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# ITU-T Q.811

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

(03/93)

## SPECIFICATIONS OF SIGNALLING SYSTEM No. 7

## Q3 INTERFACE

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# LOWER LAYER PROTOCOL PROFILES FOR THE Q3 INTERFACE

## ITU-T Recommendation Q.811

(Previously "CCITT Recommendation")

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## FOREWORD

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

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

ITU-T Recommendation Q.811 was prepared by the ITU-T Study Group XI (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

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NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

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

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## SUMMARY

This Recommendation provides the lower layer protocol profiles for the Q3 interface as defined in Recommendation M.3010. It also provides a method for interworking.



**Keywords**

Q3 Interface, TMN, Protocol Profiles, DCN, ISDN, X.25, NSAP and Interworking.

**Recommendation Q.811**

# LOWER LAYER PROTOCOL PROFILES FOR THE Q3 INTERFACE

*(Helsinki, 1993)*

## 1 Introduction

### 1.1 Scope

This Recommendation is a part of a series of Recommendations dealing with the transfer of information for the management of telecommunications systems. This Recommendation defines the requirements of lower layer protocol profiles for the Q3 interface[1)], as defined in Recommendation M.3010 [1]. The companion Recommendation Q.812 [2] defines the requirements of the upper layer protocol profiles for the Q3 interface. The Q3 interface will support bidirectional data transfer for the management of telecommunications systems.

This Recommendation defines the requirements that must be met at the layer 3 to layer 4 boundary (i.e. the boundary between the upper and lower layer profiles) and defines a number of lower layer profiles that meet these requirements.

In addition, this Recommendation defines mechanisms for interworking among the profiles defined in this Recommendation.

Specifically, this Recommendation defines:

- the layer service profiles for the defined supported networks;
- the layer protocol profiles for the defined supported networks;
- the requirements at the layer 3/layer 4 service boundary for any network used to support the Q3 interface of the TMN;
- the means of interworking between the supported networks;
- an interworking protocol that can be used for interworking if appropriate conveyance functions exist or are defined.

It is the intention to move the specification of the subnetworks to International Standard Profiles (ISP) format. As the ISPs become standardized, they will be reviewed for applicability and definition.

### 1.2 Abbreviations and symbols

#### 1.2.1 Abbreviations

For the purpose of this Recommendation, the following abbreviations are used:

| | |
|---|---|
| AFI | Authority and Format Identifier |
| CD | Collision Detection |
| Conf | Confirm |
| CSMA | Carrier Sense Multiple Access |
| DCN | Data Communication Network |
| DIS | Draft International Standard |
| DLC | Data Link Connection |
| DLS | Data Link Service |
| DSP | Domain Specific Part |
| HDLC | High-level Data Link Control |
| IDI | Initial Domain Identifier |
| IDP | Initial Domain Part |

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1) This protocol is also applicable to the Qx interface when a full seven layer stack is required.

| | |
|---|---|
| Ind | Indication |
| ISO | International Organization for Standardization |
| LLC | Logical Link Control |
| LME | Layer Management Entity |
| MAC | Media Access Control |
| NDM | Normal Disconnected Mode |
| NE | Network Element |
| NLR | Network Layer Relay |
| NS | Network Service |
| NSAP | Network Service Access Point |
| OSI | Open Systems Interconnection |
| PhC | Physical Connection |
| Ph | Physical |
| PhS | Physical Service |
| PICS | Protocol Implementation Conformance Statement |
| PVC | Permanent Virtual Circuit |
| QOS | Quality of Service |
| Req | Request |
| Res | Result |
| SVC | Switched Virtual Circuit[2)] |
| TMN | Telecommunications Management Network |

#### 1.2.2 Symbols and abbreviations used in tables [3]

M Mandatory.

– The parameter is not present in the interaction described by the service or primitive concerned.

(=) The value of the parameter is equal to the value of the parameter in the column to the left.

### 1.3 Terms

To be provided.

## 2 DCN model

A DCN model is shown in Figure 1. It indicates communication paths, Q3 interface on which the Q3 interface profiles described in this Recommendation and in Recommendation Q.812 could be applied.

Each network is identified by an alpha character. The interfaces on each network connection is identified by two (2) alphas. The first alpha identifies the network to which the interface is attached, the second alpha identifies the network to which the other interface is attached, i.e. an interface coded ab indicates that it is attached to the PSPDN (a) and connects through to an ISDN D-channel Packet network (b). Thus the interface on the ISDN D-channel Packet network is identified as (ba).

The identification of homogeneous lower layer protocol combinations which require no interworking is given in Table 10. Table 11 identifies the lower layer protocols for interfaces requiring interworking as well as the interworking method.

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2) Switched Virtual Circuit corresponds to "Virtual Call" used in Recommendation X.25.

The following briefly describes the individual lower layer protocol profiles:

| | |
|---|---|
| CONS1 | A connection mode packet interface using X.25 |
| CONS2 | A connection mode packet interface using X.31 on an ISDN D-channel |
| CONS3 | A connection mode packet interface using X.31 on an ISDN B- channel |
| CONS5 | A connection mode interface using Signalling System No. 7 MTP and SCCP[3)] |
| CONS6 | A connection mode packet interface X.25 over LAN |
| CLNS1 | A connectionless mode interface using ISO 8802-2 type LANS using CSMA/CD |
| CLNS2 | A connectionless mode interface using ISO IP over a connection mode X.25 protocol. |

## 2.1 Typical fields of application

This subclause provides typical examples of the application of these profiles at the Q3 interface. Other fields of application are not precluded by this Recommendation.

### 2.1.1 CONS1

CONS1 is applied to the reference point between PSPDN and OS/MD/QA/NE which communicates with OS accommodated in PSPDN and ISDN.

### 2.1.2 CONS2, CONS3

CONS2 and CONS3 are applied to the reference point between ISDN and OS/MD/QA/NE which communicates with OS accommodated in PSPDN or ISDN.

### 2.1.3 CLNS1

CLNS1 is applied to the reference point between LAN and OS/MD/QA/NE which communicates with OS accommodated in LAN or PSPDN.

### 2.1.4 CLNS2

CLNS2 is applied to the reference point between PSPDN and OS/MD/QA/NE which communicates with OS accommodated in LAN.

### 2.1.5 CONS6

CONS6 is applied to OS/MD/QA/NE which is connected to the reference point on connection mode oriented LAN.

## 2.2 Relationship between ISDN model and Q3 interface

Figure 2 shows the location of Q3 interface in ISDN access. This figure shows that OSs accommodated in ISDN which serves as a DCN of TMN have Q3 interfaces over T point or S point.

# 3 Lower layer protocol profiles: overview

The communication services and protocol referred to in this Recommendation are in accordance with the open system interconnection (OSI) reference model [3].

The protocols for the different layers are based on CCITT Recommendations and/or ISO standards.

