EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

EUROCONTROL

Eurocontrol Standard Document for Flight Data Exchange Interface Control Document

Part 1

Point-to-Point and Limited Networking Circuits

COM.ET1.ST12-STD-01-01

Edition	:	1.0
Edition Date	:	September 1998
Status	:	Released Issue
Class	:	General Public

EUROPEAN AIR TRAFFIC CONTROL HARMONISATION AND INTEGRATION PROGRAMME

DOCUMENT IDENTIFICATION SHEET

DOCUMENT DESCRIPTION

Document Title

Flight Data Exchange - Interface Control Document
Part 1
Point-to-Point and Limited Networking Circuits.

EWP DELIVERABLE REFERENCE NUMBER	Eurocontrol Standard 008-1-98
PROGRAMME REFERENCE INDEX	**EDITION :** 1.0
COM.ET1.ST12-STD-01-01	**EDITION DATE :** September 1998

Abstract

Flight Data Exchange Interface Control Document Part 1 is a communications profile designed to support the exchange of data between flight data or flight plan processing systems. It specifies a state machine (Message Transfer Protocol) that operates over X.25.

Keywords

Flight data	Interface Control	X.25
Data exchange	Point-to-point circuits	FDPS
Networks	Limited Network circuits	FPPS

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DOCUMENT STATUS AND TYPE

STATUS		CATEGORY		CLASSIFICATION	
Working Draft	☐	Executive Task	☐	General Public	☑
Draft	☐	Specialist Task	☑	EATCHIP	☐
Proposed Issue	☐	Lower Layer Task	☐	Restricted	☐
Released Issue	☑				

ELECTRONIC BACKUP

INTERNAL REFERENCE NAME :

HOST SYSTEM	MEDIA	SOFTWARE(S)
EATCHIP Network	Type : EATCHIP Domain	**MS Office Word 6.0**
	Media Identification :	**MS Windows**

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DOCUMENT APPROVAL

The following table identifies all management authorities who have successively approved the present issue of this document.

AUTHORITY	NAME AND SIGNATURE	DATE
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DOCUMENT CHANGE RECORD

The following table records the complete history of the successive editions of the present document.

EDITION	DATE	REASON FOR CHANGE	SECTIONS / PAGES AFFECTED
1.0	Sept 1998	Adoption by the Eurocontrol Permanent Commission	

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FOREWORD

1. Responsible Body

This Standard Document has been prepared by and is maintained by the Flight Plan related Data Exchange (FPDE) Task Force of the European Organisation for the Safety of Air Navigation (Eurocontrol).

2. EATCHIP Work Programme Document

This Standard relates to the EATCHIP Work Programme Document (EWPD), Communications Domain, Executive Task 01, Specialist Task 12

3. Approval of the Standard

3.1. This Standard is adopted in accordance with the procedures outlined in the Directives for Eurocontrol Standardisation Ref. 000-2-93.

3.2. This Standard becomes effective upon adoption by the Permanent Commission of Eurocontrol and supersedes Eurocontrol Standard for On-Line Data Interchange (OLDI), Edition 1, Part 3 : TECHNICAL REQUIREMENTS (Short Term Interface Control Document) Ref. 001-3-92.

4. Technical Corrigenda and Amendments

This Standard is kept under review to ascertain required amendments or technical corrigenda. The procedure for the maintenance of this Standard is laid down in Annex H of the Directives for the Uniform Drafting and Presentation of Eurocontrol Standard Documents Ref. 000-1-92.

5. Editorial Conventions

5.1. The format of this Standard complies with the Directives for the Uniform Drafting and Presentation of Eurocontrol Standard Documents.

5.2. The following notation has been used to indicate the status of each statement:

- Normative statements use the operative verb “shall” and have been printed in light faced roman text;
- *Recommended statements* use the operative verb “should” and have been printed in light faced italics, the status being indicated by the prefix **Recommendation**.

