internal resources are released. A RELEASE.confirm primitive is sent to the AAL type 2 served user with the cause received from the outgoing protocol entity instance, i.e., "Recovery on timer expiry".

## A.8.2.2    Nodal functions for AAL type 2 nodes without served user interaction

Subclause 8.2.2/Q.2630.1 [15] is not applicable.

## A.8.3    Protocol entity

Subclause 8.3/Q.2630.1 [15] applies.

## A.8.4    List of timers

Subclause 8.4/Q.2630.1 [15] applies.

# Annex B

# Coding of the compatibility information

## B.1 Coding of the compatibility information for CS-1 and CS-2 networks using link characteristics for connection resource allocation

### B.1.1 Message compatibility

To ensure backward compatibility with AAL type 2 nodes conforming only to ITU-T Recs Q.2630.1 [15] or Q.2630.2 [16], the message compatibility field of the Modify Request (MOD), Modify Acknowledge (MOA), and Modify Reject (MOR) messages shall be set as indicated in Table B.1.

**Table B.1/Q.2630.3 – Coding of the message compatibility information**

| | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|---|---|
| | | pass-on not possible | | | | general action | | |
| **Message** | res. | send notification indicator | instruction indicator | | res. | send notification indicator | instruction indicator | |
| **Modify Request (MOD) with Transfer Capability** | 0 | 0 do not send notification | 1 0 discard message | | 0 | 0 do not send notification | 1 0 discard message | |
| **Modify Request (MOD) without Transfer Capability** | 0 | 0 do not send notification | 1 0 discard message | | 0 | 0 do not send notification | 0 0 pass on message | |
| **Modify Acknowledge (MOA)** | 0 | 0 do not send notification | 1 0 discard message | | 0 | 0 do not send notification | 0 0 pass on message | |
| **Modify Reject (MOR)** | 0 | 0 do not send notification | 1 0 discard message | | 0 | 0 do not send notification | 0 0 pass on message | |

### B.1.2 Parameter compatibility

To ensure backward compatibility with AAL type 2 nodes conforming only to ITU-T Rec. Q.2630.1 [15], the parameter compatibility field of the new or differently used parameters introduced in ITU-T Rec. Q.2630.2 [16] shall be set as indicated in Table B.2.

**Table B.2/Q.2630.3 – Coding of the parameter compatibility information**

| Parameter | 8 res. | 7 send notification indicator | 6 5 instruction indicator | | 4 res. | 3 send notification indicator | 2 1 instruction indicator | |
|---|---|---|---|---|---|---|---|---|
| | | pass-on not possible | | | | general action | | |
| Connection Element Identifier (CEID) in RLC message | **0** | **0** do not send notification | **0 1** discard parameter | | **0** | **0** do not send notification | **0 1** discard parameter | |
| Modify Support for Link Characteristics (MSLC) in ERQ and ECF messages | **0** | **0** do not send notification | **0 1** discard parameter | | **0** | **0** do not send notification | **0 1** discard parameter | |
| Modify Support for Service Specific Information (MSSSI) in ERQ and ECF messages | **0** | **0** do not send notification | **0 1** discard parameter | | **0** | **0** do not send notification | **0 0** pass on parameter | |
| Preferred Link Characteristics (PLC) in ERQ message | **0** | **0** do not send notification | **0 1** discard parameter | | **0** | **0** do not send notification | **0 1** discard parameter | |
| Preferred Service Specific Information (Audio Extended) (PSSIAE) in ERQ message | **0** | **0** do not send notification | **0 1** discard parameter | | **0** | **0** do not send notification | **0 0** pass on parameter | |
| Preferred Service Specific Information (Multirate Extended) (PSSIME) in ERQ message | **0** | **0** do not send notification | **0 1** discard parameter | | **0** | **0** do not send notification | **0 0** pass on parameter | |
| Service Specific Information (Audio Extended) (SSIAE) in ERQ message | **0** | **0** do not send notification | **1 1** release connection | | **0** | **0** do not send notification | **0 0** pass on parameter | |
| Service Specific Information (Multirate Extended) (SSIME) in ERQ message | **0** | **0** do not send notification | **1 1** release connection | | **0** | **0** do not send notification | **0 0** pass on parameter | |
| Path Type (PT) in ERQ message | **0** | **1** send notification | **0 1** discard parameter | | **0** | **1** send notification | **0 0** pass on parameter | |
| Served User Correlation ID (SUCI) in MOD and MOA messages | **0** | **0** do not send notification | **0 1** discard parameter | | **0** | **0** do not send notification | **0 0** pass on parameter | |

## B.2 Coding of the compatibility information for CS-1 and CS-2 networks using service specific information for connection resource allocation

### B.2.1 Message compatibility

To ensure backward compatibility with AAL type 2 nodes conforming only to ITU-T Recs Q.2630.1 [15] or Q.2630.2 [16], the message compatibility field of the Modify Request (MOD), Modify Acknowledge (MOA), and Modify Reject (MOR) messages shall be set as indicated in Table B.3.

**Table B.3/Q.2630.3 – Coding of the message compatibility information**

| Message | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|---|---|
| | | pass-on not possible | | | | general action | | |
| | res. | send notification indicator | instruction indicator | | res. | send notification indicator | instruction indicator | |
| **Modify Request (MOD)** | 0 | 0 do not send notification | 1 0 discard message | | 0 | 0 do not send notification | 1 0 discard message | |
| **Modify Acknowledge (MOA)** | 0 | 0 do not send notification | 1 0 discard message | | 0 | 0 do not send notification | 0 0 pass on message | |
| **Modify Reject (MOR)** | 0 | 0 do not send notification | 1 0 discard message | | 0 | 0 do not send notification | 0 0 pass on message | |

### B.2.2 Parameter compatibility

To ensure backward compatibility with AAL type 2 nodes conforming only to ITU-T Rec. Q.2630.1 [15], the parameter compatibility field of the new or differently used parameters introduced in ITU-T Rec. Q.2630.2 [16] shall be set as indicated in Table B.4.

**Table B.4/Q.2630.3 – Coding of the parameter compatibility information**

| Parameter | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|---|---|
| | | pass-on not possible | | | | general action | | |
| | res. | send notification indicator | instruction indicator | | res. | send notification indicator | instruction indicator | |
| Connection Element Identifier (CEID) in RLC message | **0** | **0** do not send notification | **0 1** discard parameter | | **0** | **0** do not send notification | **0 1** discard parameter | |
| Modify Support for Service Specific Information (MSSSI) in ERQ and ECF messages | **0** | **0** do not send notification | **0 1** discard parameter | | **0** | **0** do not send notification | **0 1** discard parameter | |
| Preferred Service Specific Information (Audio Extended) (PSSIAE) in ERQ message | **0** | **0** do not send notification | **0 1** discard parameter | | **0** | **0** do not send notification | **0 1** discard parameter | |
| Preferred Service Specific Information (Multirate Extended) (PSSIME) in ERQ message | **0** | **0** do not send notification | **0 1** discard parameter | | **0** | **0** do not send notification | **0 1** discard parameter | |
| Service Specific Information (Audio Extended) (SSIAE) in ERQ message | **0** | **0** do not send notification | **1 1** release connection | | **0** | **0** do not send notification | **1 1** release connection | |
| Service Specific Information (Multirate Extended) (SSIME) in ERQ message | **0** | **0** do not send notification | **1 1** release connection | | **0** | **0** do not send notification | **1 1** release connection | |
| Path Type (PT) in ERQ message | **0** | **1** send notification | **0 1** discard parameter | | **0** | **1** send notification | **0 0** pass on parameter | |
| Served User Correlation ID (SUCI) in MOD and MOA messages | **0** | **0** do not send notification | **0 1** discard parameter | | **0** | **0** do not send notification | **0 0** pass on parameter | |

## B.3 Coding of the compatibility information of the new parameters for CS-1 and CS-2 networks

To ensure backward compatibility with AAL type 2 nodes conforming only to ITU-T Recs Q.2630.1 [15] or Q.2630.2 [16], the parameter compatibility field of the new parameter shall be set as indicated in Table B.5.

**Table B.5/Q.2630.3 – Coding of the parameter compatibility information**

| Parameter | 8 | 7 | 6 5 | 4 | 3 | 2 1 |
|---|---|---|---|---|---|---|
| | pass-on not possible | | | general action | | |
| | res. | send notification indicator | instruction indicator | res. | send notification indicator | instruction indicator |
| Origination AAL type 2 Service Endpoint Address (OA2AE) in ERQ message | **0** | **0** do not send notification | **0 1** discard parameter | **0** | **0** do not send notification | **0 0** pass on parameter |
| Connection Priority (CP) in ERQ message | **0** | **0** do not send notification | **0 1** discard parameter | **0** | **0** do not send notification | **0 0** pass on parameter |
| Congestion Level (CL) in REL or RLC message | **0** | **0** do not send notification | **0 1** discard parameter | **0** | **0** do not send notification | **0 1** discard parameter |
| Hop Counter (HC) in ERQ message | **0** | **0** do not send notification | **0 1** discard parameter | **0** | **0** do not send notification | **0 0** pass on parameter |
| TAR Controlled Connection (TCC) in ERQ message | **0** | **0** do not send notification | **0 1** discard parameter | **0** | **0** do not send notification | **0 0** pass on parameter |
| Transfer Capability Support (TCS) in ERQ and ECF messages | **0** | **0** do not send notification | **0 1** discard parameter | **0** | **0** do not send notification | **0 1** discard parameter |
| Fixed Bandwidth Transfer Capability (FBW) in ERQ and MOD messages | **0** | **0** do not send notification | **0 1** discard parameter | **0** | **0** do not send notification | **0 0** pass on parameter |
| Variable Bandwidth Stringent Transfer Capability (VBWS) in ERQ and MOD messages | **0** | **0** do not send notification | **0 1** discard parameter | **0** | **0** do not send notification | **0 0** pass on parameter |
| Variable Bandwidth Tolerant Transfer Capability (VBWT) in ERQ and MOD messages | **0** | **0** do not send notification | **0 1** discard parameter | **0** | **0** do not send notification | **0 0** pass on parameter |
| Preferred Fixed Bandwidth Transfer Capability (PFBW) in ERQ message | **0** | **0** do not send notification | **0 1** discard parameter | **0** | **0** do not send notification | **0 0** pass on parameter |
| Preferred Variable Bandwidth Stringent Transfer Capability (PVBWS) in ERQ message | **0** | **0** do not send notification | **0 1** discard parameter | **0** | **0** do not send notification | **0 0** pass on parameter |
| Preferred Variable Bandwidth Tolerant Transfer Capability (PVBWT) in ERQ message | **0** | **0** do not send notification | **0 1** discard parameter | **0** | **0** do not send notification | **0 0** pass on parameter |

# Annex C

# Interworking with CS-1 and CS-2 nodes for connection resource allocation

Examples of interworking cases are illustrated in Appendix III.

## C.1 Connection resources indicated with link characteristic parameters

### C.1.1 Connection establishment

#### C.1.1.1 Introduction

NOTE 1 – In order to ensure interworking the following three cases are considered:

a) If no connection resource modifications are required for the AAL type 2 connection, the originating AAL type 2 served user may include a Link Characteristics parameter in the ESTABLISH.request primitive that corresponds to the Transfer Capability parameter.

b) If connection resource modifications may be required for the AAL type 2 connection and interworking to CS-1 nodes is not required, the originating AAL type 2 served user may include a Link Characteristics parameter and a Modify Support for Link Characteristics parameter in the ESTABLISH.request primitive; the Link Characteristics parameter corresponds to the Transfer Capability parameter.

c) If connection resource modifications may be required for the AAL type 2 connection and interworking to CS-1 nodes may be required, the originating AAL type 2 served user may additionally include the following parameters in the ESTABLISH.request primitive:

- the Link Characteristics;
- the Preferred Transfer Capability;
- the Preferred Link Characteristics; and
- the Modify Support for Link Characteristics.

Interworking with CS-2 and CS-1 nodes is designed such that:

- If the Modify Support for Link Characteristics parameter is received by the destination AAL type 2 service endpoint, no CS-1 node is part of the AAL type 2 connection; resource allocation for the AAL type 2 connection is based on the Preferred Transfer Capability (for CS-3 nodes) and Preferred Link Characteristics (for CS-2 nodes) and the connection resources are modifiable.

- If the Modify Support for Link Characteristics parameter is not received by the destination AAL type 2 service endpoint, a CS-1 node is part of the AAL type 2 connection; resource allocation for the AAL type 2 connection is based on the Transfer Capability (for CS-3 nodes) and Link Characteristics (for CS-1 and CS-2 nodes) and the connection resources are not modifiable.

- In all cases, the originating AAL type 2 served user includes a Transfer Capability Support parameter in the ESTABLISH.request primitive as well. If this parameter is received by a destination CS-3 service endpoint, it is sent back towards the originating AAL type 2 service endpoint. The complete AAL type 2 connection passes through CS-3 nodes only and the originating and the destination AAL type 2 served users know that the full functionality of this Recommendation is available for this connection.

NOTE 2 – From the point of view of this Recommendation, it is regarded to be within the responsibility of the AAL type 2 served user to ensure consistency between Transfer Capability and Link Characteristics parameters.

## C.1.1.2 Actions at the originating AAL type 2 service endpoint

In addition to the specifications in 8.2, the following applies:

When the nodal function receives an ESTABLISH.request primitive from the AAL type 2 served user, the following restrictions on the optionality of the parameters of the primitive apply:

- The Transfer Capability Support parameter shall be present;

- The Link Characteristics parameter shall be present;

- The Modify Support for Link Characteristics parameter may be present;

- The Preferred Link Characteristics parameter may be present only if the Modify Support for Link Characteristics parameter is also present;

- The Preferred Transfer Capability parameter shall be present if the AAL type 2 Preferred Link Characteristics parameter is present; and

- If a Preferred Transfer Capability parameter is specified, it must refer to the same AAL type 2 transfer capability as the Transfer Capability parameter.