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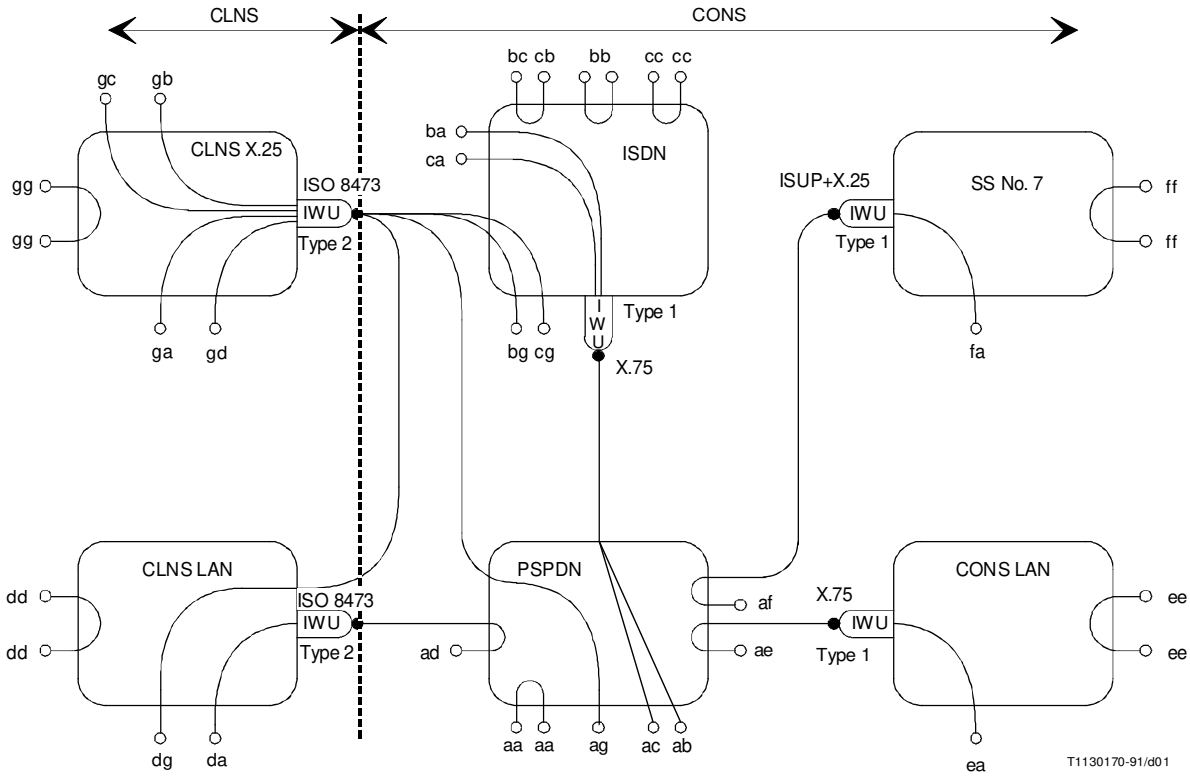
3) The additions required to provide the connection mode network service by the SCCP are under study.




| *Alpha character* | *Network* |
|---|---|
| a | PSPDN |
| b | ISDN D-channel Packet |
| c | ISDN B-channel Packet |
| d | CLNS LAN |
| e | CONS LAN |
| f | SS No. 7 Network |
| g | CLNS/X.25 |

NOTES

1 White dots indicate Q3 interfaces to which OSs, MDs, QAs and NEs are connected.

2 Black dots indicate reference points of IWUs.

3 A Type 1 interworking function is one which is performed at the boundary between the subnetworks and is not visible to the end systems.

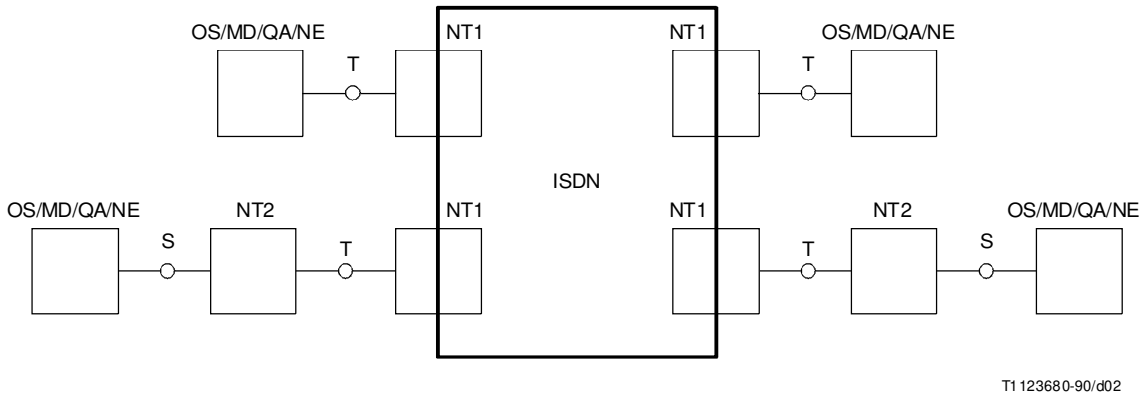
4 A Type 2 interworking function is one which is performed at the boundary of the subnetworks and may be visible to the end systems.

FIGURE 1/Q.811

**DCN model**

The protocol profiles can be applied to DCN, as defined by Recommendation M.3010 [1].

Any Administration may use any existing network that meets the requirements at the layer 3/layer 4 service boundary.




NOTE – Circles indicate the location of Q3 interface.

FIGURE 2/Q.811

**Location of Q3 interface in ISDN access**

For the network profiles defined in this Recommendation, interoperability mechanisms are to be defined as a part of this Recommendation. For networks not using these profiles it is the responsibility of the individual Administration to solve any interoperability problems that may exist.

# 4 Requirements for network layer/transport layer interface

If these requirements are met by new or existing networks, these networks may be used to provide the lower layer services at the Q3 interface.

To be provided.