5.3. Any other information which is considered essential to the understanding of a particular indent will be integrated within the text as a NOTE . A note is considered to be informative only, therefore does not contain specifications and is placed immediately after the indent to which it refers.

5.4. Exceptionally, in order to present the Profile Requirements Lists (PRLs) in Annex E in a suitable format, some tables are not indented and are not continued over several pages.

6. Relationship to other Standard Documents

6.1. This Eurocontrol Standard Document supersedes the OLDI Short Term Interface Control Document (ST-ICD), Part 3, Edition 1 of the OLDI Eurocontrol Standard [Reference 13].

6.2. This Eurocontrol Standard Document is the first part in a expected series of Eurocontrol Standard Interface Control Documents (ICDs) for Flight Data Exchange.

7. Status of Annexes to this Standard

The Annexes to this Standard have the following status:

- Annex A - Normative
- Annex B - Normative
- Annex C - Normative
- Annex D - Normative.
- Annex E - Normative
- Annex F - Informative
- Annex G - Informative
- Annex H - Informative

8. Language Used

The English language has been used for the original text of this Standard.

1. INTRODUCTION

This Eurocontrol Standard is based on the Short Term Interface Control Document developed by the former OLDI Technical Sub-Group which was tasked with defining new interface standards for the future operation of OLDI between Area Control Centres.

Earlier OLDI links were based on proprietary protocols such as INTERCAUTRA or Datenübertragungs- und Verteilungssystem (DÜV), which run over dedicated point-to-point circuits or limited networks, and require the use of specialised hardware and software.

For the larger number of new links planned, it was felt to be desirable to move towards a network-based architecture and the adoption of international telecommunications standards, enabling links to be implemented in a more cost-effective manner, by reducing the number of connections at each Centre and allowing the use of standard "off the shelf" hardware and software.

This Eurocontrol Standard formalises and extends the Short Term ICD. The ST-ICD has been rewritten to give a more rigorous specification that will improve interoperability and, in addition, is suitable to form the basis of future ICDs to meet the evolving requirements for Flight Data Exchange (FDE), including wider use of shared networks and the introduction of new lower layer standards. This Eurocontrol Standard provides a minimum set of functionalities that can be supported by existing OLDI implementations with minimal modifications, using either point-to-point links or Comité Consultatif des Téléphones et Télégraphes (CCITT) Recommendation X.25, 1980 or later, packet-switched networks. For procurement, more possibilities can be specified. This ICD does not prevent agreements on a bilateral basis to go further.

Installations wishing to run other application protocols in addition to, or in place of the one described in this document may either apply for amendment of the present protocol, or separate their protocol using different virtual circuits.

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2. SCOPE

2.1. This Eurocontrol Standard Document specifies a data communications interface for the exchange of flight-related data messages between Area Control Centres (ACCs). It is presented in the form of an Open Systems Interconnection (OSI) profile as defined in International Organisation for Standardisation/International Electrotechnical Commission (ISO/IEC) Technical Report (TR) 10000-2 [Reference 3]. The profile covers both lower layers (T-profile) and upper layers (A-profile).

2.2. This Eurocontrol Standard Document is applicable to the following scenarios:

- support of OLDI as described in Eurocontrol Standard N° 001-92 Edition 1;
- support of transmission of OLDI application messages from ACCs to the Central Flow Management Unit (CFMU) systems.

2.3. The Standard is applicable for connection using either:

- leased line point-to-point circuits, or
- Public Switched Telephone Network (PSTN) point-to-point circuits, or
- packet-switched data networks, or interconnected packet-switched data networks, that provide an interface conforming to CCITT Recommendation X.25, 1980 or later.

NOTES

1. The arrangement between Flight Plan Processing Systems (FPPSs) is represented in Figure 1.
2. Figure 1 does not illustrate potential backup connections, such as PSTN, for which guidance is given in Annex H.