    NOTE 1 – For example, if the Transfer Capability parameter indicates a Variable Bandwidth Stringent Transfer Capability, the Preferred Transfer Capability parameter, if present, may only indicate a Variable Bandwidth Stringent Transfer Capability.

Depending on the presence of Preferred Transfer Capability parameter, the following applies:

- If the Preferred Transfer Capability parameter is not present, connection admission control and connection resource allocation are performed as defined in 8.2.

- If the Preferred Transfer Capability parameter is present, the connection admission control and connection resource allocation shall be based on the most demanding of the Preferred Transfer Capability and the Transfer Capability.

    NOTE 2 – The concept of "demanding" depends on the connection admission control algorithm and connection resource allocation mechanisms in use which are outside the scope of this Recommendation.

If the originating AAL type 2 service endpoint receives a notification that the succeeding node did not recognize the Path Type parameter, the connection establishment shall be allowed to continue (QoS requirements are met by the network default stringent QoS class), or the connection is released and a RELEASE.confirm primitive is returned to the AAL type 2 served user with the cause "Resource unavailable, unspecified" (QoS requirements are not met by network default stringent QoS class).

After receiving an indication of the successful AAL type 2 connection setup from the outgoing protocol entity instance, the following applies depending on the presence of the Modify Support for Link Characteristics parameter and the Preferred Transfer Capability parameter:

- If the Modify Support for Link Characteristics parameter is not present, connection admission control and connection resource allocation shall reflect the Transfer Capability (TC).

- If the Modify Support for Link Characteristics parameter is present, connection admission control and connection resource allocation shall reflect the Preferred Transfer Capability (PTC) if present; otherwise, the Transfer Capability (TC) shall be reflected.

### C.1.1.3 Actions at AAL type 2 nodes without served user interaction

In addition to the specifications in 8.2, the following applies:

Upon receiving notification from an incoming protocol entity instance requesting a new connection and the Transfer Capability parameter is not conveyed by the incoming protocol entity instance,

• the nodal function prepares a Transfer Capability parameter corresponding to the Link Characteristics parameter; and

• if a Preferred Link Characteristics parameter is also conveyed by the incoming protocol entity instance, the nodal function prepares a Preferred Transfer Capability parameter corresponding to the Preferred Link Characteristics parameter. The Preferred Transfer Capability parameter must refer to the same AAL type 2 transfer capability as the Transfer Capability parameter.

> NOTE 1 – For example, if the Transfer Capability parameter indicates a Variable Bandwidth Stringent Transfer Capability, the Preferred Transfer Capability parameter, if present, may only indicate a Variable Bandwidth Stringent Transfer Capability.

NOTE 2 – In Appendix II, guidelines to derive the Transfer Capability parameter from a Link Characteristics parameter are shown.

These parameters are treated as if they would have been conveyed by the incoming protocol entity instance.

If a Preferred Transfer Capability parameter is conveyed by the incoming protocol entity instance but not a Preferred Link Characteristics parameter, the Preferred Transfer Capability parameter is discarded; subsequent treatment of the parameters is as if the Preferred Transfer Capability parameter would not have been conveyed by the incoming protocol entity instance.

Depending on the presence of Preferred Transfer Capability parameter, the following applies:

• If the Preferred Transfer Capability parameter is not present, the connection admission control and connection resource allocation are performed as defined in 8.2.

• If the Preferred Transfer Capability parameter is present, the connection admission control and connection resource allocation shall be based on the most demanding of the Preferred Transfer Capability and the Transfer Capability.

> NOTE 3 – The concept of "demanding" depends on the connection admission control algorithm and connection resource allocation mechanisms in use which are outside the scope of this Recommendation.

If AAL type 2 node receives a notification that the succeeding node did not recognize the Path Type parameter, the AAL type 2 node allows the connection to be established (QoS requirements are met by the network default stringent QoS class), or releases the connection with the cause "Resource unavailable, unspecified" (QoS requirements are not met by network default stringent QoS class).

After receiving an indication of the successful AAL type 2 connection setup from the outgoing protocol entity instance, the following applies depending on the presence of the Modify Support for Link Characteristics parameter and the Preferred Transfer Capability parameter:

• If the Modify Support for Link Characteristics parameter is not present, connection admission control and connection resource allocation shall reflect the Transfer Capability (TC).

• If the Modify Support for Link Characteristics parameter is present, connection admission control and connection resource allocation shall reflect the Preferred Transfer Capability (PTC) if present; otherwise, the Transfer Capability (TC) shall be reflected.

## C.1.1.4 Actions at the destination AAL type 2 service endpoint

In addition to the specifications in 8.2, the following applies:

Upon receiving notification from an incoming protocol entity instance requesting a new connection and the Transfer Capability parameter is not conveyed by the incoming protocol entity instance,

• the nodal function prepares a Transfer Capability parameter corresponding to the Link Characteristics parameter; and

• if a Preferred Link Characteristics parameter is also conveyed by the incoming protocol entity instance, the nodal function prepares a Preferred Transfer Capability parameter corresponding to the Preferred Link Characteristics parameter. The Preferred Transfer Capability parameter must refer to the same AAL type 2 transfer capability as the Transfer Capability parameter.

> NOTE 1 – For example, if the Transfer Capability parameter indicates a Variable Bandwidth Stringent Transfer Capability, the Preferred Transfer Capability parameter, if present, may only indicate a Variable Bandwidth Stringent Transfer Capability.

NOTE 2 – In Appendix II, guidelines to derive the Transfer Capability parameter from a Link Characteristics parameter are shown.

These parameters are treated as if they would have been conveyed by the incoming protocol entity instance.

If a Preferred Transfer Capability parameter is conveyed by the incoming protocol entity instance but not a Preferred Link Characteristics parameter, the Preferred Transfer Capability parameter is discarded; subsequent treatment of the parameters is as if the Preferred Transfer Capability parameter would not have been conveyed by the incoming protocol entity instance.

Depending on the presence of Preferred Transfer Capability parameter, the following applies:

• If the Preferred Transfer Capability parameter is not present, AAL type 2 connection resources (internal and on the incoming AAL type 2 path) indicated by the Transfer Capability (TC) parameter are allocated as specified in 8.2.

• If the Preferred Transfer Capability parameter is present, AAL type 2 connection resources (internal and on the incoming AAL type 2 path) indicated by the Preferred Transfer Capability (PTC) parameter are allocated.

If a Transfer Capability Support parameter was received from the incoming protocol instance, the parameter shall be passed to the incoming protocol entity instance when the nodal function acknowledges the successful AAL type 2 connection establishment.

If a Modify Support for Link Characteristics parameter was received from the incoming protocol instance, the parameter shall be passed to the incoming protocol entity instance when the nodal function acknowledges the successful AAL type 2 connection establishment.

## C.1.2 Connection resource modification

### C.1.2.1 Introduction

If, during connection establishment, a Transfer Capability Support parameter was received by an AAL type 2 service endpoint, connection resource modification as specified in 8.2 applies.

If, during connection establishment, a Transfer Capability Support parameter was not received but a Modify Support for Link Characteristics parameter was received by an AAL type 2 service endpoint, connection resource modification follows the specifications in this subclause.

If, during connection establishment, neither a Transfer Capability Support parameter nor a Modify Support for Link Characteristics parameter was received by an AAL type 2 service endpoint, no connection resource modification is possible.

NOTE – From the point of view of this Recommendation, it is regarded to be within the responsibility of the AAL type 2 served user to ensure consistency between Transfer Capability and Link Characteristics parameters.

### C.1.2.2    Actions at the AAL type 2 service endpoint originating the modification

In addition to the specifications in 8.2, the following applies:

The AAL type 2 served user shall include a Link Characteristics parameter (corresponding to the Transfer Capability parameter) in the MODIFY.request primitive.

### C.1.2.3    Actions at AAL type 2 nodes without served user interaction

Upon receiving notification from a protocol entity instance requesting a connection modification and the Transfer Capability parameter is not conveyed by the protocol entity instance, the nodal function prepares a Transfer Capability parameter corresponding to the Link Characteristics parameter. This parameter is treated as if it would have been conveyed by the protocol entity instance.

NOTE – In Appendix II, guidelines to derive the Transfer Capability parameter from a Link Characteristics parameter are shown.

### C.1.2.4    Actions at the AAL type 2 service endpoint receiving the modification

Upon receiving notification from a protocol entity instance requesting a connection modification and the Transfer Capability parameter is not conveyed by the protocol entity instance, the nodal function prepares a Transfer Capability parameter corresponding to the Link Characteristics parameter. This parameter is treated as if it would have been conveyed by the protocol entity instance.

NOTE – In Appendix II, guidelines to derive the Transfer Capability parameter from a Link Characteristics parameter are shown.

### C.2    Connection resources indicated with service specific information parameters

### C.2.1    Connection establishment

### C.2.1.1    Introduction

NOTE 1 – In order to ensure interworking the following three cases are considered:

a)    If no connection resource modifications are required for the AAL type 2 connection, the originating AAL type 2 served user may include an SSCS Information parameter in the ESTABLISH.request primitive whose connection resource requirements corresponds to those of the Transfer Capability parameter.

b)    If connection resource modifications may be required for the AAL type 2 connection and interworking with CS-1 nodes is not required, the originating AAL type 2 served user may include an SSCS Information parameter and a Modify Support for SSCS Information parameter in the ESTABLISH.request primitive; the connection resource requirements of the SSCS Information parameter corresponds to those of the Transfer Capability parameter.

c)    If connection resource modifications may be required for the AAL type 2 connection and interworking to CS-1 nodes may be required, the originating AAL type 2 served user may additionally include the following parameters in the ESTABLISH.request primitive:

·    the SSCS Information;

·    the Preferred Transfer Capability;

·    the Preferred SSCS Information; and

·    the Modify Support for SSCS Information.

Interworking with CS-2 and CS-1 nodes is designed such that:

- If the Modify Support for SSCS Information parameter is received by the destination AAL type 2 service endpoint, no CS-1 node is part of the AAL type 2 connection; resource allocation for the AAL type 2 connection is based on the Preferred Transfer Capability (for CS-3 nodes) and Preferred SSCS Information (for CS-2 nodes) and the connection resources are modifiable.

- If the Modify Support for SSCS Information parameter is not received by the destination AAL type 2 service endpoint, a CS-1 node is part of the AAL type 2 connection; resource allocation for the AAL type 2 connection is based on the Transfer Capability (for CS-3 nodes) and SSCS Information (for CS-1 and CS-2 nodes) and the connection resources are not modifiable.

- In all cases, the originating AAL type 2 served user includes a Transfer Capability Support parameter in the ESTABLISH.request primitive as well. If this parameter is received by a destination CS-3 service endpoint, it is sent back towards the originating AAL type 2 service endpoint. The complete AAL type 2 connection passes through CS-3 nodes only and the originating and the destination AAL type 2 served users know that the full functionality of this Recommendation is available for this connection.

NOTE 2 – From the point of view of this Recommendation, it is regarded to be within the responsibility of the AAL type 2 served user to ensure consistency between the resource requirements of the Transfer Capability and SSCS Information parameters.

### C.2.1.2    Actions at the originating AAL type 2 service endpoint

In addition to the specifications in 8.2, the following applies:

When the nodal function receives an ESTABLISH.request primitive from the AAL type 2 served user, the following restrictions on the optionality of the parameters of the primitive apply:

- The Transfer Capability Support parameter shall be present;

- The SSCS Information parameter shall be present;

- The Modify Support for SSCS Information parameter may be present;

- The Preferred SSCS Information parameter may only be present if the Modify Support for SSCS Information parameter is present;

- If a Preferred SSCS Information parameter is specified, it has to refer to the same SSCS Information type as the SSCS Information parameter.

    NOTE 1 – For example, if the SSCS Information parameter indicates an Audio SSCS Information, the Preferred SSCS Information parameter, if present, may only indicate an Audio SSCS Information.

- If a Preferred SSCS Information parameter is specified, the SSCS Information "Audio Extended" and "Multirate Extended" shall not be used in the SSCS Information parameter.

- The Preferred Transfer Capability parameter shall be present if the Preferred SSCS Information parameter is present; and

- If a Preferred Transfer Capability parameter is specified, it has to refer to the same Transfer Capability as the Transfer Capability parameter.

    NOTE 2 – For example, if the Transfer Capability parameter indicates a Variable Bandwidth Stringent Transfer Capability, the Preferred Transfer Capability parameter, if present, may only indicate a Variable Bandwidth Stringent Transfer Capability.

Depending on the presence of Preferred Transfer Capability parameter, the following applies:

- If the Preferred Transfer Capability parameter is not present, connection admission control and connection resource allocation are performed as defined in 8.2.

- If the Preferred Transfer Capability parameter is present, the connection admission control and connection resource allocation shall be based on the most demanding of the Preferred Transfer Capability and the Transfer Capability.

If the originating AAL type 2 service endpoint receives a notification that the succeeding node did not recognize the Path Type parameter, the connection establishment shall be allowed to continue (QoS requirements are met by the network default stringent QoS class), or the connection is released and a RELEASE.confirm primitive is returned to the AAL type 2 served user with the cause "Resource unavailable, unspecified" (QoS requirements are not met by network default stringent QoS class).