# 5 Defined network profiles

## 5.1 Connectionless mode network profile

**5.1.1 LAN** [see Figure 3 (4)]

**5.1.2 WAN, LAN** [see Figure 3 (7)]

## 5.2 Connection mode network profiles

**5.2.1 X.25/LAPB** [see Figure 3 (1), (3), (2), (6), (5)]

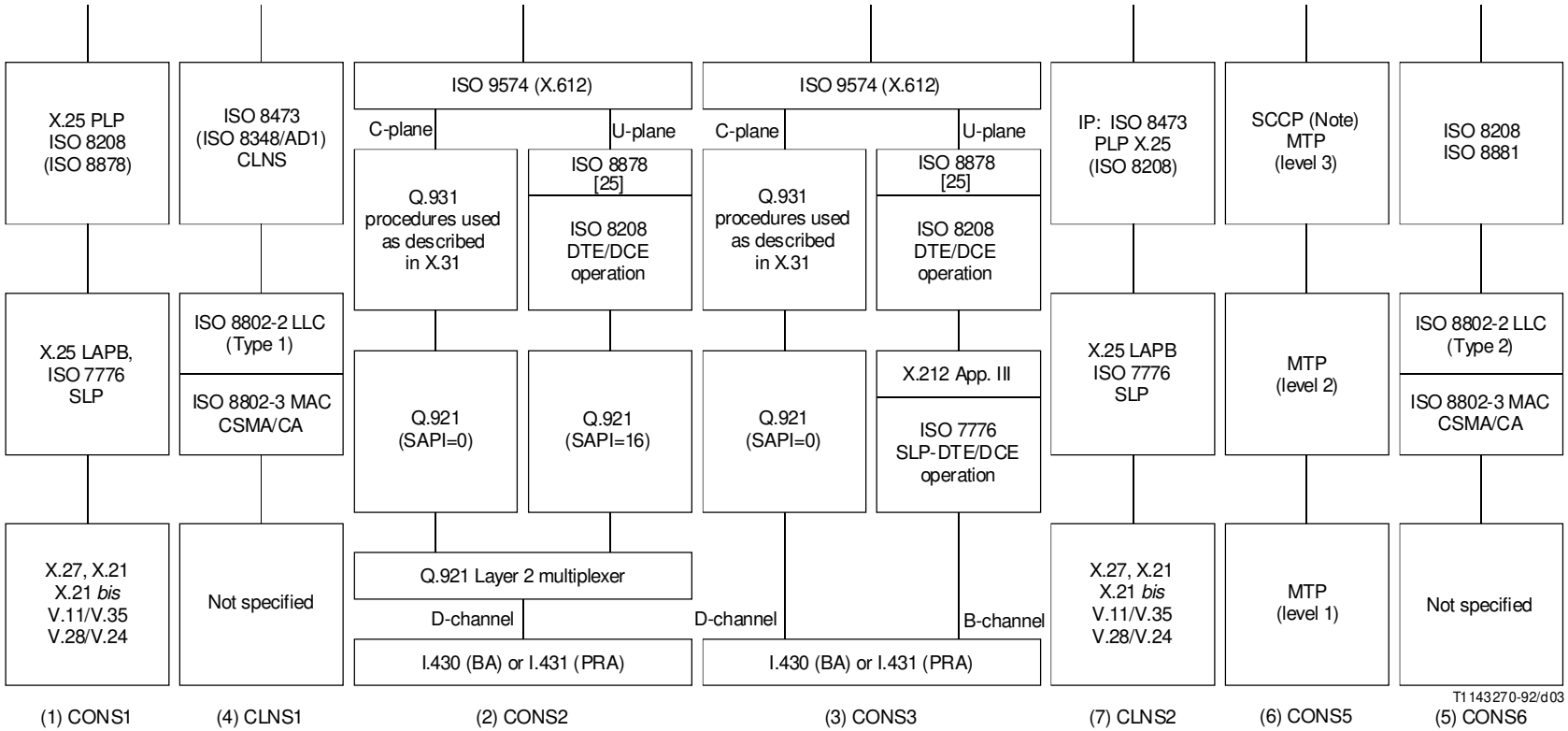
## 5.3 CL-LAN profile (CLNS1)

### 5.3.1 Physical layer profile

#### 5.3.1.1 Service profile

The service definition for the physical layer shall comply with that specified in Clause 6 of ISO 8802-3 [4].

All of the primitives defined and listed in Table 1 are mandatory.




NOTE – Further study is needed for the function of SCCP at the boundary of Network layer and Transport layer.

FIGURE 3/Q.811

**Protocol profile for network management**

TABLE 1/Q.811

**Primitives of the physical layer**

| Primitive |
|---|
| PLS-DATA-request |
| PLS-DATA-indication |
| PLS-CARRIER-indication |
| PLS-SIGNAL-indication |

#### 5.3.1.2 Protocol profile

The possible bit rate will be 1 Mbit/s, 10 Mbit/s or higher.

#### 5.3.1.3 Physical interface

Administrations will select the appropriate physical medium, e.g. coaxial cable, screened pairs, optical fibre according to technological and operational requirements.

### 5.3.2 Data link layer profile

The data link layer provides the unacknowledged connectionless mode service. The access method employed is Carrier Sense Multiple Access with Collision Detection (CSMA/CD).

#### 5.3.2.1 Media access control (MAC) profile

The services and protocol of the CSMA/CD access method shall comply with those specified in ISO 8802-3 [4].

The address length used at the MAC sub-layer shall be 48 bits.

#### 5.3.2.2 Logical link control (LLC) profile

The definition of the unacknowledged connectionless mode LLC service shall comply with that specified in ISO 8802-2 [5]. All of the primitives defined for "Type 1" operation shall be supported.

The protocol used to provide the unacknowledged connectionless mode LLC service shall be as specified in ISO 8802-2 [5]. All of the commands and responses defined for Type 1 operation shall be supported.

### 5.3.3 Network layer profile

#### 5.3.3.1 Services profile

The definition of the connectionless mode network service shall comply with that specified in ISO 8348/AD 1 [6]. Address formats supported shall conform to ISO 8348/AD 2 [7].

The network layer shall provide the N-UNITDATA service as specified in ISO 8348/AD 1 [6].

#### 5.3.3.2 Protocol profile

The protocol shall be in accordance with the full protocol subset of category "Type 1" functions, as specified in ISO 8473 [8].

#### 5.3.3.3 Network layer attributes

Characteristics of the connectionless-mode network layer service and the connectionless-mode network layer protocol shall be as shown in Table 2.

TABLE 2/Q.811

**Network layer service/protocol parameters**

| | |
|---|---|
| a | Destination and Source Addresses used by this protocol shall be Network Service Access Points (NSAP) addresses, as specified in ISO 8348/AD 2 or Annex A/X.213.<br><br>The Destination and Source Address are of variable length. The Destination and Source Address fields shall be as Network Protocol Address Information using the preferred Binary Encoding specified in ISO 8348/AD 2. |
| b | The setting of Error Reporting Flag (E/R) shall be a local matter (Note). |
| c | Partial Source Routing shall NOT be supported. A defect exits with this option which can cause PDUs to loop in the network until their lifetime expires. |
| d | Inactive Subset – Implementations shall not transmit PDUs encoded using the ISO 8473 inactive subset. Received PDUs encoded with the inactive subset shall be discarded. |
| e | Segmentation – The non-segmentation subset shall NOT be used. However, implementations shall be capable of receiving and correctly processing PDUs which do not contain the segmentation part. |
| f | Segmentation Permitted Flag – Implementations shall NOT generate data PDUs without a segmentation part, i.e., the Segmentation Permitted Flag (SP) shall be set to 1 and the segmentation part shall be included. |
| g | Lifetime Control – The lifetime parameter shall be used as specified in clause 6.4 of ISO 8473. This parameter shall have an initial value of at least three times the network span (number of network entities) or three times the maximum transmission delay (in units of 500 milliseconds), whichever is greater. |
| NOTE – The use of error Reporting and setting the E/R flag to 1 may lead to excessive network traffic. | |

## 5.4. CL-WAN profile (CLNS2)

### 5.4.1 Physical layer profile

#### 5.4.1.1 Service profile

To be provided.