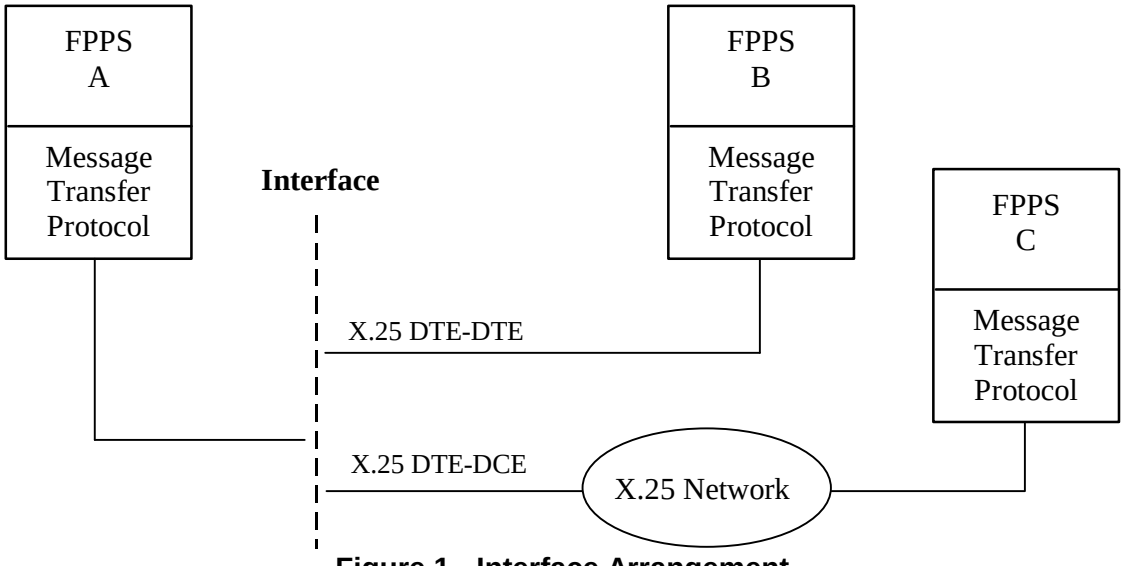

Figure 1 - Interface Arrangement

2.4. Detailed security aspects of the specified data communications interface are not mandated by this Standard. However, a basic provision is specified in Annex C.5.4 and further guidance may be found in Annex H of this Eurocontrol Standard.

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3. REFERENCES

3.1. Introduction

The following documents and standards contain provisions which, through reference in this text, constitute provisions of this Eurocontrol Standard.

At the time of publication of this Eurocontrol Standard, the editions indicated for the referenced documents and standards were valid.

Any revision of the referenced International Civil Aviation Organisation (ICAO) Documents shall be immediately taken into account to revise this Eurocontrol Standard.

Revisions of the other referenced documents shall not form part of the provisions of this Eurocontrol Standard until they are formally reviewed and incorporated into this Eurocontrol Standard Document.

In case of conflict between the requirements of this Eurocontrol Standard Document and the contents of these other referenced documents, this Eurocontrol Standard shall take precedence.

3.2. References

1. ITU-T Recommendation X.25 (1993) (Rev. 1), Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit.
2. ISO/IEC TR 10000-1:1992, Information technology – Framework and taxonomy of International Standardized Profiles: – Part 1: Framework (2nd edition).
3. ISO/IEC TR 10000-2:1994, Information technology – Framework and taxonomy of International Standardized Profiles – Part 2: Principles and Taxonomy for OSI Profiles (3rd edition).
4. ITU-T Recommendation X.21 (1992) (Rev. 1), Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for synchronous operation on public data networks.
5. CCITT Recommendation X.21bis (1988), Use on public data networks of data terminal equipment (DTE) which is designed for interfacing to synchronous V-Series modems.
6. ISO/IEC 7776:1994, Information technology – Telecommunications and information exchange between systems – High-level data link control procedures – Description of the X.25 LAPB-compatible DTE Data Link procedures (2nd edition).
7. ISO/IEC 8208:1993, Information Technology – Data communications – X.25 Packet Layer Protocol for Data Terminal Equipment (3rd edition).