After receiving an indication of the successful AAL type 2 connection setup from the outgoing protocol entity instance, the following applies depending on the presence of the Modify Support for SSCS Information parameter and the Preferred SSCS Information parameter:

- If the Modify Support for SSCS Information parameter is not present, connection admission control and connection resource allocation shall reflect the Transfer Capability (TC).

- If the Modify Support for SSCS Information parameter is present, connection admission control and connection resource allocation shall reflect the Preferred Transfer Capability (PTC) if present; otherwise, the Transfer Capability (TC) shall be reflected.

### C.2.1.3    Actions at AAL type 2 nodes without served user interaction

In addition to the specifications in 8.2, the following applies:

Upon receiving notification from an incoming protocol entity instance requesting a new connection and the Transfer Capability parameter is not conveyed by the incoming protocol entity instance,

- the nodal function prepares a Transfer Capability parameter whose connection resource requirements correspond to those of the SSCS Information parameter; and

- if a Preferred SSCS Information parameter is also conveyed by the incoming protocol entity instance, the nodal function prepares a Preferred Transfer Capability parameter whose connection resource requirements correspond to those of the Preferred SSCS Information parameter. The Preferred Transfer Capability parameter must refer to the same AAL type 2 transfer capability as the Transfer Capability parameter.

  NOTE 1 – For example, if the Transfer Capability parameter indicates a Variable Bandwidth Stringent Transfer Capability, the Preferred Transfer Capability parameter, if present, may only indicate a Variable Bandwidth Stringent Transfer Capability.

These parameters are treated as if they would have been conveyed by the incoming protocol entity instance.

If a Preferred Transfer Capability parameter is conveyed by the incoming protocol entity instance but not a Preferred SSCS Information parameter, the Preferred Transfer Capability parameter is discarded; the treatment of the parameters is as if the Preferred Transfer Capability parameter would not have been conveyed by the incoming protocol entity instance.

Depending on the presence of Preferred Transfer Capability parameter, the following applies:

- If the Preferred Transfer Capability parameter is not present, connection admission control and connection resource allocation are performed as defined in 8.2.

- If the Preferred Transfer Capability parameter is present, the connection admission control and connection resource allocation shall be based on the most demanding of the Preferred Transfer Capability and the Transfer Capability.

  NOTE 2 – The concept of "demanding" depends on the Connection Admission Control algorithm and connection resource allocation mechanisms in use which are outside the scope of this Recommendation.

If AAL type 2 node receives a notification that the succeeding node did not recognize the Path Type parameter, the AAL type 2 node allows the connection to be established (QoS requirements are met by the network default stringent QoS class), or releases the connection with the cause "Resource unavailable, unspecified" (QoS requirements are not met by network default stringent QoS class).

After receiving an indication of the successful AAL type 2 connection setup from the outgoing protocol entity instance, the following applies depending on the presence of the Modify Support for SSCS Information parameter and the Preferred SSCS Information parameter:

• If the Modify Support for SSCS Information parameter is not present, connection admission control and connection resource allocation shall reflect the Transfer Capability (TC).

• If the Modify Support for SSCS Information parameter is present, connection admission control and connection resource allocation shall reflect the Preferred Transfer Capability (PTC) if present, otherwise the Transfer Capability (TC) shall be reflected.

### C.2.1.4 Actions at the destination AAL type 2 service endpoint

In addition to the specifications in 8.2, the following applies:

Upon receiving notification from an incoming protocol entity instance requesting a new connection and the Transfer Capability parameter is not conveyed by the incoming protocol entity instance,

• the nodal function prepares a Transfer Capability parameter whose connection resource requirements correspond to those of the SSCS Information parameter; and

• if a Preferred SSCS Information parameter is also conveyed by the incoming protocol entity instance, the nodal function prepares a Preferred Transfer Capability parameter whose connection resource requirements correspond to those of the Preferred SSCS Information parameter. The Preferred Transfer Capability parameter must refer to the same AAL type 2 transfer capability as the Transfer Capability parameter.

> NOTE – For example, if the Transfer Capability parameter indicates a Variable Bandwidth Stringent Transfer Capability, the Preferred Transfer Capability parameter, if present, may only indicate a Variable Bandwidth Stringent Transfer Capability.

These parameters are treated as if they would have been conveyed by the incoming protocol entity instance.

If a Preferred Transfer Capability parameter is conveyed by the incoming protocol entity instance but not a Preferred SSCS Information parameter, the Preferred Transfer Capability parameter is discarded; subsequent treatment of the parameters is as if the Preferred Transfer Capability parameter would not have been conveyed by the incoming protocol entity instance.

Depending on the presence of Preferred Transfer Capability parameter, the following applies:

• If the Preferred Transfer Capability parameter is not present, AAL type 2 connection resources (internal and on the incoming AAL type 2 path) indicated by the Transfer Capability (TC) parameter are allocated as specified in 8.2.

• If the Preferred Transfer Capability parameter is present, AAL type 2 connection resources (internal and on the incoming AAL type 2 path) indicated by the Preferred Transfer Capability (PTC) parameter are allocated.

If a Transfer Capability Support parameter was received from the incoming protocol instance, the parameter shall be passed to the incoming protocol entity instance when the nodal function acknowledges the successful AAL type 2 connection establishment.

If a Modify Support for SSCS Information parameter was received from the incoming protocol instance, the parameter shall be passed to the incoming protocol entity instance when the nodal function acknowledges the successful AAL type 2 connection establishment.

### C.2.2   Connection Resource Modification

### C.2.2.1   Introduction

If, during connection establishment, a Transfer Capability Support parameter was received by the destination AAL type 2 service endpoint and sent back to the originating AAL type 2 service endpoint, connection resource modification as specified in 8.2 applies.

If, during connection establishment, a Transfer Capability Support parameter was not received but a Modify Support for SSCS Information parameter was received by an AAL type 2 service endpoint, connection resource modification follows the specifications in this subclause.

If, during connection establishment, neither a Transfer Capability Support parameter nor a Modify Support for SSCS Information parameter was received by an AAL type 2 service endpoint, no connection resource modification is possible.

NOTE – From the point of view of this Recommendation, it is regarded to be within the responsibility of the AAL type 2 served user to ensure consistency between Transfer Capability and SSCS Information parameters.

### C.2.2.2   Actions at the AAL type 2 service endpoint originating the modification

In addition to the specifications in 8.2, the following applies:

The AAL type 2 served user shall include a SSCS Information parameter (whose connection resource requirements correspond to those of the Transfer Capability parameter) in the MODIFY.request primitive.

### C.2.2.3   Actions at AAL type 2 nodes without served user interaction

Upon receiving notification from a protocol entity instance requesting a connection modification and the Transfer Capability parameter is not conveyed by the protocol entity instance, the nodal function prepares a Transfer Capability parameter corresponding to the SSCS Information parameter. This parameter is treated as if it would have been conveyed by the protocol entity instance.

### C.2.2.4   Actions at the AAL type 2 service endpoint receiving the modification

Upon receiving notification from a protocol entity instance requesting a connection modification and the Transfer Capability parameter is not conveyed by the protocol entity instance, the nodal function prepares a Transfer Capability parameter corresponding to the SSCS Information parameter. This parameter is treated as if it would have been conveyed by the protocol entity instance.

### C.3   Service Specific Information indicated with SSCS information parameters

This clause only applies to the signalling for the service specific convergence sublayer.

NOTE – From the point of view of this Recommendation, it is regarded to be within the responsibility of the AAL type 2 served user to ensure consistency between the resource requirements of the Transfer Capability and SSCS Information parameters.

### C.3.1   Connection establishment

### C.3.1.1   Introduction

NOTE 1 – In order to ensure interworking the following three cases are considered:

a)      If no Service Specific Information modifications are required for the AAL type 2 connection, the originating AAL type 2 served user may include an SSCS Information parameter in the ESTABLISH.request primitive.

b) If Service Specific Information modifications are required for the AAL type 2 connection and interworking to CS-1 nodes is not required, the originating AAL type 2 served user may include an SSCS Information parameter and a Modify Support for SSCS Information parameter in the ESTABLISH.request primitive.

c) If Service Specific Information modifications are required for the AAL type 2 connection and interworking to CS-1 nodes may be required, the originating AAL type 2 served user may additionally include the following parameters in the ESTABLISH.request primitive:

- the SSCS Information parameter;
- the Preferred SSCS Information parameter; and
- the Modify Support for SSCS Information.

Interworking with CS-2 and CS-1 nodes is designed such that:

- If the Modify Support for SSCS Information parameter is received by the destination AAL type 2 service endpoint and this endpoint is a CS-2 node, the Service Specific Information for the AAL type 2 connection is based on the Preferred SSCS Information (if present) and the Service Specific Information is modifiable.

- Otherwise, the Service Specific Information for the AAL type 2 connection is based on the SSCS Information and the Service Specific Information is not modifiable.

  NOTE 2 – If the destination AAL type 2 service endpoint is a CS-1 node, the Service Specific Information (Audio Extended) and Service Specific Information (Multirate Extended) are unknown to the AAL type 2 service endpoint.

- In all cases, the originating AAL type 2 served user includes a Transfer Capability Support parameter in the ESTABLISH.request primitive as well. If this parameter is received by a destination CS-3 service endpoint, it is sent back towards the originating AAL type 2 service endpoint. The complete AAL type 2 connection passes through CS-3 nodes only and the originating and the destination AAL type 2 served users know that the full functionality of this Recommendation is available.

### C.3.1.2 Actions at the originating AAL type 2 service endpoint

In addition to the specifications in 8.2, the following applies:

When the nodal function receives an ESTABLISH.request primitive from the AAL type 2 served user, the following restrictions on the optionality of the parameters of the primitive apply:

- The Transfer Capability Support parameter shall be present;
- The SSCS Information parameter shall be present;
- The Modify Support for SSCS Information parameter may be present;
- The Preferred SSCS Information parameter shall only be present if the Modify Support for SSCS Information parameter is present;
- If a Preferred SSCS Information parameter is specified, it has to refer to the same SSCS Information type as the SSCS Information parameter.

  NOTE – For example, if the SSCS Information parameter indicates an Audio SSCS Information, the Preferred SSCS Information parameter, if present, may only indicate an Audio SSCS Information.

After receiving an indication of the successful AAL type 2 connection setup from the outgoing protocol entity instance, the following applies depending on the presence of the Modify Support for SSCS Information parameter and the Preferred SSCS Information parameter:

- If the Modify Support for SSCS Information parameter is not present, the Service Specific Information used for the connection is based on the SSCS Information parameter (SSCS) in the ESTABLISH.request primitive.

- If the Modify Support for SSCS Information parameter is present, the Service Specific Information used for the connection is based on the Preferred SSCS Information parameter (PSSCS) in the ESTABLISH.request primitive if present; otherwise, the SSCS Information parameter (SSCS) shall be reflected.

### C.3.1.3　Actions at AAL type 2 nodes without served user interaction

NOTE – No changes to the procedures in § 8.2 are required.

### C.3.1.4　Actions at the destination AAL type 2 service endpoint

In addition to the specifications in 8.2, the following applies:

The Service Specific Information used for the connection depends on the presence of the Preferred SSCS Information parameter and the Preferred SSCS Information parameter in the indication from the incoming protocol entity instance as follows:

- If the Preferred SSCS Information parameter is not present, the Service Specific Information used for the connection is based on the SSCS Information parameter indicated by the incoming protocol entity.

- If the Preferred SSCS Information parameter is present, the Service Specific Information used for the connection is based on the Preferred SSCS Information parameter indicated by the incoming protocol entity if present; otherwise, the SSCS Information parameter (SSCS) shall be reflected.

If a Modify Support for SSCS Information parameter was received from the incoming protocol instance, the parameter shall be passed to the incoming protocol entity instance when the nodal function acknowledges the successful AAL type 2 connection establishment.

### C.3.2　Service specific information modification

If, during connection establishment, a Transfer Capability Support parameter was received by the destination AAL type 2 service endpoint and sent back to the originating AAL type 2 service endpoint, Service Specific Information modification as specified in 8.2 applies.

If, during connection establishment, a Transfer Capability Support parameter was not received but a Modify Support for SSCS Information parameter was received by an AAL type 2 service endpoint, Service Specific Information modification also follows the specifications in 8.2.

If, during connection establishment, neither a Transfer Capability Support parameter nor a Modify Support for SSCS Information parameter was received by an AAL type 2 service endpoint, no Service Specific Information modification is possible.

NOTE – From the point of view of this Recommendation, it is regarded to be within the responsibility of the AAL type 2 served user to ensure consistency between Transfer Capability and SSCS Information parameters.

# Annex D

# SDL Definition of the AAL type 2 Signalling Protocol

The SDL definitions may contain more detail than the prose definition in clause 8. Nevertheless, should there exist any technical difference between this annex and clause 8, then the definitions in clause 8 take precedence.

# Appendix I

## Example message sequences

### I.1 Successful establishment and release

Figure I.1 illustrates the message sequences for a successful AAL type 2 connection establishment and its release.



**Figure I.1/Q.2630.3 – Example of successful AAL type 2 connection establishment and release message sequences**

Signalling Association Identifiers (SAID) are treated in the following way:

1) Whenever a new link associated signalling relationship is created, a new protocol entity instance is created and an OSAID is allocated to it; this ID is then transported in the first message in the OSAID parameter. The DSAID in this message contains the value "unknown", i.e., all octets are set to "0". (In the figures, this is indicated by "DSAID = 0".)

2) Upon receipt of a message that has a DSAID field set to "unknown", a new protocol entity instance is created and an OSAID is allocated to it.

3) In the first message returned to the originator of the association, the OSAID of the sending protocol entity instance is transported in the OSAID parameter. The DSAID field carries the previously received OSAID of the originator of the association.

4) In all subsequent messages, the DSAID field carries the previously received OSAID of the destination entity.