#### 5.4.1.2 Protocol profile

The protocol of the physical layer of Protocol Profile CLNS2 shall comply with the following specifications:

- X.21 interface in accordance with 1.1/X.25 [9];
- X.21bis interface in accordance with 1.2/X.25;
- V-Series interface in accordance with 1.3/X.25.

##### 5.4.1.2.1 Bit rate

The supported bit rates are: 1200, 2400, 4800, 9600, 19 200 and 64 000 bit/s. The bit rates 48 000 bit/s and 56 000 bit/s may be used for an interim period (see Note 1 to Table 9).

#### 5.4.1.3 Connector

Table 3 lists the connectors to be used in accessing the X.21 and X.21 *bis* interfaces. Tables 4, 5 and 6 list respectively the pin descriptions of ISO 2110 [37], ISO 2593 [38], ISO 4902 and ISO 4903.

TABLE 3/Q.811

**X.21/X.21 *bis* connectors**

| Data signalling rate | X.21 *bis* | X.21 |
|---|---|---|
| 2 400 bit/s | ISO 2110 | ISO 4903 |
| 4 800 bit/s | ISO 2110 | ISO 4903 |
| 9 600 bit/s | ISO 2110 | ISO 4903 |
| 19 200 bit/s | ISO 2110 | ISO 4903 |
| 48 000 bit/s | ISO 2593<br>ISO 4902 | ISO 4903 |
| 56 000 bit/s | ISO 2593 | ISO 2593 |
| 64 000 bit/s | ISO 4902 | ISO 4903 |

TABLE 4/Q.811

**ISO 2110 [37] Pin description** (see Note 6)

| Pin | V.24 [34] circuit | Description | Notes |
|---|---|---|---|
| 1 | 101 | Protective ground (Shield) | 1 |
| 7 | 102 | Signal Ground | 2 |
| 2 | 103 | Transmitted Data | 2 |
| 3 | 104 | Received Data | 2 |
| 4 | 105 | Request to Send | 2 |
| 5 | 106 | Clear to Send | 2 |
| 6 | 107 | Data Set Ready (DCE Ready) | 2 |
| 20 | 108.2 | Data terminal Ready (DTE Ready) | 3 |
| 22 | 125 | Ring Indicator | 3 |
| 8 | 109 | Received Line Signal Detector | 2 |
| 24 | 113 | Transmitter Signal Element Timing (DTE to DCE) | 4 |
| 15 | 114 | Transmitter Signal Element Timing (DCE to DTE) | 5 |

NOTES

1 Equipment: removable strap to frame ground or other equivalent grounding arrangement. Cable: connected to shield.

2 Basic interchange circuits, all systems.

3 Additional interchange circuits required for switched service.

4 Circuit 113 is not used in OS-MD/NE interfaces.

5 Additional interchange circuits required for synchronous channel.

6 Duplex, interface type D.

7 Circuits are grouped by function: ground, data, control and timing.

8 For further information see Recommendations V.24 [34] and V.28 [35], and ISO 2110 [37].

TABLE 5/Q.811

**V.35 [36], ISO 2593 [38] Pin description** (see Note 3)

| Pin | Circuit | Description | Notes |
|---|---|---|---|
| A<br>B | 101<br>102 | Protective Ground<br>Signal Ground | 1 |
| P<br>S<br>R<br>T | 103<br>103<br>104<br>104 | Transmitted Data A-wire<br>Transmitted Data B-wire<br>Received Data A-wire<br>Received Data B-wire | 2<br>2<br>2<br>2 |
| C<br>D<br>E<br>F | 105<br>106<br>107<br>109 | Request to Send<br>Ready for Sending<br>Data Set Ready<br>Data Channel Receive Line Signal Detector | |
| Y<br>AA<br>V<br>X | 114<br>114<br>115<br>115 | Transmitter Signal Element Timing A (DCE to DTE)<br>Transmitter Signal Element Timing B (DCE to DTE)<br>Receiver Signal Element Timing A (DCE to DTE)<br>Receiver Signal Element Timing B (DCE to DTE) | 2<br>2<br>2<br>2 |

NOTES

1 Equipment: removable strap to frame ground or other equivalent grounding arrangement. Cable: connected to shield.

2 The electrical characteristics of the interchange circuits 103, 104, 114 and 115 shall be balanced double-current, conforming to Appendix II/V.35 [36].

All other circuits shall conform to Recommendation V.28 [35].

3 The mode is synchronous at 64 000 bit/s.

Some countries may use 56 000 bit/s for an interim period of time.

4 Circuits are grouped by function: ground, data, control and timing.

5 For further information, see Recommendations V.35 [36], V.24 [34] and V.28 [35] and ISO 2593 [38].

TABLE 6/Q.811

**ISO 4903 pin description** (see Note 2)

| Pin | X.21 circuit | Description | Notes |
|---|---|---|---|
| 1<br>8 | –<br>G | Protective ground<br>Signal ground or common return | 1 |
| 2<br>9<br>4<br>11 | T<br>T<br>R<br>R | Transmit A-wire<br>Transmit B-wire<br>Receive A-wire<br>Receive B-wire | |
| 3<br>10<br>5<br>12 | C<br>C<br>I<br>I | Control A-wire<br>Control B-wire<br>Indication A-wire<br>Indication B-wire | |
| 6<br>13 | S<br>S | Signal element timing A-wire<br>Signal element timing B-wire | |

NOTES

1 Equipment: removable strap to frame ground or other equivalent grounding arrangement. Cable: connected to shield.

2 Circuits are grouped by functions: ground, data, control and timing.

3 For further information: see Recommendations V.10, V.11 and X.21 and ISO 4903.

#### 5.4.2 Data link layer profile

It is mandatory that the data link layer conforms to LAPB as defined in Recommendation X.25 [9]. In addition, provision shall be made for connection between Data Terminal Equipment without an intervening packet switched network. The interface shall conform to ISO 7776 [10].

##### 5.4.2.1 Service profile

To be provided.

##### 5.4.2.2 Protocol profile

###### 5.4.2.2.1 Equipment type during link set up and reset

When a packet switched network is used to connect systems, they are each designated "Data Terminal Equipment" (DTE) and the network acts as a "Data Circuit-Terminating Equipment" (DCE). When a dedicated or dial-up link is provided, other means must be used to supply the DCE role.

At the physical layer the modems will provide the DCE interface, supplying bit synchronization.

At the link level, the procedures specified in ISO 7776 [10] shall be followed. A system must be able to start the set-up or reset of the link (a DCE function in Recommendation X.25 [9]). In addition, provision must be made for assignments of the A/B addresses. This mandatory option is to be field-settable and stored in non-volatile memory. Equipment which meets this requirement is compatible with connection to either a DCE or remote DTE.

###### 5.4.2.2.2 Window

Modulo 8 operation shall be used. Support of modulo 128 is optional. The window for unacknowledged frames is to be optional between 1 and 7 frames and 1 to 127 with modulo 128. The standard default is 7.

###### 5.4.2.2.3 User information

The user information is to be arranged in an integral number of octets.