8. ISO/IEC ISP 10609-9:1992, Information technology – International Standardized Profiles TB, TC, TD and TE – Connection-mode Transport Service over Connection-mode Network Service – Part 9: Subnetwork-type dependent requirements for Network Layer, Data Link Layer and Physical Layer concerning permanent access to a packet-switched data network using virtual calls.

9. ISO/IEC 7498-1:1994, Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model (2nd edition).

10. ISO/IEC 8348:1993, Information technology – Open Systems Interconnection – Network Service Definition (1st edition).

11. ISO/IEC 8072:1994, Information technology – Open Systems Interconnection – Transport service definition (2nd edition).

12. ISO/IEC 8878:1992, Information Technology – Telecommunications and information exchange between systems – Use of X.25 to provide the OSI connection-mode Network Service (2nd edition).

13. Eurocontrol Standard for On-Line Data Interchange (OLDI), N° 001-92, Edition 1, 1992.

14. ISO/IEC 9646-1:1994, Information technology – Open Systems Interconnection – Conformance testing methodology and framework – Part 1: General concepts (2nd edition).

15. Eurocontrol (Maastricht Upper Area Control (UAC) Systems Division) FDE ICD Part 1 Integration Test Plan Version 1.0, dated 10 May 1996.

16. Eurocontrol FDE ICD Part 1– Reliability, Availability and Security – Technical Report version 1.0, dated 20 April 1997.

17. ITU-T Recommendation X.32 (1993) (Rev. 1), Interface between DTE and DCE for terminals operating in the packet mode and accessing a packet switched public data through a public switched telephone network or an integrated services digital network or a circuit switched public data network.

18. ITU-T Recommendation E.164 (1991) (Rev. 1), Numbering plan for the ISDN era.

19. ITU-T Recommendation X.75 (1993) (Rev. 1), Packet-switched signalling system between public network providing data transmission service.

20. ITU-T Recommendation X.121 (1993), International numbering plan for public data networks.

4. DEFINITIONS, SYMBOLS AND ABBREVIATIONS

4.1. Definitions

4.1.1 For the purposes of this Eurocontrol Standard Document, the following definitions shall apply:

4.1.2. **Profile :** A set of one or more base standards, and, where applicable, the identification of chosen classes, subsets, options and parameters of those base standards, necessary for accomplishing a particular function [Reference 2].

4.1.3. **Profile Requirements List (PRL) :** The profile requirements are expressed in the form of conformance requirements and are arranged in a tabular list format [Reference 2].

4.1.4. **T-profile :** Transport Profile providing a Connection mode Transport Service [Reference 3].

4.1.5. **A-profile :** Application Profile requiring a Connection-mode Transport Service [Reference 3].

4.1.6. **Protocol Implementation Conformance Statement (PICS) :** A statement made by the supplier of an OSI system, stating which capabilities have been implemented, for a given OSI protocol [Reference 14].

4.2. Symbols and Abbreviations

For the purpose of this Eurocontrol Standard Document, the following symbols and abbreviations are used :

ACC	Area Control Centre
AFI	Authority and Format Identifier
ASCII	American Standard Code for Information Interchange
ATC	Air Traffic Control
ATCC	Air Traffic Control Centre
CAUTRA	Coordinateur Automatique du Trafic Aérien
CCITT	Comité consultatif international télégraphique et téléphonique (now ITU-T)
CFMU	Central Flow Management Unit
CUG	Closed User Group
DCE	Data Circuit-terminating Equipment
DCTS	Digital Communications Terminal System
DSP	Domain Specific Part
DTE	Data Terminal Equipment
DÜV	Datenübertragungs- und Verteilungssystem
FDE	Flight Data Exchange
FEP	Front-End Processor
FPDE	Flight Plan related Data Exchange
FPPS	Flight Plan Processing System