5)     If the first message returned to the originator of the association is also the last one for this link associated signalling relationship (see Figure I.2 or I.3), no OSAID parameter is carried in the message. The DSAID field carries the previously received OSAID of the originator of the association.

## I.2     Unsuccessful establishment

Figure I.2 illustrates the message sequences for an unsuccessful AAL type 2 connection establishment.



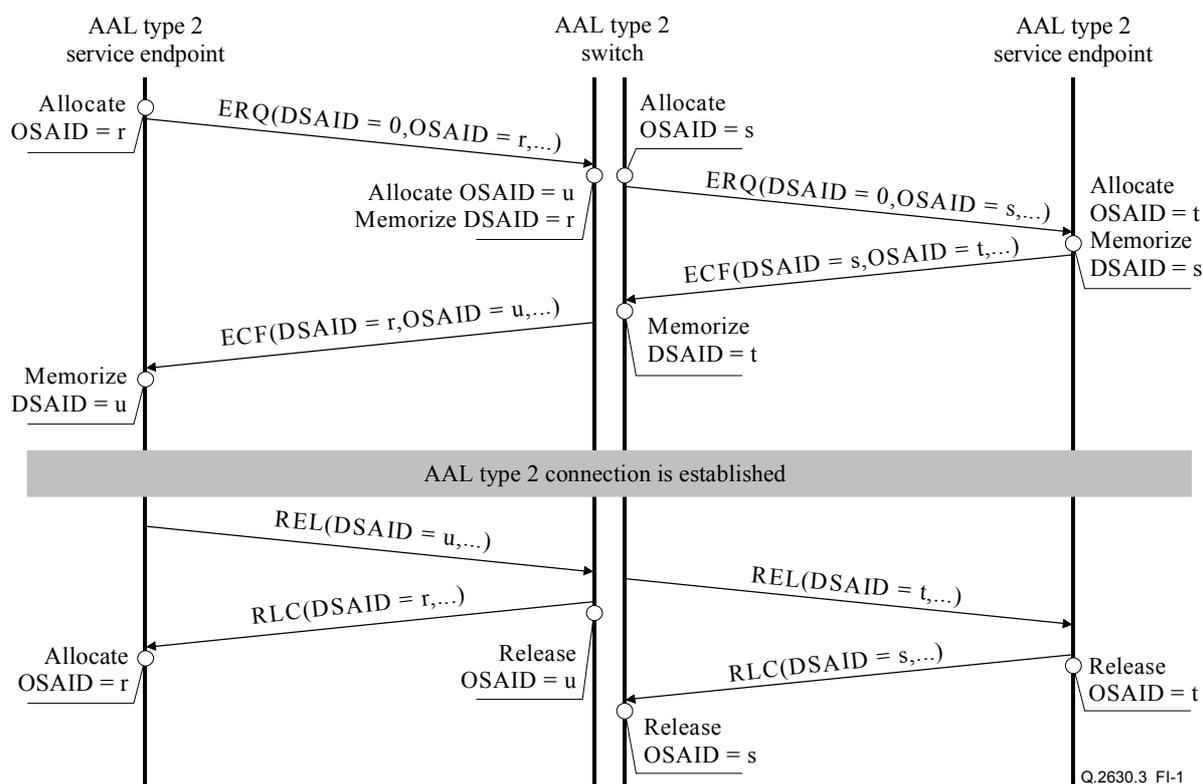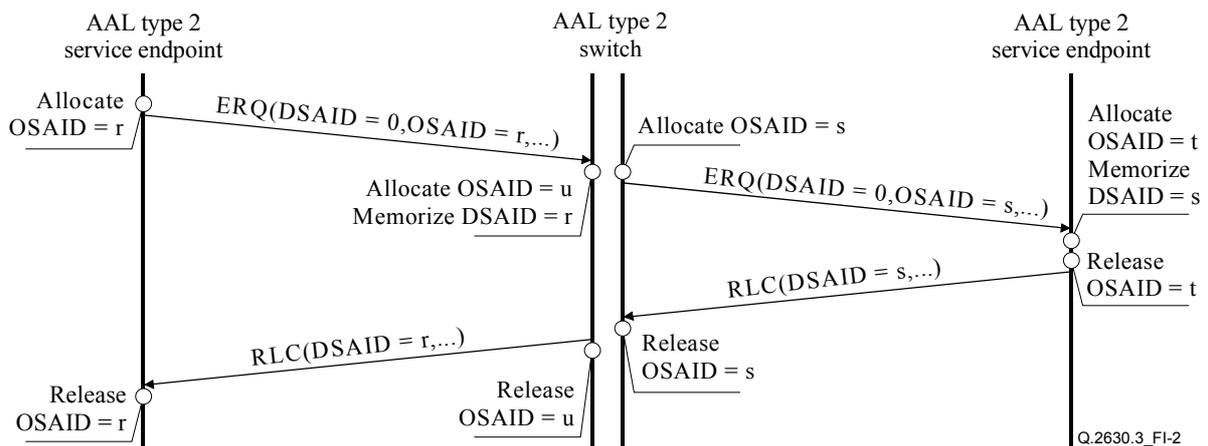**Figure I.2/Q.2630.3 – Example of a message sequence for an unsuccessful AAL type 2 connection establishment**

## I.3     Management message sequences

Figure I.3 illustrates the message sequences for a management operation. Management operations include:

• reset procedures;

• blocking procedures;

• unblocking procedures.
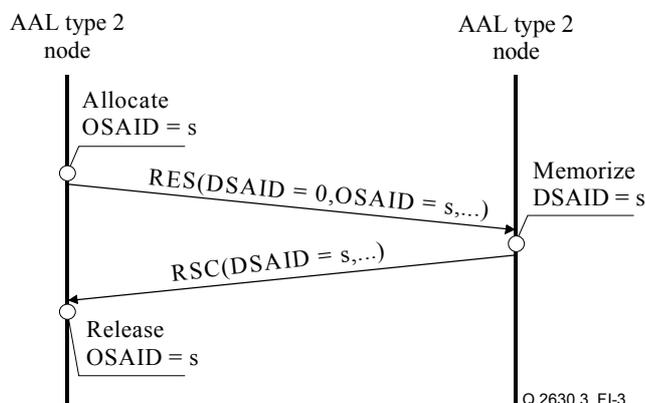


**Figure I.3/Q.2630.3 – Example of a message sequence for a management operation**

NOTE – Message sequences for blocking or unblocking are the same as for reset except that instead of "RES" and "RSC":

•        for blocking, the messages "BLO" and "BLC" are used respectively; and

•        for unblocking, the messages "UBL" and "UBC" are used respectively.

## I.4        Release crossover/release collision

Figure I.4 illustrates the message sequences for release collision on an AAL type 2 connection release.
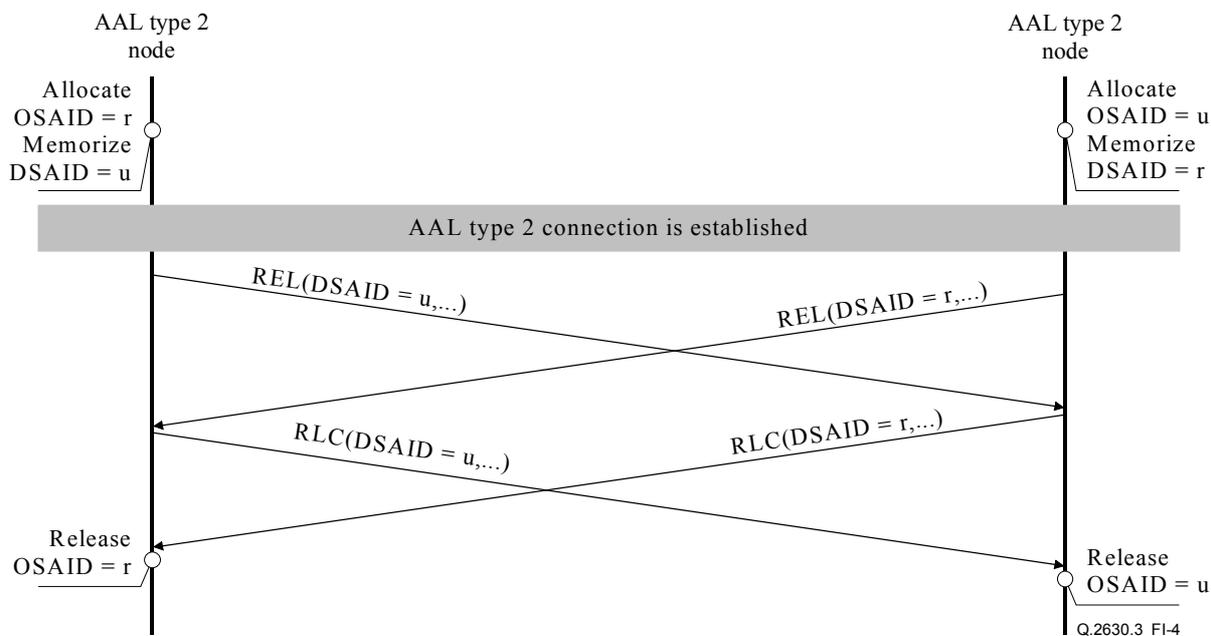


**Figure I.4/Q.2630.3 – Example of a message sequence for a release collision on an AAL type 2 connection**

## I.5 Resource contention

Figure I.5 illustrates the message sequences for a resource contention on an AAL type 2 connection establishment.
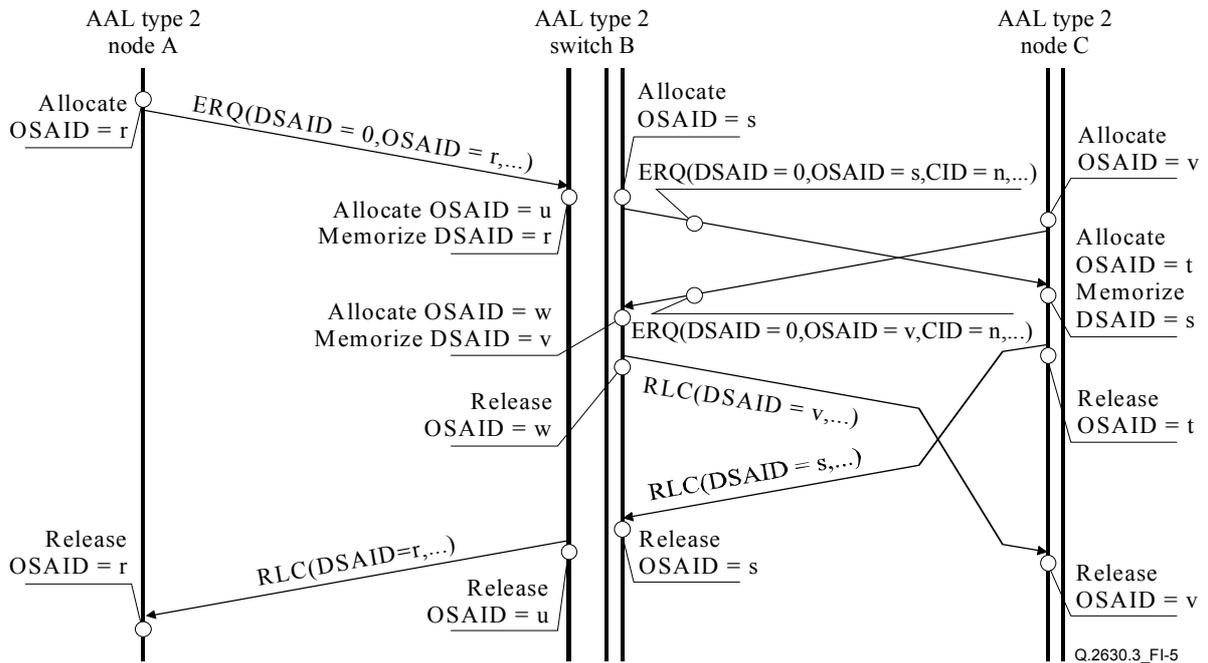


**Figure I.5/Q.2630.3 – Example of a message sequence for a resource contention on two AAL type 2 connections**

NOTE – The resource contention is shown for a CID value "n" that is attempting to be assigned to two new AAL type 2 connections.