The maximum length of the user information shall be user settable, consistent with the range of values for the N1 parameter as shown in Table 7. Maximum information field lengths that shall be supported are 131 and 259 octets with 515, 1027, 2051 and 4099 octets optional. These values provide for three packet header octets and maximum length of User Data Field of 128, 256, 512, 1024, 2048 and 4096 octets, respectively.

###### 5.4.2.2.4 Other frame parameters

Certain other frame parameters shall be set by the user to be consistent with the bit rate, frame size and characteristics of the connecting network. A system design should be sufficiently flexible to accommodate parameter sets for diverse networks, both as order options and later reconfigurations. The range of parameters is shown in Table 7. These options, like those of the physical layer, are to be set at installation, changeable by the user, and non-volatile.

#### 5.4.3 Network layer profile

##### 5.4.3.1 Service profile

To be specified.

##### 5.4.3.2 Protocol profiles

The protocols for the network layer shall be identical to the network layer protocol of Protocol Profile CONS1 (see 5.5.3) with the inclusion of ISO 8473 [8] as specified in ISO 8880/3 [11] Clause 4, to provide the connectionless-mode network service over the connection-mode network service.

For those instances of communication requiring interworking between a connection mode service (CONS) and a connectionless mode service (CLNS), ISO 7498 and ISO 8648 [12] provides an OSI compatible interworking capability. This capability is known as a network layer relay (NLR) and utilizes the ISO 8473 [8] protocol to provide this service.

TABLE 7/Q.811

**LAPB data link layer attributes**

| LAPB Protocol<br>Octet aligned<br>Single link procedure (SLP) | | | |
|---|---|---|---|
| Parameter | Function | Range | Default |
| K | I-Frames Window | 1 to 7 (with Modulo 8)<br>1 to 127 (with optional Modulo 128) | (7)<br>(7) |
| T1 | Waiting Acknowledgement (Retry) timer[a]<br>For up to 9600 bit/s<br>For 56 000 bit/s | <br><br>2 to 20 seconds<br>0.2 to 20 seconds | <br><br>(3)<br>(3) |
| T2 | Response delay par.[a] | Not greater than 0.3 seconds | |
| T3 | Disconnect Timer | T3 >> T4[b] | |
| T4 | No activity Timer | 4 to 120 seconds | (20) |
| N1 | Bits per I-Frame, excluding flags and zero bit insertion for transparency[c] | 1080, 2104 (with Modulo 8) optional: 4152, 8248, 16 440, 32 824 (with Modulo 8)[d]<br>1096, 2120 (with Modulo 128) optional: 4168, 8264, 16 456, 32 840 (with Modulo 128)[d] | (2104)<br><br>(2120) |
| N2 | Retransmission Count | 2 to 16 | (7) |
| A/B | Address Assignment | Selectable by the user | |

a) Further guidelines on the use of T1 and T2 can be found in Recommendation X.25 [9] and ISO 7776 [10]. The transport layer T1 timer should always be greater than the link layer T1 timer.

b) The value of timer T3, the disconnect timer, is not critical for successful interworking of OSs and NEs. Therefore no value is specified.

c) In some cases, users may need to choose a maximum information field length of 259 octets (N1 = 2104 for Modulo 8 or N1 = 2120 for Modulo 128) with a 128 octets packet data unit in order to accomodate call request packets containing 128 octets user data fields in addition to the packet header and facility fields. These values are based on Modulo 8 or Modulo 128 operation at both link and packet layer.

d) Optional.

The default values shall be part of a vendor's offering. That is, unless otherwise specified by the user, the default parameters shall be the initial values supplied. They can be subsequently changed by the user within the specified range.

#### 5.4.3.3 Network layer attributes

Characteristics of the connectionless-mode network layer service, and the connectionless-mode network layer protocol shall be as shown in Table 2.

## 5.5 X.25/LAPB network profile CONS1

### 5.5.1 Physical layer profile

See 5.4.1.

### 5.5.2 Data link layer profile

See 5.4.2.

### 5.5.3 Network layer profile

It is mandatory that the packet layer conforms to Recommendation X.25 [9]. In addition, the packet layer must provide for connection of data terminal equipments without an intervening packet network; the required interface for this purpose conforms to ISO 8208 [13]. In addition, the provisions of Recommendation X.223 [14] shall apply.

The attributes which must be supported are summarized in Tables 8 and 9. Note in particular that these tables show the different attributes needed to support PVCs [the X.25 Permanent Virtual Circuit (PVC) procedures] and Switched Virtual Circuits (SVCs) (the X.25/SVC procedures).

TABLE 8/Q.811

**X.25 [9] Packet layer attributes for permanent virtual circuits**

| | Range | Default |
|---|---|---|
| Extended Packet Sequence Numbering | Modulo 128 optional | |
| Packet size (octets) | 128, 256<br>512, 1024, 2048, 4096 optional | (128) |
| Window size | 1-7 (with Modulo 8) | (2) |
| Extended Sequence Number option | 1-127 (with optional Modulo 128) | (2) |
| Interrupt packets | Optional | |

NOTES

1 The default values shall be part of a vendor's offering. That is, unless otherwise specified by the user, the default parameters shall be the initial values supplied. They can be subsequently changed by the user within the specified range.

2 The attributes which are not marked optional are mandatory.

3 The ranges specified for negotiated parameters in no way affect the normal negotiation rules specified in the international standards.

#### 5.5.3.1 Numbering plans

To support communications over public networks, public numbering plans may be used on the packet-switched network between OSs and MDs/QAs/NEs. The 1988 versions of Recommendations E.164 [15] and X.121 [16] specify public numbering plans. Equipment may be assigned numbers in accordance with either of these international Recommendations. The escape code values of "0" and "9" shall be supported as specified in Table 2/X.121. Where a public numbering plan is not necessary, a private numbering plan may be used.

Network layer addressing as specified in Annex A/X.213 [17] and ISO 8348/AD 2 [7] shall be supported.

##### 5.5.3.1.1 CLNS (ISO 8473) Communications

When an instance of data communications involves use of the ISO 8473 CLNP, a Network Service Access Point (NSAP) address scheme shall be used. The NSAP structure and semantics are for further study.

For examples of possible NSAP structures, refer to Appendix I.

#### 5.5.3.2 Services profile

##### 5.5.3.2.1 Expedited data negotiation

The initiator shall be capable of proposing the non-use of the expedited data service. Responders shall be capable of receiving requests for the expedited data service, but shall be capable of responding with non-use of the service. The expedited data service is neither required nor precluded by this Recommendation.