ICAO	International Civil Aviation Organisation
ICD	Interface Control Document
IDI	Initial Domain Identifier
IDP	Initial Domain Part
IEC	International Electrotechnical Commission
INTERCAUTRA	Inter-CAUTRA protocol
ISO	International Organization for Standardization
ITU-T	International Telecommunication Union - Telecommunication Standardization Sector
ISDN	Integrated Services Digital Network
LAPB	Link Access Procedure Balanced
LSB	Least Significant Bit
M, m	Mandatory
MSB	Most Significant Bit
MT	Message Transfer
NA	Not Applicable
NS	Network Service
NSAP	Network Service Access Point
NSDU	Network Service Data Unit
O, O.<n>	Optional, where <n> is a numeral for referencing
o, o.<n>	Optional, where <n> is a numeral for referencing
OLDI	On-Line Data Interchange
OSI	Open Systems Interconnection
PICS	Protocol Implementation Conformance Statement
PLP	Packet Layer Protocol
PRL	Profile Requirements List
PSTN	Public Switched Telephone Network
ST-ICD	Short Term Interface Control Document
SUT	System Under Test
T<x>	Timer (where <x> is a single or double letter for referencing)
TA	Terminal Adaptor
TSDU	Transport Service Data Unit
TPDU	Transport Protocol Data Unit
TR	ISO Technical Report
X	Prohibited
x	Excluded
<item>:	Conditional Item (dependent on the value of item)

4.3. Notations

4.3.1 For the purpose of this Eurocontrol Standard Document, binary values or a sequence of bits are denoted in hexadecimal using the notation 'd'H, where the letter d stands for a digit or a sequence of hexadecimal digits.

4.3.2 For the purpose of this Eurocontrol Standard Document, the hexadecimal representation of a bit sequence is formed by taking 4 bits at a time from the most significant bit (MSB) to the least significant bit (LSB).

NOTE - Unless otherwise specified in the referred international Standards, a sequence of bits is transmitted from MSB to LSB.

4.3.3 For the purpose of this Eurocontrol Standard Document, the status of the support for features of a base standard, or this Eurocontrol Standard, shall be shown in upper case (e.g. M, O, O.<n>, X). The exact meaning of each status symbol is described in the Annexes of this Eurocontrol Standard prior to their use.

4.3.4 For the purpose of defining the FDE ICD Part 1 profile in this Eurocontrol Standard Document, the status of the support for features of a base standard or this Eurocontrol Standard, shall be shown in lower case (e.g. m, o, o.<n>, x).

NOTE - The result is a further refinement of the features of the base standards that areconditional, optional, or value dependent (see E.3.1).

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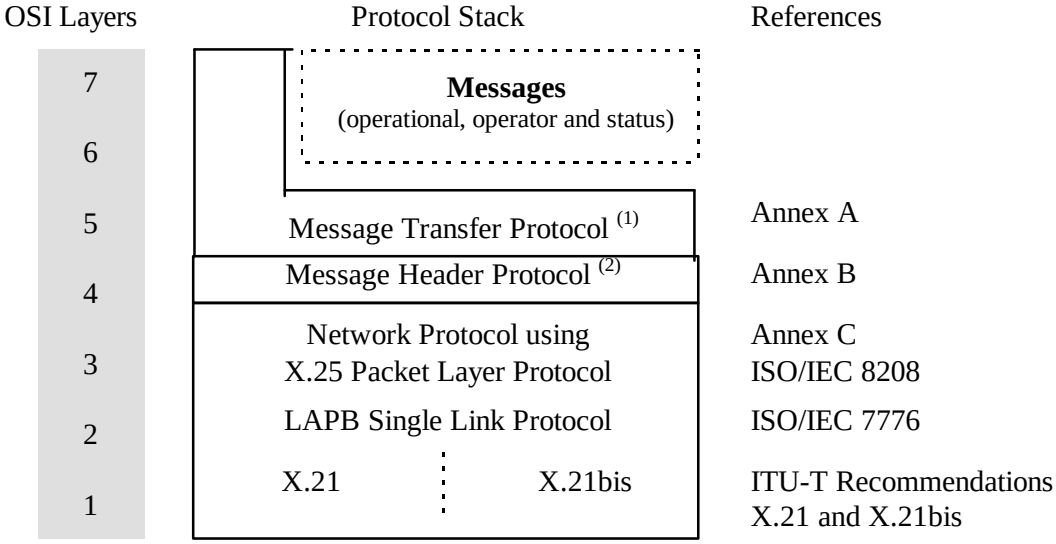
5. TECHNICAL OVERVIEW