## I.6 Successful modification

Figure I.6 illustrates the message sequences for a successful resource modification of an established AAL type 2 connection.
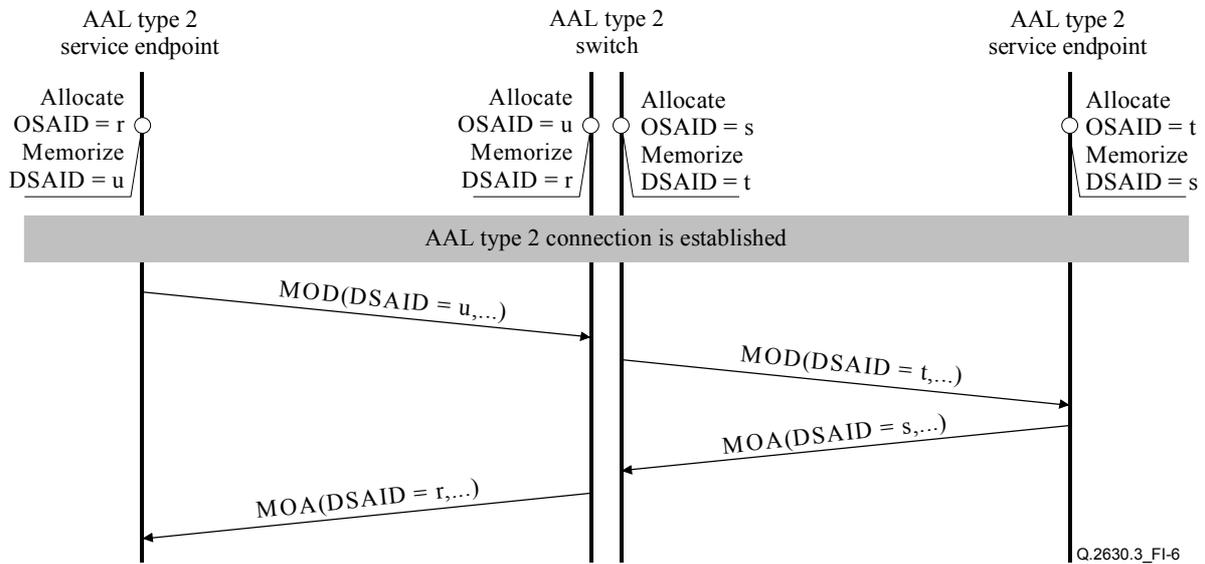


**Figure I.6/Q.2630.3 – Example of a message sequence for a successful resource modification of an established AAL type 2 connection**

## I.7 Unsuccessful modification

Figure I.7 illustrates the message sequences for an unsuccessful resource modification of an established AAL type 2 connection.
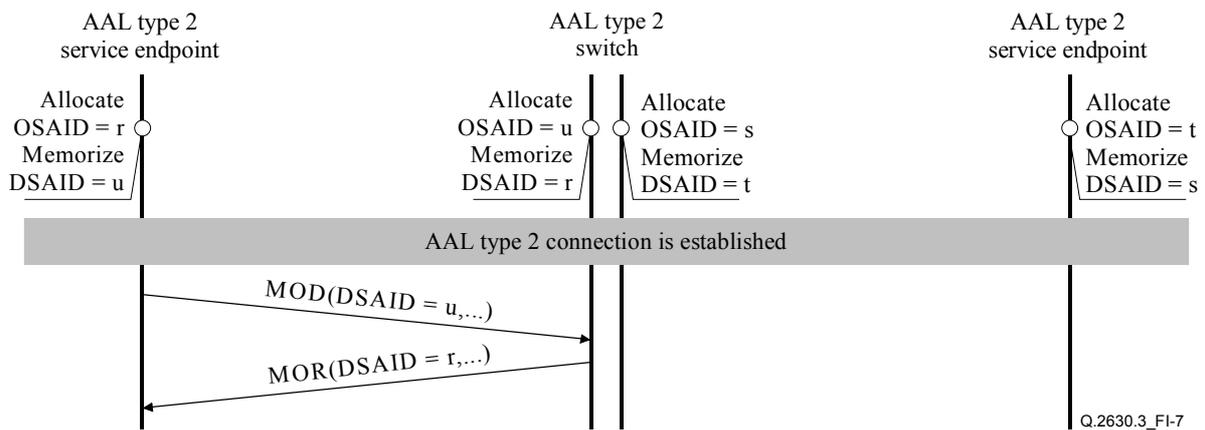


**Figure I.7/Q.2630.3 – Example of a message sequence for an unsuccessful resource modification of an established AAL type 2 connection**

## I.8 Modification Collision

Figure I.8 illustrates the message sequences for a resource modification collision of an established AAL type 2 connection.
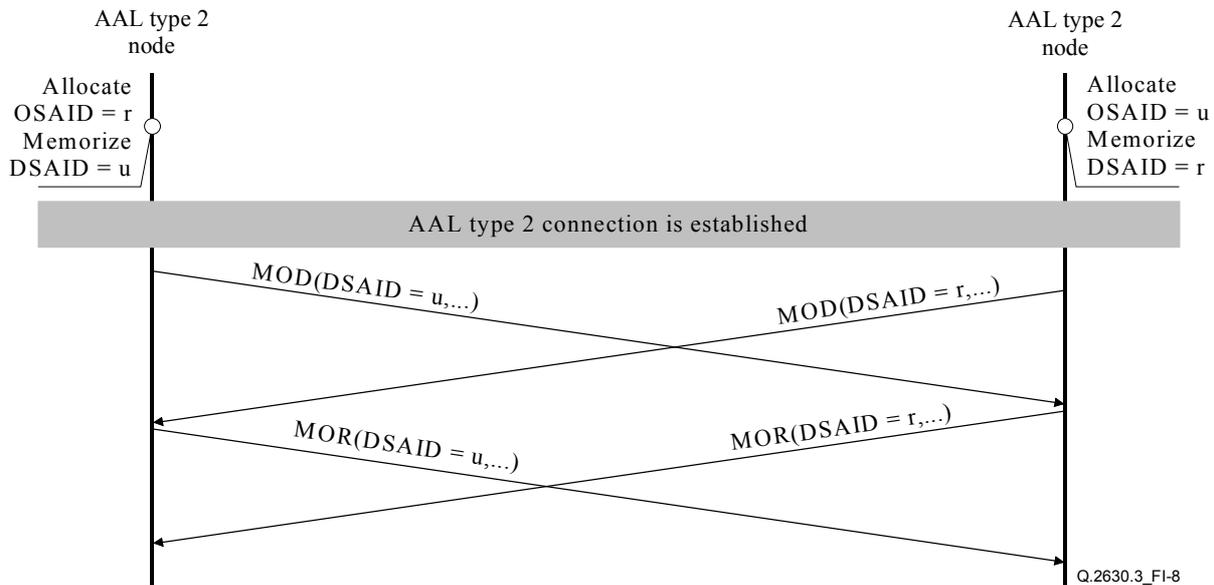


**Figure I.8/Q.2630.3 – Example of a message sequence for a resource modification collision of an established AAL type 2 connection**

# Appendix II

# Conversion of CS-1 or CS-2 (Preferred) Link Characteristics to (Preferred) Transfer Capability parameters

The purpose of this appendix is to give guidance to implementers how to capture the problem of interworking of CS-1 and CS-2 Link Characteristics parameters into CS-3 Transfer Capability parameters.

NOTE – In this Appendix the terms "Transfer Capability" and "Preferred Transfer Capability" and the abbreviations "TC" and "PTC" do not distinguish between the different types of Transfer Capabilities, i.e., Fixed Bandwidth, Variable Bandwidth Stringent, Variable Bandwidth Tolerant.

## II.1 Guidelines and definitions

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

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

–     they do not overrule constraints of any type that are defined within this protocol specification.

For the purpose of this clause, the following shorthand notation shall be used (see Tables II.1 to II.4).

**Table II.1/Q.2630.3 – 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 II.2/Q.2630.3 – TC parameter fields**

| |
|---|
| U = Peak CPS bit rate in the forward direction |
| V = Sustainable CPS bit rate in the forward direction |
| W = Peak CPS bit rate in the backward direction |
| X = Sustainable CPS bit rate in the backward direction |
| Y = Maximum allowed CPS packet size in the forward direction |
| Z = Maximum allowed CPS packet size in the backward direction |
| STT = Source traffic type |

**Table II.3/Q.2630.3 – 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 II.4/Q.2630.3 – PTC parameter fields**

| |
|---|
| u = Peak CPS bit rate in the forward direction |
| v = Sustainable CPS bit rate in the forward direction |
| w = Peak CPS bit rate in the backward direction |
| x = Sustainable CPS bit rate in the backward direction |
| y = Maximum allowed CPS packet size in the forward direction |
| z = Maximum allowed CPS packet size in the backward direction |
| stt = Source traffic type |

CPHL shall denote the length of the CPS packet header (see ITU-T Rec. I.363.2 [1]) in octet.

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 octet.

## II.2    Bit rates

The conversion from LC-type to TC-type bit rates requires to estimate the rate that will be caused by the CPS packet header overhead of length CPHL. This estimate is given in Table II.5. The values are "normalized" to multiples of 64 bit/s.

**Table II.5/Q.2630.3 – CPS packet header overhead rates**

| Definition | Meaning |
|---|---|
| HBA := [(CPHL*A) / (64*F)] * 64 | Estimate of the CPHL bit rate for the Peak CPS bit rate in the forward direction for given LC |
| HBa := [(CPHL*a) / (64*f)] * 64 | Estimate of the CPHL bit rate for the Peak CPS bit rate in the forward direction for given PLC |
| HBB := [(CPHL*B) / (64*F)] * 64 | Estimate of the CPHL bit rate for the Sustainable CPS bit rate in the forward direction for given LC |
| HBb := [(CPHL*b) / (64*f)] * 64 | Estimate of the CPHL bit rate for the Sustainable CPS bit rate in the forward direction for given PLC |
| HBC := [(CPHL*C) / (64*H)] * 64 | Estimate of the CPHL bit rate for the Peak CPS bit rate in the backward direction for given LC |
| HBc := [(CPHL*c) / (64*h)] * 64 | Estimate of the CPHL bit rate for the Peak CPS bit rate in the backward direction for given PLC |
| HBD := [(CPHL*D) / (64*H)] * 64 | Estimate of the CPHL bit rate for the Sustainable CPS bit rate in the backward direction for given LC |
| HBd := [(CPHL*d) / (64*h)] * 64 | Estimate of the CPHL bit rate for the Sustainable CPS 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 protocol specification. ||

Table II.6 defines the interworking of LC bit rates (AAL type 2) to TC CPS bit rates

**Table II.6/Q.2630.3 – TC CPS bit rates determined from LC**

| TC parameter field | Value |
|---|---|
| U | A + HBA |
| V | B + HBB |
| W | C + HBC |
| X | D + HBD |
| NOTE 1 – Whether or not a certain field is required is determined by the protocol specification.<br><br>NOTE 2 – Whether or not a certain value is meaningful and valid is determined by the protocol specification. | |

Table II.7 defines the interworking of PLC bit rates (AAL type 2) to PTC CPS bit rates

**Table II.7/Q.2630.3 – PTC bit rates determined from PLC**

| PTC parameter field | Value |
|---|---|
| u | a + HBa |
| v | b + HBb |
| w | c + HBc |
| x | d + HBd |
| NOTE 1 – Whether or not a certain field is required is determined by the protocol specification.<br><br>NOTE 2 – Whether or not a certain value is meaningful and valid is determined by the protocol specification. | |

## II.3    Maximum allowed packet sizes

Table II.8 defines the derivation of TC and PTC maximum allowed packet sizes from LC and PLC CPS-SDU sizes.

**Table II.8/Q.2630.3 – Determination of maximum allowed packet sizes**

| TC/PTC SDU size subfields | Value |
|---|---|
| Y | CPHL + E |
| Z | CPHL + G |
| y | CPHL + e |
| z | CPHL + g |
| NOTE 1 – Whether or not a certain field is required is determined by the protocol specification.<br><br>NOTE 2 – Whether or not a certain value is meaningful and valid is determined by the protocol specification. | |

## II.4    Token bucket sizes

The CS-3 node receiving LC without TC in an initial ERQ 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 – If modification is possible, an appropriate adjustment of the token bucket sizes controlled by the Served User may be initiated from a CS-3 service endpoint with a subsequent MOD message.

Token bucket sizes shall not be affected by received MOD messages with LC but without TC parameter.

## II.5    Determination of the TC class

ITU-T Rec. I.378 [19] defines three AAL Type 2 transfer capability classes: Fixed Bandwidth, Variable Bandwidth Stringent, and Variable Bandwidth Tolerant Transfer Capability.

A CS-3 node receiving LC without TC in an initial ERQ has to determine the AAL Type 2 Transfer Capability class to be used by CS-3 nodes.

If all subsequent conditions:

C1)    $A = B$

C2)    $C = D$

C3)    $E = F$

C4)    $G = H$

C5)    MSLC not set

are satisfied, the Fixed Bandwidth Transfer Capability shall be selected. If at least one of the conditions C1), ... , C5) is not fulfilled, the Variable Bandwidth Stringent or Variable Bandwidth Tolerant Transfer Capability shall be applied. If not otherwise indicated by administrative settings in the CS-3 node (possibly in dependence from a received Path Type parameter), Variable Bandwidth Stringent Transfer Capability shall be selected.

## II.6    Source traffic type

A CS-3 node, which receives LC (and possibly PLC) without TC (and PTC) in an initial ERQ and which selects the Variable Bandwidth Stringent Transfer Capability, shall set the Source Traffic Type parameters in TC (and possibly PTC) as follows:

STT =   STT unknown

stt =    STT unknown

NOTE 1 – If the received signalling information or network configuration knowledge indicate that other valid source traffic type values are more suitable, then the STT and stt parameters may be set to values other than "unknown".

NOTE 2 – If modification is possible, an appropriate adjustment of the source traffic type controlled by the Served User may be initiated from a CS-3 service endpoint with a subsequent MOD message.

Source traffic types shall not be affected by received MOD messages with LC but without TC parameter.

# Appendix III

## Interworking examples

This appendix illustrates the mechanism for connection resource allocation in a network where the CS-1 and CS-2 nodes allocate connection resources based on link characteristics. The mechanisms where CS-1 and CS-2 nodes allocate connection resources based on SSCS information are similar.

This appendix assumes the behaviour of CS-3 nodes according to Annex C.

### III.1    Symbols and abbreviations

The diagrams show the exchange of ERQ/ECF messages (originating at left) and the exchange of MOD/MOA messages (also originating at left). Only parameters relevant to connection resource reservation and allocation are shown.

a)      The 1st column shows the name of the relevant parameters.

On the Modify Request (MOD) message, $LC_{old}$ indicates the actually allocated resources in CS-2 and CS-1 nodes, $LC_{new}$ the new LC that the modification attempts to allocate. Similarly, $TC_{old}$ indicates the actually allocated resources in CS-3 nodes, $TC_{new}$ the new TC that the modification attempts to allocate.