TABLE 9/Q.811

**X.25 [9] Packet layer attributes for switched virtual circuits**

| | Range | Default |
|---|---|---|
| Flow Control Parameter<br>Packet size (octets) | 128, 256<br>512 optional | 128 |
| Window size | 1-7 (with Modulo 8) | 2 |
| Extended Sequence Number Option | 1-127 (with optional Modulo 128) | 2 |
| Throughput Class (Note 1)<br>Bit rate (bit/s) | 1200, 2400, 4800, 9600, 19 200 and 64 000 | 2400 |
| Expedited Data Neg | | |
| Closed User Group | | |
| Closed User Group Selection<br>Basic Format | 2 decimal digits | |
| Fast Select | 128 octets | |
| Fast Select Acceptance | | |
| Hunt Group | Optional | |
| Transit Delay Selection and Indication | | |
| Calling Address Extension | | |
| Called Address Extension | | |
| Minimum Throughput Class Negotiation | | |
| End-to-End Transit Delay Negotiation | | |

NOTES

1 Some countries may use 56 000 bit/s for an interim period of time. In addition to the codes specified in the table in 7.2.2.2/X.25, 56 000 bit/s shall be encoded as binary 1100. 48 000 bit/s is encoded as binary 1100 in that table, but when 56 000 bit/s is supported, the code shall stand for 56 000 bit/s.

2 The default values shall be part of a vendor's offering. That is, unless otherwise specified by the user, the default parameters shall be the initial values supplied. They can be subsequently changed by the user within the specified range.

3 The attributes which are not marked optional are mandatory.

4 The ranges specified for negotiated parameters in no way affect the normal A negotiation rules specified in the international standards.

#### 5.5.3.2.2 Receipt confirmation negotiation

The initiator shall be capable of setting bit 7 of the General Format Identifier to 0. Responders shall be capable of receiving bit 7 set to 1, but shall be capable of responding with bit 7 set to 0. The Receipt Confirmation Service is neither required nor precluded by this Recommendation.

#### 5.5.3.2.3 Throughput class

When the end system requires only one network layer connection on a physical access port, support of throughput classes up to the access line transmission rate is required. When multiple network layer connections are required, support of the throughput class equal to the access line transmission rate is optional. Further study of Throughput Class range and default values at various access line rates is needed.

#### 5.5.3.2.4 Packet size negotiation

Interoperability is achieved by having the initiator propose a packet size from the set specified in Tables 8 and 9 and by the responder selecting the most appropriate packet size between 128 and the proposed packet size. The rules for negotiation of the size of the packet to be used in a given instance of communication are specified in ISO 8208 [13].

The choice of packet size is a local issue which can depend on, for example, the overall Quality of Service requested or needed by the user or Application Layer, and the sub-network characteristics.

#### 5.5.3.3 Protocol profile

##### 5.5.3.3.1 Equipment type during restart

When the packet level X.25 interface is used, automatic selection of the DCE/DTE role during restart is required, as specified in ISO 8208 [13].

##### 5.5.3.3.2 Other features and parameters

The packet layer attributes are summarized in Tables 8 and 9.

##### 5.5.3.3.3 User data field

When layers above X.25 are used, the initial octets of (N)-DATA primitive and the corresponding user data field are used for peer-to-peer protocol data for those layers.

In following the procedures of Recommendation X.244 [18], ISO TR 9577 [19], Annex B/X.224 and ISO 8073/AD 1 [20], the initial octets of the user data field of the call request packet may only be used for protocol identification. For those cases in which the fast select feature is used, the call request packet may contain a call user data field of up to 128 octets.

## 5.6 Packet mode bearer service on the D-channel (CONS2)

### 5.6.1 Physical layer profile

The physical layer conforms to Recomendation I.430 [21] for basic rate access and I.431 [22] for primary rate access.

### 5.6.2 Link layer C-plane profile

The link layer C-plane conforms to Recomendation Q.921 [23] with the default parmeters specified for links within the SAP identified by SAPI = 0.

### 5.6.3 Network layer C-plane profile

The network layer C-plane conforms to Recomendation Q.931. Q.931 procedures are used as described in Recommendation X.31 [24] with encodings for information elements according to X.31.

### 5.6.4 Link layer U-plane profile

The link layer U-plane profile conforms to Recommendation Q.921 with the default parameters specified for links within the SAP identified by SAPI = 16.

### 5.6.5 Network layer U-plane profile

The network layer U-plane conforms to International Standard ISO 8208 for DTE-DCE operation. The throughput class corresponds to the access-line bit rate of the D-channel which is 16 kbit/s. The network layer attributes are specified in Table 9.

### 5.6.6 Provision of OSI-CONS

ISO 9574 (X.612) [39] provides the connection-mode network service to packet mode terminal equipment connected to ISDN.

## 5.7 Packet mode bearer service on the B-channel (CONS3)

### 5.7.1 Physical layer profile

The physical layer conforms to Recommendation I.430 for basic rate access and I.431 for primary rate access.

#### 5.7.2 Link layer C-plane profile

The link layer C-plane conforms to Recommendation Q.921 with the default parameters specified for links within the SAP identified by SAPI = 0.

#### 5.7.3 Network layer C-plane profile

The network layer C-plane conforms to Recommendation Q.931. Q.931 procedures are used as described in Recommendation X.31 with encodings for information elements according to X.31.

#### 5.7.4 Link layer U-plane profile

The link layer U-plane conforms to International Standard ISO 7776 for single link procedures (SLP) in DTE-DCE operation. The link layer attributes are specified in Table 7.

#### 5.7.5 Network layer U-plane profile

The network layer U-plane conforms to International Standard ISO 8208 for DTE-DCE operation. The throughput class corresponds to the access-line bit rate of the B-channel which is 64 kbit/s. The network layer attributes are specified in Table 9.

#### 5.7.6 Provision of OSI-CONS

ISO 9574 (X.612) [39] provides the connection-mode network service to packet mode terminal equipment connected to ISDN.

### 5.8 Signalling System No. 7 networks (CONS5)

Layer 1 conforms to MTP (level 1) [26].

Layer 2 conforms to MTP (level 2) [27].

Layer 3 conforms to MTP (level 3) [28] and SCCP [29]-[33].

NOTE – Further study is needed for the function of SCCP at the boundary of Network layer and Transport layer.

### 5.9 Connection oriented LAN(CONS6)

#### 5.9.1 Physical layer profile

See 5.3.1.

#### 5.9.2 Data link layer profile

See 5.3.2, and *replace* “Type 1” by “Type 2”.

#### 5.9.3 Network layer profile

To be provided.

### 5.10 Conformance requirements

To be provided.

### 5.11 Homogeneous protocol profiles

Table 10 shows homogeneous protocol profiles which are to be applied to the reference points without interworking.

## 6 Network layer service

### 6.1 Network layer profiles

The following will describe three ways in which the lower layers (1, 2 & 3) profiles may be viewed as transparent to the upper layers (4, 5, 6 & 7).

TABLE 10/Q.811

**Homogeneous lower layer protocol profiles**

| Interface in Figure 1 | Protocol profile |
|---|---|
| aa | CONS1 |
| bb | CONS2 |
| bc | CONS2 |
| cb | CONS3 |
| cc | CONS3 |
| dd | CLNS1 |
| ee | CONS6 |
| ff | CONS5 |

### 6.1.1 Existing lower layer profiles

The group of subnetworks described in clause 5 have been chosen to meet the requirements of the upper layer protocols. A user may choose any one of these protocol profiles with the confidence that they will interoperate with the upper layers profile.