5.1. Protocol Stack

NOTE - The protocol stack for the profile of this Eurocontrol Standard is illustrated in Figure 2. The figure places the protocols in the framework of the OSI Basic Reference Model [Reference 9] by aligning the stack with the corresponding OSI layers. However, the protocol stack is a specification for pre-OSI systems and it does not support the many functions that are allowed in the OSI protocols of the corresponding OSI layers.



NOTES

1. The Message Transfer Protocol makes use of system messages which have the same general form as the other application messages.
2. The Message Header Protocol acts as a minimal transport layer.

Figure 2 - Profile Protocol Stack

5.2. Structure of the Profile

NOTES

1. As shown in Figure 2, the profile stack combines several lower layer protocols, of which only the X.25 Packet Layer Protocol (PLP) [Reference 1] and its supporting protocols, X.21 [Reference 4] and X.21bis [Reference 5], are defined in existing ISO/IEC and International Telecommunication Union-Telecommunication Standardization Sector (ITU-T) standards. The other higher layer protocols are defined in Annexes (Annexes A, B and C) in this Eurocontrol Standard Document.
2. Conformance requirements for the profile can refer to these specifications on an equal footing with external standards and are stated in Section 6. The detailed requirements are stated using the tabular format of PRLs (Annex E) and PICS proformas (proformas for protocols defined in the Annexes are given in Annex D). The use of these PRLs and PICS proformas in development and/or procurement is explained in Annex E.

5.3. Relation to Previous Versions of the Specification

NOTES

1. This profile is based on the ST-ICD developed by the former OLDI Technical Sub-Group. The protocols and packet formats defined in this Eurocontrol Standard Document are a compatible subset of those of the ST-ICD with the exception that this Eurocontrol Standard makes more detailed requirements on the use of the X.25 PLP, includes mandatory support of the M-bit and corrects the inconsistent specification of the Authority and Format Identifier (AFI) value in the Network Service Access Point (NSAP) address.

2. The main change in the style of this Eurocontrol Standard Document relates to the structure of the ICD specification. The Message Transfer Protocol (Annex A) is separated from the supporting T-profile. This will facilitate the use of other T-profiles as this becomes necessary to support evolving FDE requirements.

3. Those parts of the ST-ICD specification dealing with control of X.25 virtual circuits and delimiting application messages are now found in the Message Header Protocol (Annex B), which constitutes a minimal transport layer for FDE.

6. PROFILE REQUIREMENTS

6.1. Conformance Requirements

6.1.1. An implementation claiming conformance to this specification shall meet the requirements laid down in sections 6.2 and 6.3 below.

6.1.2. A claim of conformance shall be supported by a Profile Implementation Conformance Statement as described in Annex D and Annex E.

6.2. Upper-layer Requirements

6.2.1. A conforming implementation shall satisfy the requirements of the base standard, given at Annex A.

6.2.2. A conforming implementation shall satisfy the constraints given in the Profile Requirements List at Annex E.7.

6.3. Lower-layer Requirements

6.3.1. Transport Layer Requirements

6.3.1.1. A conforming implementation shall satisfy the requirements of the base standard, given at Annex B.

6.3.1.2. A conforming implementation shall satisfy the constraints given in the Profile Requirements List at Annex E.8.1

6.3.1.3. A conforming implementation shall satisfy the requirement of supporting Transport Service Data Unit (TSDU) sizes of up to and including 4097 octets.