NOTE – The indications TC, PTC, LC, and PLC in the 1st column of the ECF messages or the indications $TC_{old}$; $TC_{new}$; $LC_{old}$; and $LC_{new}$ in the 1st column of the MOA messages do not refer to parameters carried in the message but are used to indicate which parameter is used to make the actual resource allocation.

b)      The 2nd column shows the name of the message.

c)      The 3rd column indicates the parameters of the primitive from (✍) or to (✍) the originating served user.

d)      The 4th to the 13th columns show the AAL type 2 nodes where in the top cell the capability set of the node is indicated. The indications in the other cells are explained below.

e)      The 14th column indicates the parameters of the primitive to (✍) or from (✍) the destination served user.

In columns 4 to 13, the indications in a row of a parameter or an actually allocated resource have the following meaning:

"   ":    Parameter not present or actual resource allocation not done with this parameter.

—":    Parameter passed because it is not relevant or due to the compatibility instructions.

"==":    Parameter passed according to specifications in ITU-T Recs Q.2630.1 [15] or Q.2630.2 [16].

"≡≡":    Parameter passed according to instructions in 8.2.

"✓":    Parameter processed.

"A":    This parameter is used to perform the allocation of resources.

"R":    These parameters are used to reserve resources according to the "most demanding" requirements.

"★":    Parameter inserted by the AAL type 2 node.

"✘":    Parameter discarded by the AAL type 2 node due to compatibility instructions.

"⊠":    Parameter discarded by the AAL type 2 node due interworking specifications instructions (see Annex C).

### III.2 Connection Establishment

#### III.2.1 All CS-3 nodes

This clause illustrates AAL type 2 connection establishment where the originating and the destination AAL type 2 service endpoints as well as all AAL type 2 switches reside in a part of the network consisting of CS-3.

The parameters transported in the Establish Request (ERQ) and Establish Confirm (ECF) messages and the effects on the connection resource allocation mechanisms are illustrated in Figure III.1.

| | | CS3a | CS3b | CS3c | CS3d | CS3e | CS3f | CS3g | CS3h | CS3i | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LC | ERQ | == | == | == | == | == | == | == | == | == | |
| PLC | | == | == | == | == | == | == | == | == | == | |
| TC | | R | R | R | R | R | R | R | R | | |
| PTC | | R | R | R | R | R | R | R | R | A | |
| MSLC | | == | == | == | == | == | == | == | == | == | |
| TCS | | == | == | == | == | == | == | == | == | == | |
| LC | ECF | | | | | | | | | | |
| PLC | | | | | | | | | | | |
| TC | | | | | | | | | | | |
| PTC | | A | A | A | A | A | A | A | A | | |
| MSLC | | == | == | == | == | == | == | == | == | == | |
| TCS | | == | == | == | == | == | == | == | == | == | |

**Figure III.1/Q.2630.3 – All CS-3 nodes in the AAL type 2 connection**

In the ESTABLISH.request primitive, the nodal function receives from the AAL type 2 served user the following parameters relevant to interworking and connection resource allocation:

- the Transfer Capability;
- the Preferred Transfer Capability;
- the Transfer Capability Support;
- the Link Characteristics;
- the Preferred Link Characteristics; and
- the Modify Support for Link Characteristics.

Nodes CS3a, CS3b, CS3c, CS3d, CS3e, CS3f, CS3g, and CS3h reserve connection resources reflecting the more "demanding" of the parameters Transfer Capability (TC) and Preferred Transfer Capability (PTC).

Node CS3i allocates connection resources reflecting the Preferred Transfer Capability (PTC) parameter; this decision is based on the presence of the Preferred Transfer Capability (PTC) parameter. The parameters Transfer Capability (TC), Preferred Transfer Capability (PTC), Link Characteristics (LC), Preferred Link Characteristics (PLC), Modify Support for Link Characteristics (MSLC), and Transfer Capability Support (TCS) are passed to the AAL type 2 served user, which interprets the last parameter to indicate that the AAL type 2 connection passes only through CS-3 nodes and that, therefore, the full functionality of this Recommendation is available.

The parameters Modify Support for Link Characteristics (MSLC) and Transfer Capability Support (TCS) are inserted into the Establish Confirm (ECF) message.

Nodes CS3h, CS3g, CS3f, CS3e, CS3d, CS3c, CS3b, and CS3a allocate connection resources reflecting the Preferred Transfer Capability (PTC) parameter that was passed previously in the Establish Request (ERQ) message or received from the AAL type 2 served user; this decision is based on the presence of the Modify Support for Link Characteristics (MSLC) parameter in the Establish Confirm (ECF) message.

Node CS3a includes the Modify Support for Link Characteristics (MSLC) and Transfer Capability Support (TCS) parameters in the ESTABLISH.confirm primitive to the AAL type 2 served user, which interprets the latter parameter to indicate that the AAL type 2 connection passes only through CS-3 nodes and that, therefore, the full functionality of this Recommendation is available.

### III.2.2  From CS-3 via CS-2/CS-1 nodes to CS-3

This clause illustrates AAL type 2 connection establishment where the originating and the destination AAL type 2 service endpoints reside in a part of the network consisting of CS-3 nodes and where the AAL type 2 connection passes through a part of the network consisting of CS-2 and/or CS-1 nodes.

### III.2.2.1  No CS-1 nodes in the AAL type 2 connection

The parameters transported in the Establish Request (ERQ) and Establish Confirm (ECF) messages and the effects on the connection resource allocation mechanisms are illustrated in Figure III.2.

|  |  |  | CS3a | CS3b | CS2c | CS2d | CS2e | CS2f | CS2g | CS3h | CS3i |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LC | ERQ | ↳ | ≡ | ≡ | R | R | R | R | R | ≡ | ≡ | ↱ |
| PLC |  | ↳ | ≡ | ≡ | R | R | R | R | R | ≡ | ≡ | ↱ |
| TC |  | ↳ | R | R | — | — | — | — | — | R |  | ↱ |
| PTC |  | ↳ | R | R | — | — | — | — | — | R | A | ↱ |
| MSLC |  | ↳ | ≡ | ≡ | == | == | == | == | == | ≡ | ≡ | ↱ |
| TCS |  | ↳ | ≡ | ≡ | ✗ |  |  |  |  | ≡ | ≡ |  |
| LC | ECF |  |  |  | A | A | A | A | A |  |  |  |
| PLC |  |  |  |  | A | A | A | A | A |  |  |  |
| TC |  |  | A | A |  |  |  |  |  | A |  |  |
| PTC |  |  | A | A |  |  |  |  |  | A |  |  |
| MSLC |  | ↰ | ≡ | ≡ | == | == | == | == | == | ≡ | ★ |  |
| TCS |  |  | ≡ | ≡ | == | == | == | == | == | ≡ | ★ |  |

**Figure III.2/Q.2630.3 – No CS-1 nodes in the AAL type 2 connection in the "From CS-3 via CS-2/CS-1 nodes to CS-3" scenario**

In the ESTABLISH.request primitive, the nodal function receives from the AAL type 2 served user the following parameters relevant to interworking and connection resource allocation:

•        the Transfer Capability;

•        the Preferred Transfer Capability;

•        the Transfer Capability Support;

•        the Link Characteristics;

•        the Preferred Link Characteristics; and

•        the Modify Support for Link Characteristics.

Nodes CS3a and CS3b reserve connection resources reflecting the more "demanding" of the parameters Transfer Capability (TC) and Preferred Transfer Capability (PTC).

At node CS2c, the Transfer Capability Support (TCS) parameter is discarded (compatibility instructions); the AAL type 2 served users at both AAL type 2 service endpoints realize that the connection does not pass through CS-3 nodes entirely.

Nodes CS2c, CS2d, CS2e, CS2f, and CS2g reserve connection resources reflecting the more "demanding" of the parameters Link Characteristics (LC) and Preferred Link Characteristics (PLC).

Node CS3h reserves connection resources reflecting the more "demanding" of the parameters Transfer Capability (TC) and Preferred Transfer Capability (PTC).

Node CS3i allocates connection resources reflecting the Preferred Transfer Capability (PTC) parameter; this decision is based on the presence of the Preferred Transfer Capability (PTC) parameter. The parameters Transfer Capability (TC), Preferred Transfer Capability (PTC), Link Characteristics (LC), Preferred Link Characteristics (PLC), and Modify Support for Link Characteristics (MSLC) are passed to the AAL type 2 served user. The absence of the Transfer Capability Support (TCS) parameter indicates that the AAL type 2 connection does not pass through CS-3 nodes entirely. The Modify Support for Link Characteristics (MSLC) parameter is inserted into the Establish Confirm (ECF) message.

Node CS3h allocates connection resources reflecting the Preferred Transfer Capability (PTC) parameter that was previously passed in the Establish Request (ERQ) message; this decision is based on the presence of the Modify Support for Link Characteristics (MSLC) parameter in the Establish Confirm (ECF) message.

Nodes CS2g, CS2f, CS2e, CS2d, and CS2c allocate connection resources reflecting the Preferred Link Characteristics (PLC) parameter that was previously passed in the Establish Request (ERQ) message; this decision is based on the presence of the Modify Support for Link Characteristics (MSLC) parameter in the Establish Confirm (ECF) message.

Nodes CS3b and CS3a allocate connection resources reflecting the Preferred Transfer Capability (PTC) that was previously passed in the Establish Request (ERQ) message or received from the AAL type 2 served user; this decision is based on the presence of the Modify Support for Link Characteristics (MSLC) parameter in the Establish Confirm (ECF) message.

Node CS3a includes the Modify Support for Link Characteristics (MSLC) parameter in the ESTABLISH.confirm primitive to the AAL type 2 served user.

### III.2.2.2  At least one CS-1 node in the AAL type 2 connection

The parameters transported in the Establish Request (ERQ) and Establish Confirm (ECF) messages and the effects on the connection resource allocation mechanisms are illustrated in Figure III.3.

| | | CS3a | CS3b | CS2c | CS2d | CS1e | CS2f | CS2g | CS3h | CS3i | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LC | ↳ | ≡ | ≡ | R | R | A | A | A | ≡ | ≡ | ☞ |
| PLC | ↳ | ≡ | ≡ | R | R | ✗ | | | | | |
| TC | ↳ | R | R | — | — | — | — | — | A | A | ☞ |
| PTC | ↳ | R | R | — | — | — | — | — | ☒ | | |
| MSLC | ↳ | ≡ | ≡ | == | == | ✗ | | | | | |
| TCS | ↳ | ≡ | ≡ | ✗ | | | | | | | |
| LC | | | | A | A | | | | | | |
| PLC | | | | | | | | | | | |
| TC | | A | A | | | | | | | | |
| PTC | | | | | | | | | | | |
| MSLC | | | | | | | | | | | |
| TCS | | | | | | | | | | | |

(Left-side labels: ERQ spans the first six rows; ECF spans the last six rows.)

**Figure III.3/Q.2630.3 – At least one CS-1 node in the AAL type 2 connection in the "From CS-3 via CS-2/CS-1 nodes to CS-3" scenario**

In the ESTABLISH.request primitive, the nodal function receives from the AAL type 2 served user the following parameters relevant to interworking and connection resource allocation:

• the Transfer Capability;

• the Preferred Transfer Capability;

• the Transfer Capability Support;

• the Link Characteristics;

• the Preferred Link Characteristics; and

• the Modify Support for Link Characteristics.

Nodes CS3a and CS3b reserve connection resources reflecting the more "demanding" of the parameters Transfer Capability (TC) and Preferred Transfer Capability (PTC).

At node CS2c, the Transfer Capability Support (TCS) parameter is discarded (compatibility instructions); the AAL type 2 served users at both AAL type 2 service endpoints realize that the connection does not pass through CS-3 nodes entirely.

Nodes CS2c and CS2d reserve connection resources reflecting the more "demanding" of the parameters Link Characteristics (LC) and Preferred Link Characteristics (PLC).

At node CS1e, the parameters Preferred Link Characteristics (PLC) and Modify Support for Link Characteristics (MSLC) are discarded (compatibility instructions). Connection resources reflecting the Link Characteristics (LC) are allocated.

Nodes CS2f and CS2g allocate connection resources reflecting the Link Characteristics (LC); the Preferred Link Characteristics (PLC) parameter is no longer present in the Establish Request (ERQ) message.

At node CS3h it is detected that although no Preferred Link Characteristics (PLC) parameter is present, a Preferred Transfer Capability (PTC) parameter is; this parameter is discarded due to interworking definitions (see Annex C) before the Establish Request (ERQ) message is interpreted by the nodal function. Connection resources reflecting the Transfer Capability (TC) are allocated.

At node CS3i, connection resources reflecting the Transfer Capability (TC) are allocated. The parameters Transfer Capability (TC) and Link Characteristics (LC) are passed to the AAL type 2 served user. The absence of the Transfer Capability Support (TCS) parameter indicates that the AAL type 2 connection does not pass through CS-3 nodes entirely. No parameters are inserted into the Establish Confirm (ECF) message.

At nodes CS3h, CS2g, CS2f, and CS1e, no action except passing the Establish Confirm (ECF) message is performed.

Nodes CS2d and CS2c allocate connection resources reflecting the Link Characteristics (LC) that was previously passed in the Establish Request (ERQ) message; this decision is based on the absence of the Modify Support for Link Characteristics (MSLC) parameter in the Establish Confirm (ECF) message.

Nodes CS3b and CS3a allocate connection resources reflecting the Transfer Capability (TC) that was previously passed in the Establish Request (ERQ) message or received from the AAL type 2 served user; this decision is based on the absence of the Modify Support for Link Characteristics (MSLC) parameter in the Establish Confirm (ECF) message.

Node CS3a includes no parameters in the ESTABLISH.confirm primitive to the AAL type 2 served user.