### 6.1.2 Network layer service description for new subnetworks

On a forward going basis, any subnetwork developed must meet the criteria provided for the network layer service as viewed by the transport layer. There are two services provided by the network layer. The first is the connection mode network service (CONS) described in ISO 8348. The second is the connectionless mode network service (CLNS) described in ISO 8248/AD 1.

These standards provide the description of the network services.

### 6.1.3 Non-conforming network layer profile

For those lower layer protocol profiles which do not meet the network layers description, the addition of ISO 8473 with the proper choice of SNCPs will provide a combination that will meet the network layer service description.

In addition, the Subnetwork Dependent Convergence Protocols (SNDCPs) are described for the use of ISO 8473 over ISO 8208/X.25 networks and for the use of ISO 8473 over connectionless mode subnetworks such as ISO 8802-2 subnetworks.

## 6.2 Internetworking

This subclause describes the technical principles for interworking between TMNs using different protocol stacks. In some cases interworking units have to be supplied between the different DCNs. It is the responsibility of the two TMN Administrations to determine which Administration shall provide the IWU. This interworking procedure is known as Network Layer Relay (NLR).

When networks of different types, such as connection mode and connectionless mode, wish to transfer information across the boundary, internetworking principles are stated in ISO 7498 and 8648. These standards state that internetworking should occur within the network layer. The transport layer and higher layers operate on a peer-to-peer basis. ISO 8473 provides a family of subnetwork dependent convergence protocols that provide for the operation of ISO 8473 over different subnetworks. Thus in the example above, ISO 8473 would operate over both the connection mode subnetwork and over the connectionless mode subnetwork. The transport layer, ISO 8073 would provide for operation over the connection mode subnetwork and ISO 8073/AD 2 would provide for operation over the connectionless mode subnetwork. In this example the transport layer would operate in the Class 4 mode. Thus the

internetworking between dissimilar subnetworks would be achieved and the transport layer and higher layers of the end systems would operate on a peer-to-peer basis.

There are three basic principles to be followed in adopting interworking solutions between Q3 protocol stacks.

The three principles are:

1) interworking should be done in the network layer;

2) existing standards should be applied for interworking functions; i.e. X.300-Series Recommendations should be applied for interworking between CO-CO networks; and NLR using ISO 8473 and associated SNDCF for interworking between CO-CL type networks;

3) new interworking functions should be specified only if existing standards for interworking cannot meet requirements of new network capabilities.

Table 11 shows protocol profiles which are to be applied to a reference point which has interworking, and it also defines internetworking methods.

TABLE 11/Q.811

**Internetworking functions for Q3 lower layers**

| Interface in Figure 1 | Protocol profile | Method interworking |
|---|---|---|
| aa | CONS1 | N.R. |
| ab | CONS1 | X.325 |
| ac | CONS1 | X.325 |
| ad | CLNS2 | NLR |
| ae | CONS1 | X.327 |
| af | CONS1 | X.326 |
| ag | CLNS2 | NLR |
| ba | CONS3 | X.325 |
| bb | CONS3 | N.R. |
| bc | CONS3 | N.R. |
| bg | CLNS2 | NLR |
| ca | CONS2 | X.325 |
| cb | CONS2 | N.R. |
| cc | CONS2 | N.R. |
| cg | CLNS2 | NLR |
| da | CLNS1 | NLR |
| dd | CLNS1 | N.R. |
| dg | CLNS1 | NLR |
| ea | CONS6 | X.327 |
| ee | CONS6 | N.R. |
| fa | CONS5 | X.326 |
| ff | CONS5 | N.R. |
| ga | CLNS2 | NLR |
| gb | CLNS2 | NLR |
| gc | CLNS2 | NLR |
| gd | CLNS2 | NLR |
| gg | CLNS2 | N.R. |

NLR Network layer relay

N.R. Not required

NOTE – All other connections are for further study.

# Annex A

## Protocol stack for information transfer over ISDN transparent B-channel

(This annex forms an integral part of this Recommendation)

### A.1 Introduction

This annex describes a protocol stack for connection between data terminal equipment without an intervening packet switched network. End systems are making use of the 64 kbit/s unrestricted circuit mode bearer service offered by an ISDN. The OSI connection-mode service (OSI-CONS) over ISDN transparent B-channel defined in this annex is identified as CONS4 at the Q3 interface.

The CONS4 lower layer protocol profile provides for a connection mode interface using ISDN transparent B-channel.

### A.2 Protocol stack for CONS4 over ISDN transparent B channel

Figure A.1 depicts the protocol stack CONS4 for network management.

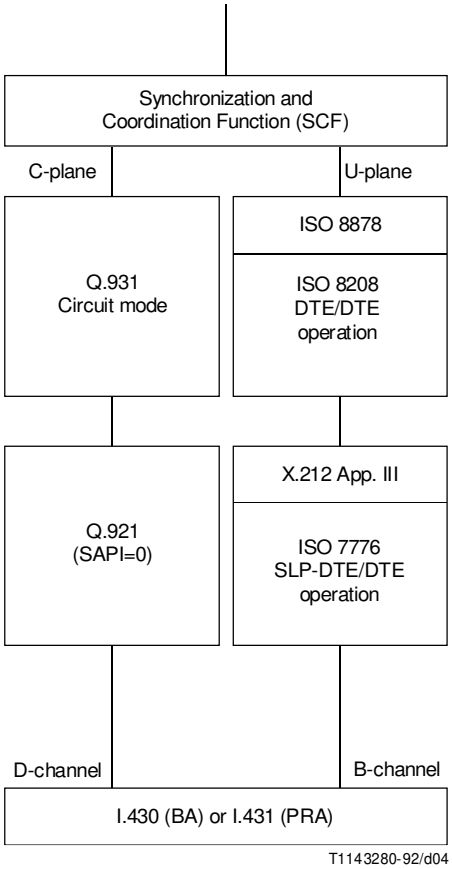



FIGURE A.1/Q.811

**Protocol profile on ISDN for network management**

## A.3 Network profile CONS4

### A.3.1 Physical layer profile

The physical layer conforms to Recommendation I.430 for basic rate access and Recommendation I.431 for primary rate access.

### A.3.2 Link layer C-plane profile

The link layer C-plane conforms to Recommendation Q.921 with the default parameters specified for links within the SAP identified by SAPI = 0.

### A.3.3 Network layer C-plane profile

The network layer C-plane conforms to Recommendation Q.931 for circuit-switched call control procedures using codings of information element as in Table A.1.