### III.2.3  From a CS-3 service endpoint to a CS-2/CS-1 service endpoint

This clause illustrates AAL type 2 connection establishment where the originating AAL type 2 service endpoint resides in a part of the network consisting of CS-3 nodes and where the destination AAL type 2 service endpoint resides in a part of the network consisting of CS-2 and/or CS-1 nodes.

### III.2.3.1  No CS-1 nodes in the AAL type 2 connection

The parameters transported in the Establish Request (ERQ) and Establish Confirm (ECF) messages and the effects on the connection resource allocation mechanisms are illustrated in Figure III.4.

|  |  |  | CS3a | CS3b | CS3c | CS3d | CS2e | CS2f | CS2g | CS2h | CS2i |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LC | ERQ | ↴ | ≡ | ≡ | ≡ | ≡ | R | R | R | R | A | ➥ |
| PLC |  | ↴ | ≡ | ≡ | ≡ | ≡ | R | R | R | R | A | ➥ |
| TC |  | ↴ | R | R | R | R | — | — | — | — | ✖ |  |
| PTC |  | ↴ | R | R | R | R | — | — | — | — | ✖ |  |
| MSLC |  | ↴ | ≡ | ≡ | ≡ | ≡ | == | == | == | == | == | ➥ |
| TCS |  | ↴ | ≡ | ≡ | ≡ | ≡ | ✖ | == | == | == | == |  |
| LC | ECF |  |  |  |  |  | A | A | A | A |  |  |
| PLC |  |  |  |  |  |  | A | A | A | A |  |  |
| TC |  |  | A | A | A | A |  |  |  |  |  |  |
| PTC |  |  | A | A | A | A |  |  |  |  |  |  |
| MSLC |  | ↰ | == | == | == | == | == | == | == | == | ★ |  |
| TCS |  |  | == | == | == | == | == | == | == | == |  |  |

**Figure III.4/Q.2630.3 – No CS-1 nodes in the AAL type 2 connection in the "From CS-3 to CS-2/CS-1" scenario**

In the ESTABLISH.request primitive, the nodal function receives from the AAL type 2 served user the following parameters relevant to interworking and connection resource allocation:

- the Transfer Capability;
- the Preferred Transfer Capability;
- the Transfer Capability Support;
- the Link Characteristics;
- the Preferred Link Characteristics; and
- the Modify Support for Link Characteristics.

Nodes CS3a, CS3b, CS3c, and CS3d reserve connection resources reflecting the more "demanding" of the parameters Transfer Capability (TC) and Preferred Transfer Capability (PTC).

At node CS2e, the Transfer Capability Support (TCS) parameter is discarded (compatibility instructions).

Nodes CS2e, CS2f, CS2g, and CS2h reserve connection resources reflecting the more "demanding" of the parameters Link Characteristics (LC) and Preferred Link Characteristics (PLC).

Node CS2i allocates connection resources reflecting the Preferred Link Characteristics (PLC) parameter; this decision is based on the presence of the Modify Support for Link Characteristics (MSLC) parameter. The parameters Transfer Capability (TC) and Preferred Transfer Capability (PTC) are discarded. The parameters Link Characteristics (LC), Preferred Link Characteristics (PLC), and Modify Support for Link Characteristics (MSLC) are passed to the AAL type 2 served user. The Modify Support for Link Characteristics (MSLC) parameter is inserted into the Establish Confirm (ECF) message.

Nodes CS2h, CS2g, CS2f, and CS2e allocate connection resources reflecting the Preferred Link Characteristics (PLC) parameter that was previously passed in the Establish Request (ERQ) message; this decision is based on the presence of the Modify Support for Link Characteristics (MSLC) parameter in the Establish Confirm (ECF) message.

Nodes CS3d, CS3c, CS3b, and CS3a allocate connection resources reflecting the Preferred Transfer Capability (PTC) that was previously passed in the Establish Request (ERQ) message or received from the AAL type 2 served user; this decision is based on the presence of the Modify Support for Link Characteristics (MSLC) parameter in the Establish Confirm (ECF) message.

Node CS3a includes the Modify Support for Link Characteristics (MSLC) parameter in the ESTABLISH.confirm primitive to the AAL type 2 served user. The absence of the Transfer Capability Support (TCS) parameter indicates that the AAL type 2 connection does not pass through CS-3 nodes entirely.

### III.2.3.2 At least one CS-1 node in the AAL type 2 connection

The parameters transported in the Establish Request (ERQ) and Establish Confirm (ECF) messages and the effects on the connection resource allocation mechanisms are illustrated in Figure III.5.

| | | | CS3a | CS3b | CS3c | CS3d | CS2e | CS2f | CS1g | CS2h | CS2i | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LC | E R Q | ↪ | ≡ | ≡ | ≡ | ≡ | R | R | A | A | A | ↪ |
| PLC | | ↪ | ≡ | ≡ | ≡ | ≡ | R | R | ✕ | | | |
| TC | | ↪ | R | R | R | R | –– | –– | –– | –– | ✕ | |
| PTC | | ↪ | R | R | R | R | –– | –– | –– | –– | ✕ | |
| MSLC | | ↪ | ≡ | ≡ | ≡ | ≡ | –– | –– | ✕ | | | |
| TCS | | ↪ | ≡ | ≡ | ≡ | ≡ | ✕ | –– | | | | |
| LC | E C F | | | | | | A | A | | | | |
| PLC | | | | | | | | | | | | |
| TC | | | A | A | A | A | | | | | | |
| PTC | | | | | | | | | | | | |
| MSLC | | | | | | | | | | | | |
| TCS | | | | | | | | | | | | |

**Figure III.5/Q.2630.3 – At least one CS-1 nodes in the AAL type 2 connection in the "From CS-3 to CS-2/CS-1" scenario**

In the ESTABLISH.request primitive, the nodal function receives from the AAL type 2 served user the following parameters relevant to interworking and connection resource allocation:

- the Transfer Capability;
- the Preferred Transfer Capability;
- the Transfer Capability Support;
- the Link Characteristics;
- the Preferred Link Characteristics; and
- the Modify Support for Link Characteristics.

Nodes CS3a, CS3b, CS3c, and CS3d reserve connection resources reflecting the more "demanding" of the parameters Transfer Capability (TC) and Preferred Transfer Capability (PTC).

At node CS2e, the Transfer Capability Support (TCS) parameter is discarded (compatibility instructions).

Nodes CS2e and CS2f reserve connection resources reflecting the more "demanding" of the parameters Link Characteristics (LC) and Preferred Link Characteristics (PLC).

At node CS1g, the parameters Preferred Link Characteristics (PLC) and Modify Support for Link Characteristics (MSLC) are discarded (compatibility instructions). Connection resources reflecting the Link Characteristics (LC) are allocated.

Node CS2h allocates connection resources reflecting the Link Characteristics (LC); the Preferred Link Characteristics (PLC) parameter is no longer present in the Establish Request (ERQ) message.

At node CS2i, connection resources reflecting the Link Characteristics (LC) are allocated; the Preferred Link Characteristics (PLC) parameter is no longer present in the Establish Request (ERQ) message. The parameters Transfer Capability (TC) and Preferred Transfer Capability (PTC) are discarded. The Link Characteristics (LC) parameter is passed to the AAL type 2 served user. No parameters are inserted into the Establish Confirm (ECF) message.

At nodes CS2h and CS1g, no action except passing the Establish Confirm (ECF) message is performed.

Nodes CS2f and CS2e allocate connection resources reflecting the Link Characteristics (LC) that was previously passed in the Establish Request (ERQ) message; this decision is based on the absence of the Modify Support for Link Characteristics (MSLC) parameter in the Establish Confirm (ECF) message.

Nodes CS3d, CS3c, CS3b, and CS3a allocate connection resources reflecting the Transfer Capability (TC) that was previously passed in the Establish Request (ERQ) message or received from the AAL type 2 served user; this decision is based on the absence of the Modify Support for Link Characteristics (MSLC) parameter in the Establish Confirm (ECF) message.

Node CS3a includes no parameters in the ESTABLISH.confirm primitive to the AAL type 2 served user. The absence of the Transfer Capability Support (TCS) parameter indicates that the AAL type 2 connection does not pass through CS-3 nodes entirely.

### III.2.4  From a CS-2/CS-1 service endpoint to a CS-3 service endpoint

This clause illustrates AAL type 2 connection establishment where the originating AAL type 2 service endpoint resides in a part of the network consisting of CS-2 and/or CS-1 nodes and where the destination AAL type 2 service endpoint resides in a part of the network consisting of CS-3 nodes.

### III.2.4.1  No CS-1 nodes in the AAL type 2 connection

The parameters transported in the Establish Request (ERQ) and Establish Confirm (ECF) messages and the effects on the connection resource allocation mechanisms are illustrated in Figure III.6.

| | | | CS2a | CS2b | CS2c | CS2d | CS2e | CS3f | CS3g | CS3h | CS3i | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LC | ERQ | | R | R | R | R | R | ≡ | ≡ | ≡ | ≡ | |
| PLC | | | R | R | R | R | R | ≡ | ≡ | ≡ | ≡ | |
| TC | | | | | | | | ★ R | R | R | A | |
| PTC | | | | | | | | ★ R | R | R | A | |
| MSLC | | | == | == | == | == | == | ≡ | ≡ | ≡ | ≡ | |
| TCS | | | | | | | | | | | | |
| LC | ECF | | A | A | A | A | A | | | | | |
| PLC | | | | | | | | | | | | |
| TC | | | | | | | | A | A | A | | |
| PTC | | | | | | | | | | | | |
| MSLC | | | == | == | == | == | == | ≡ | ≡ | ≡ | ★ | |
| TCS | | | | | | | | | | | | |

**Figure III.6/Q.2630.3 – No CS-1 nodes in the AAL type 2 connection in the "From CS-2/CS-1 to CS-3" scenario**

In the ESTABLISH.request primitive, the nodal function receives from the AAL type 2 served user the following parameters relevant to interworking and connection resource allocation:

• the Link Characteristics;

• the Preferred Link Characteristics; and

• the Modify Support for Link Characteristics.

Nodes CS2a, CS2b, CS2c, CS2d, and CS2e reserve connection resources reflecting the more "demanding" of the parameters Link Characteristics (LC) and Preferred Link Characteristics (PLC).

At node CS3f, the Transfer Capability (TC) parameter is not present; hence, the nodal function prepares a Transfer Capability (TC) parameter corresponding to the Link Characteristics (LC) parameter. In addition, the Preferred Link Characteristics (PLC) parameter is present also; hence, the nodal function prepares a Preferred Transfer Capability (PTC) parameter corresponding to the Preferred Link Characteristics (PLC) as well. Node CS3f then reserves connection resources reflecting the more "demanding" of the parameters Transfer Capability (TC) and Preferred Transfer Capability (PTC).

Nodes CS3g and CS3h reserve connection resources reflecting the more "demanding" of the parameters Transfer Capability (TC) and Preferred Transfer Capability (PTC).

Node CS3i allocates connection resources reflecting the Preferred Transfer Capability (PTC) parameter; this decision is based on the presence of the Preferred Transfer Capability (PTC) parameter. The parameters Transfer Capability (TC), Preferred Transfer Capability (PTC), Link Characteristics (LC), Preferred Link Characteristics (PLC), and Modify Support for Link Characteristics (MSLC) are passed to the AAL type 2 served user. The absence of the Transfer Capability Support (TCS) parameter indicates that the AAL type 2 connection does not pass through CS-3 nodes entirely. The Modify Support for Link Characteristics (MSLC) parameter is inserted into the Establish Confirm (ECF) message.

Nodes CS3h, CS3g, and CS3f allocate connection resources reflecting the Preferred Transfer Capability (PTC) parameter that was previously passed in the Establish Request (ERQ) message; this decision is based on the presence of the Modify Support for Link Characteristics (MSLC) parameter in the Establish Confirm (ECF) message.

Nodes CS2e, CS2d, CS2c, CS2b, and CS2a allocate connection resources reflecting the Preferred Link Characteristics (PLC) parameter that was previously passed in the Establish Request (ERQ) message or received from the AAL type 2 served user; this decision is based on the presence of the Modify Support for Link Characteristics (MSLC) parameter in the Establish Confirm (ECF) message.

Node CS2a includes the Modify Support for Link Characteristics (MSLC) parameter in the ESTABLISH.confirm primitive to the AAL type 2 served user.

### III.2.4.2   At least one CS-1 node in the AAL type 2 connection

The parameters transported in the Establish Request (ERQ) and Establish Confirm (ECF) messages and the effects on the connection resource allocation mechanisms are illustrated in Figure III.7.

| | | CS2a | CS2b | CS1c | CS2d | CS2e | CS3f | CS3g | CS3h | CS3i | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LC | ☞ | R | R | A | A | A | ≡ | ≡ | ≡ | ≡ | ☞ |
| PLC | ☞ | R | R | ✖ | | | | | | | |
| TC | E R Q | | | | | | ★ A | A | A | A | ☞ |
| PTC | | | | | | | | | | | |
| MSLC | ☞ | == | == | ✖ | | | | | | | |
| TCS | | | | | | | | | | | |
| LC | | A | A | | | | | | | | |
| PLC | E C F | | | | | | | | | | |
| TC | | | | | | | | | | | |
| PTC | | | | | | | | | | | |
| MSLC | | | | | | | | | | | |
| TCS | | | | | | | | | | | |

**Figure III.7/Q.2630.3 – At least one CS-1 nodes in the AAL type 2 connection in the "From CS-2/CS-1 to CS-3" scenario**

In the ESTABLISH.request primitive, the nodal function receives from the AAL type 2 served user the following parameters relevant to interworking and connection resource allocation:

• the Link Characteristics;

• the Preferred Link Characteristics; and

• the Modify Support for Link Characteristics.

Nodes CS2a and CS2b reserve connection resources reflecting the more "demanding" of the parameters Link Characteristics (LC) and Preferred Link Characteristics (PLC).

At node CS1c, the parameters Preferred Link Characteristics (PLC) and Modify Support for Link Characteristics (MSLC) are discarded (compatibility instructions). Connection resources reflecting the Link Characteristics (LC) are allocated.

Nodes CS2d and CS2e allocate connection resources reflecting the Link Characteristics (LC); the Preferred Link Characteristics (PLC) parameter is no longer present in the Establish Request (ERQ) message.

At node CS3f, the Transfer Capability (TC) parameter is not present; hence, the nodal function prepares a Transfer Capability (TC) parameter corresponding to the Link Characteristics (LC) parameter. The Preferred Link Characteristics (PLC) parameter is not present; hence, no Preferred Transfer Capability (PTC) parameter needs to be prepared. Node CS3f then allocates connection resources reflecting the Transfer Capability (TC) parameter.

Nodes CS3g and CS3h allocate connection resources reflecting the Transfer Capability (TC) parameter.

Node CS3i allocates connection resources reflecting the Transfer Capability (TC) parameter. The parameters Transfer Capability (TC) and Link Characteristics (LC) are passed to the AAL type 2 served user. The absence of the Transfer Capability Support (TCS) parameter indicates that the AAL type 2 connection does not pass through CS-3 nodes entirely. No parameters are inserted into the Establish Confirm (ECF) message.

At nodes CS3h, CS3g, CS3f, CS2e, CS2d and CS1c, no action except passing the Establish Confirm (ECF) message is performed.

Nodes CS2b and CS2a allocate connection resources reflecting the Link Characteristics (LC) parameter that was previously passed in the Establish Request (ERQ) message or received from the AAL type 2 served user; this decision is based on the absence of the Modify Support for Link Characteristics (MSLC) parameter in the Establish Confirm (ECF) message.

Node CS2a includes no parameters in the ESTABLISH.confirm primitive to the AAL type 2 served user.

## III.3 Connection Resource Modification

### III.3.1 All CS-3 nodes

This clause illustrates AAL type 2 connection resource modifications where the originating and the destination AAL type 2 service endpoints as well as all AAL type 2 switches reside in a part of the network consisting of CS-3.

The availability of the full functionality specified in this Recommendation (capability set 3) was asserted by the receipt of the Transfer Capability Support (TCS) parameter by both service endpoints at connection establishment (see III.2.1). There exists no need to transmit parameters used only for interworking.

The parameters transported in the Modify Request (MOD) and Modify Acknowledge (MOA) messages and the effects on the connection resource allocation mechanisms are illustrated in Figure III.8.

| | | | CS3a | CS3b | CS3c | CS3d | CS3e | CS3f | CS3g | CS3h | CS3i | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $LC_{old}$ $LC_{new}$ | M O D | | | | | | | | | | | |
| $TC_{old}$ $TC_{new}$ | | ↩ | R R | R R | R R | R R | R R | R R | R R | R R | A | ↩ |
| $LC_{old}$ $LC_{new}$ | M O A | | | | | | | | | | | |
| $TC_{old}$ $TC_{new}$ | | | A | A | A | A | A | A | A | A | | |

**Figure III.8/Q.2630.3 – AAL type 2 connection resource modification
in the "All CS-3" scenario**

In the MODIFY.request primitive, the nodal function receives from the AAL type 2 served user the Transfer Capability (TC) parameter.

Nodes CS3a, CS3b, CS3c, CS3d, CS3e, CS3f, CS3g, and CS3h reserve connection resources reflecting the more "demanding" of the currently allocated connection resources ($TC_{old}$) and the Transfer Capability ($TC_{new}$) parameter.

Node CS3i allocates connection resources reflecting the Transfer Capability ($TC_{new}$) parameter. The Transfer Capability ($TC_{new}$) parameter is passed to the AAL type 2 served user.

Nodes CS3h, CS3g, CS3f, CS3e, CS3d, CS3c, CS3b, and CS3a allocate connection resources reflecting the new Transfer Capability ($TC_{new}$) parameter that was previously passed in the Modify Request (MOD) message or received from the AAL type 2 served user; this decision is based on the nature of the message, i.e., Modification Acknowledge (MOA) message rather than the Modification Reject (MOR) message.

Node CS3a includes no parameters in the MODIFY.confirm primitive to the AAL type 2 served user.

## III.3.2 From CS-3 via CS-2 nodes to CS-3

This clause illustrates AAL type 2 connection resource modification where the modify originating and the modify destination AAL type 2 service endpoints reside in a part of the network consisting of CS-3 nodes and where the AAL type 2 connection passes through a part of the network consisting of CS-2 nodes.

NOTE – Connection Resource Modification is not possible if a CS-1 node is part of the AAL type 2 connection.

The parameters transported in the Modify Request (MOD) and Modify Acknowledge (MOA) messages and the effects on the connection resource allocation mechanisms are illustrated in Figure III.9.

| | | | CS3a | CS3b | CS2c | CS2d | CS2e | CS2f | CS2g | CS3h | CS3i | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $LC_{old}$ $LC_{new}$ | M O D | ⟳ | == | == | R R | R R | R R | R R | R R | == | == | ⟳ |
| $TC_{old}$ $TC_{new}$ | | ⟳ | R R | R R | — | — | — | — | — | R R | A | ⟳ |
| $LC_{old}$ $LC_{new}$ | M O A | | | | A | A | A | A | A | | | |
| $TC_{old}$ $TC_{new}$ | | | A | A | | | | | | A | | |

**Figure III.9/Q.2630.3 – AAL type 2 connection resource modification
in the "From CS-3 via CS-2 nodes to CS-3" scenario**

In the MODIFY.request primitive, the nodal function receives from the AAL type 2 served user the following parameters relevant to interworking and connection resource allocation:

• the Transfer Capability; and

• the Link Characteristics.

Nodes CS3a and CS3b reserve connection resources reflecting the more "demanding" of the currently allocated connection resources ($TC_{old}$) and the Transfer Capability ($TC_{new}$) parameter.

Nodes CS2c, CS2d, CS2e, CS2f and CS2g reserve connection resources reflecting the more "demanding" of the currently allocated connection resources ($LC_{old}$) and the Link Characteristics ($LC_{new}$) parameter.

Node CS3h reserves connection resources reflecting the more "demanding" of the currently allocated connection resources ($TC_{old}$) and the Transfer Capability ($TC_{new}$) parameter.

Node CS3i allocates connection resources reflecting the Transfer Capability ($TC_{new}$) parameter. The parameters Transfer Capability ($TC_{new}$) and Link Characteristics ($LC_{new}$) are passed to the AAL type 2 served user.

Node CS3h allocates connection resources reflecting the new Transfer Capability ($TC_{new}$) parameter that was previously passed in the Modify Request (MOD) message; this decision is based on the nature of the message, i.e., Modification Acknowledge (MOA) message rather than the Modification Reject (MOR) message.

Nodes CS2g, CS2f, CS2e, CS2d and CS2c allocate connection resources reflecting the new Link Characteristics (LC$_{new}$) parameter that was previously passed in the Modify Request (MOD) message; this decision is based on the nature of the message, i.e., Modification Acknowledge (MOA) message rather than the Modification Reject (MOR) message.

Nodes CS3b and CS3a allocate connection resources reflecting the new Transfer Capability (TC$_{new}$) parameter that was previously passed in the Modify Request (MOD) message or received from the AAL type 2 served user; this decision is based on the nature of the message, i.e., Modification Acknowledge (MOA) message rather than the Modification Reject (MOR) message.

Node CS3a sends a MODIFY.confirm primitive to the AAL type 2 served user.

### III.3.3 From a CS-3 service endpoint to a CS-2 service endpoint

This clause illustrates AAL type 2 connection resource modification where the modify originating AAL type 2 service endpoint resides in a part of the network consisting of CS-3 nodes and where the modify destination AAL type 2 service endpoint resides in a part of the network consisting of CS-2 nodes.

NOTE – Connection Resource Modification is not possible if a CS-1 node is part of the AAL type 2 connection.

The parameters transported in the Modify Request (MOD) and Modify Acknowledge (MOA) messages and the effects on the connection resource allocation mechanisms are illustrated in Figure III.10.

| | | | CS3a | CS3b | CS3c | CS3d | CS2e | CS2f | CS2g | CS2h | CS2i | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LC$_{old}$ LC$_{new}$ | M O D | ☞ | == | == | == | == | R R | R R | R R | R R | A | ☞ |
| TC$_{old}$ TC$_{new}$ | | ☞ | R R | R R | R R | R R | — | — | — | — | ✖ | |
| LC$_{old}$ LC$_{new}$ | M O A | | | | | | A | A | A | A | | |
| TC$_{old}$ TC$_{new}$ | | | A | A | A | A | | | | | | |

**Figure III.10/Q.2630.3 – AAL type 2 connection resource modification in the "From CS-3 to CS-2" scenario**

In the MODIFY.request primitive, the nodal function receives from the AAL type 2 served user the following parameters relevant to interworking and connection resource allocation:

• the Transfer Capability; and

• the Link Characteristics.

Nodes CS3a, CS3b, CS3c, and CS3d reserve connection resources reflecting the more "demanding" of the currently allocated connection resources (TC$_{old}$) and the Transfer Capability (TC$_{new}$) parameter.

Nodes CS2e, CS2f, CS2g and CS2h reserve connection resources reflecting the more "demanding" of the currently allocated connection resources (LC$_{old}$) and the Link Characteristics (LC$_{new}$) parameter.

Node CS2i allocates connection resources reflecting the Link Characteristics ($LC_{new}$) parameter. The Transfer Capability (TC) parameter is discarded. The Transfer Capability ($LC_{new}$) parameter is passed to the AAL type 2 served user.

Nodes CS2h, CS2g, CS2f and CS2e allocate connection resources reflecting the new Link Characteristics ($LC_{new}$) parameter that was previously passed in the Modify Request (MOD) message; this decision is based on the nature of the message, i.e., Modification Acknowledge (MOA) message rather than the Modification Reject (MOR) message.

Nodes CS3d, CS3c, CS3b, and CS3a allocate connection resources reflecting the new Transfer Capability ($TC_{new}$) parameter that was previously passed in the Modify Request (MOD) message or received from the AAL type 2 served user; this decision is based on the nature of the message, i.e., Modification Acknowledge (MOA) message rather than the Modification Reject (MOR) message.

Node CS3a sends a MODIFY.confirm primitive to the AAL type 2 served user.

### III.3.4  From a CS-2 service endpoint to a CS-3 service endpoint

This clause illustrates AAL type 2 connection resource modification where the modify originating AAL type 2 service endpoint resides in a part of the network consisting of CS-2 nodes and where the modify destination AAL type 2 service endpoint resides in a part of the network consisting of CS-3 nodes.

NOTE – Connection Resource Modification is not possible if a CS-1 node is part of the AAL type 2 connection.

The parameters transported in the Modify Request (MOD) and Modify Acknowledge (MOA) messages and the effects on the connection resource allocation mechanisms are illustrated in Figure III.11.

| | | | CS2a | CS2b | CS2c | CS2d | CS2e | CS3f | CS3g | CS3h | CS3i | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $LC_{old}$ $LC_{new}$ | M O D | | R R | R R | R R | R R | R R | == | == | == | == | |
| $TC_{old}$ $TC_{new}$ | | | | | | | | R ★ R | R R | R R | A | |
| $LC_{old}$ $LC_{new}$ | M O A | | A | A | A | A | A | | | | | |
| $TC_{old}$ $TC_{new}$ | | | | | | | | A | A | A | | |

**Figure III.11/Q.2630.3 – AAL type 2 connection resource modification
in the "From CS-2 to CS-3" scenario**

In the MODIFY.request primitive, the nodal function receives from the AAL type 2 served user the Link Characteristics ($LC_{new}$) parameter.

Nodes CS2a, CS2b, CS2c, CS2d and CS2e reserve connection resources reflecting the more "demanding" of the currently allocated connection resources ($LC_{old}$) and the Link Characteristics ($LC_{new}$) parameter.

At node CS3f, the Transfer Capability ($TC_{new}$) parameter is not present; hence, the nodal function prepares a Transfer Capability ($TC_{new}$) parameter corresponding to the Link Characteristics ($LC_{new}$) parameter.

Nodes CS3f, CS3g and CS3h reserve connection resources reflecting the more "demanding" of the currently allocated connection resources (TC$_{old}$) and the Transfer Capability (TC$_{new}$) parameter.

Node CS3i allocates connection resources reflecting the Transfer Capability (TC$_{new}$) parameter. The parameters Transfer Capability (TC$_{new}$) and Link Characteristics (LC$_{new}$) are passed to the AAL type 2 served user.

Nodes CS3h, CS3g, and CS3f allocate connection resources reflecting the new Transfer Capability (TC$_{new}$) parameter that was previously passed in the Modify Request (MOD) message; this decision is based on the nature of the message, i.e., Modification Acknowledge (MOA) message rather than the Modification Reject (MOR) message.

Nodes CS2e, CS2d, CS2c, CS2b and CS2a allocate connection resources reflecting the new Link Characteristics (LC$_{new}$) parameter that was previously passed in the Modify Request (MOD) message or received from the AAL type 2 served user; this decision is based on the nature of the message, i.e., Modification Acknowledge (MOA) message rather than the Modification Reject (MOR) message.

Node CS2a sends a MODIFY.confirm primitive to the AAL type 2 served user.

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