TABLE A.1/Q.811

**Q.931 information element encodings in support of CONS4**

| | |
|---|---|
| *Bearer capability (BC) information element codings* | |
| Coding standard (octet 3) | CCITT |
| Information transfer capability (octet 3) | Unrestricted digital information |
| Transfer mode (octet 4) | Circuit mode |
| Information transfer rate (octet 4) | 64 kbit/s |
| *Called party number information element codings* | |
| Type of number (octet 3) | International/national/subscriber |
| Numbering plan identification (octet 3) | ISDN/telephony numbering plan (E.164) |
| *Called/calling party subaddress information element codings* | |
| Type of number (octet 3) | NSAP |
| *Low layer compatibility (LLC) information element codings* | |
| Coding standard (octet 3) | CCITT |
| Information transfer capability (octet 3) | Unrestricted digital information |
| Transfer mode (octet 4) | Circuit mode |
| Information transfer rate (octet 4) | 64 kbit/s |
| User information layer 1 protocol | Not applicable (omit octet 5) |
| User information layer 2 protocol (octet 6) | ISO 7776 DTE-DTE operation |
| – Mode of operation (octet 6a) | Normal/extended (selectable by user whereby normal is a mandatory mode while extended is an optional mode) |
| – Window size (k) (octet 6b) | 1-7 (for modulo 8) (default 7)<br>1-127 (for modulo 128) (default 7) |
| | ISO 8208 DTE-DTE operation |
| User information layer 3 protocol (octet 7) | Normal (modulo 8)/extended (modulo 128) |
| – Mode of operation (octet 7a) | 128, 256, 512 octets (default 128) |
| – Default packet size (octet 7b) | 1-7 (for modulo 8)(default 2) |
| – Packet window size (k) (octet 7c) | 1-127 (for modulo 128)(default 2) |

### A.3.4 Supplementary services

The supplementary service sub-addressing (SUB) is required in order to convey the called and calling NSAP address in the called and calling party sub-address information element, respectively. In addition, the supplementary service closed user group (CUG) may be used to restrict, in a public data communication network (DCN), access of endsystems which are the members of a TMN.

### A.3.5 Link layer U-plane profile

The link layer U-plane conforms to International Standard ISO 7776 for single link procedures (SLP) in DTE-DTE operation. The link layer attributes are specified in Table 7.

### A.3.6 Network layer U-plane profile

The network layer U-plane conforms to International Standard ISO 8208 for DTE-DTE operation over circuit-switched connections.

Determining "DTE" or "DCE" characteristics is based on restart procedure:

a) acts as "DCE" when receiving RESTART INDICATION packet with the restarting cause field "DTE originated" and no restart collision occurred;

b) acts as "DTE" when a RESTART REQUEST packet is subsequently confirmed with a RESTART CONFIRMATION packet (no restart collision occurred);

c) re-initiate a restart procedure when a randomly-chosen time has elapsed following the detection of a restart collision.

The network layer attributes specified in Table 9 apply with the additions contained in Table A.2.

TABLE A.2/Q.811

**Additional U-plane network layer attributes and parameters in suport of CONS4**

| | | |
|---|---|---|
| – | The throughput class corresponds to the access-line bit rate of the B channel which is 64 kbit/s | |
| – | The network layer parameters which apply are: | |
| T20 | Restart requires response timer | 180 seconds |
| T21 | Call request response timer | 200 seconds |
| T22 | Reset request response timer | 180 seconds |
| T23 | Clear request response timer | 180 seconds |
| T24 | Window status transmission timer | Not applicable |
| T25 | Window rotation timer | Not applicable |
| T26 | Interrupt response timer | 180 seconds |
| T27 | Reject response timer | Not applicable |
| T28 | Registration request response timer | Not applicable |
| R20 | Restart request retransmission count | 1 |
| R22 | Reset request retransmission count | 1 |
| R23 | Clear request retransmission count | 1 |
| R25 | Data packet retransmission count | Not applicable |
| R27 | Reject retransmission count | Not applicable |
| R28 | Registration request retransmission count | Not applicable |

### A.3.7 Provision of OSI-CONS

The Synchronization and Coordination Function (SCF) (see Recommendation I.320) provides the connection-mode network service to the network service user.

# Appendix I

## Examples of NSAP structures for CLNP

(This appendix does not form an integral part of this Recommendation)

This appendix summarizes four examples of NSAP structure. Figures I.1, I.2 and I.3 show NSAP structures based on ISO-DCC. Figure I.4 shows an NSAP structure based on ISO-ICD.

| | IDP | | DSP | | | |
|---|---|---|---|---|---|---|
| | AFI | IDI | | | | |
| | 39 | a) | JDI# | AREA | SYSTEM | SEL |
| Number of octets | 1 | 2 | 3 | n | 6 | 1 |

a) ISO DCC (value of 392 as Japan).

# JDI (value of 100009 as NTT)
n Range of value = 1-7

FIGURE I.1/Q.811

**DCC type NSAP address format in Japan standard**

| | IDP | | DSP | | | |
|---|---|---|---|---|---|---|
| | AFI | IDI | | | | |
| | 39 | a) | ORG | AREA | SYSTEM | SEL |
| Number of octets | 1 | 2 | 3 | 2 | 0-6 | 1 |

a) ISO DCC.

ORG Organization Identifier
AREA Subnetwork Identifier
SYSTEM Subnetwork address

FIGURE I.2/Q.811

**ECMA 117 NSAP format**

| | IDP | | DSP | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | AFI | IDI | DFI | | | | | | |
| | 39 | a) | 128 | org | res | rd | AREA | SYSTEM | SEL |
| Number of octets | 1 | 2 | 1 | 3 | 2 | 2 | 2 | 6 | 1 |

a) ISO DCC.

DFI The DSP Format Identifier
org Organization Identifier
res Reserved
rd Routing domain prefix

FIGURE I.3/Q.811

**ANSI NSAP address format**

| | IDP | | DSP | | | |
|---|---|---|---|---|---|---|
| | AFI | IDI | | | | |
| | 47 | a) | DI | FI | TI | SEL |
| Number of octets | 1 | 2 | 3 | 1 | 12 | 1 |

a) ISO ICD.

DI Domain Identifier
FI Format Identifier
TI Terminal Identifier
SEL NSAP selector

FIGURE I.4/Q.811

**ICD type NSAP address format for AOTC-Australia**

## References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[22] CCITT Recommendation *Primary rate user-network interface – Layer 1 specification*, Rec. I.431.

[23] CCITT Recomendation *ISDN user-network interface data link layer specification*, Rec. Q.921.

[24] CCITT Recommendation *Support of packet mode terminal equipment by an ISDN*, Rec. X.31.

[25] ISO 8878 *Use of X.25 to provide the OSI connection mode Network Service*.

[26] CCITT Recommendation *Signalling data link*, Rec. Q.702.

[27] CCITT Recommendation *Signalling link*, Rec. Q.703.

[28] CCITT Recommendation *Signalling network functions and messages*, Rec. Q.704.

[29] CCITT Recommendation *Functional description of the signalling connection control part*, Rec. Q.711.

[30] CCITT Recommendation *Definition and function of SCCP messages*, Rec. Q.712.

[31] CCITT Recommendation *SCCP formats and codes*, Rec. Q.713.

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[33] CCITT Recommendation *Signalling connection control part (SCCP) performances*, Rec. Q.716.

[34] CCITT Recommendation *List of definitions for interchange circuits between data terminal equipment and data circuit-terminating equipment*, Rec. V.24.

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