NOTE - The first octet of the TSDU corresponds to a field of the Message Header (see A.4.10 and B.4.4), leaving a maximum of 4096 octets for user data.

6.3.2. Network Layer Requirements

6.3.2.1. A conforming implementation shall satisfy the requirements of ISO/IEC 8208 [Reference 7] in accordance with the protocol mapping given at Annex C.

6.3.2.2. A conforming implementation shall satisfy the constraints given in the Profile Requirements List at Annex E.8.2.

6.3.2.3. A conforming implementation shall, if data terminal equipment (DTE)-DTE operation is supported, be capable of configuring by system management mechanisms the choice of DTE or data circuit-terminating equipment (DCE) role for the DTE-DTE operation.

6.3.2.4. A conforming implementation shall, in either role defined by 6.3.2.3, be capable of initiating a connection according to the specification of Annex C i.e. the protocol is totally symmetric.

NOTE - Some existing implementations based on the ST-ICD, may not be able to initiate network connections according to the protocol of Annex C.

6.3.2.5. A conforming implementation shall agree for a period of time to the facility of Non-standard Default Packet Sizes, with the value 256 for both directions of transmission.

6.3.2.6. A conforming implementation shall use NSAP addresses as defined in Annex C.

6.3.2.7. A conforming implementation shall set the D-bit to 0 in CALL REQUEST, CALL ACCEPTED and DATA packets.

NOTE - Setting D=0 in CALL REQUEST and CALL ACCEPTED packets has the effect of not using Delivery Confirmation.

6.3.3. Datalink Layer Requirements

6.3.3.1. A conforming implementation shall satisfy the conformance requirements of ISO/IEC 7776 [Reference 6] for the Link Access Protocol Balanced (LAPB) Single Link Protocol.

6.3.3.2. A conforming implementation shall also satisfy the constraints given in the Profile Requirements List at Annex E.8.3.

6.3.4. Physical Layer Requirements

A conforming implementation shall satisfy the conformance requirements of ISO/IEC ISP 10609-9 clause 7[Reference 8].

7. TEST METHODS

NOTES

1. An approach to conformance testing of implementations of this specification is outlined in Annex F.
2. The use of the PRLs and PICS proformas provided with this specification to document conformance is outlined in Annex E.

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ANNEX A (NORMATIVE) MESSAGE TRANSFER PROTOCOL

A.1. Introduction

This specification defines a protocol to implement a simple message transfer service for applications that require flight data exchange.

A.2. Service Implemented

The Message Transfer (MT) protocol implements the following unconfirmed services :

MT-Associate : establish an application message transfer association;

MT-Data : transfer an application message consisting of American Standard Code for Information Interchange (ASCII) characters;

MT-Abort : terminate an application message transfer association.

A.3. Service Assumed

This Message Transfer protocol assumes a subset of the Connection-mode Transport Service as defined in ISO/IEC 8072 [Reference 11], such as that offered by the protocol defined in Annex B of this Eurocontrol Standard.

A.4. Protocol Specification

A.4.1. Introduction

In the following text, only the operation of one application initiated Message Transfer association is described. Further associations may be supported on the same network interface, by repeating these procedures for each underlying transport connection.

A.4.2. Types of Data

This Annex identifies four types of application messages that are equivalent to those defined in Eurocontrol Standard N^{o} 001-3-92 Edition 1:

System Messages: These messages shall be used for link monitoring (HEARTBEAT message) and application control (STARTUP and SHUTDOWN messages).

Operational Messages : These messages shall be linked to a specific operational context and are defined in the Eurocontrol Standards and Documents that make use of this Standard for data interchange. Eurocontrol Standard Document for On-Line Data Interchange defines operational messages such as the Activation (ACT), Advanced Boundary Information (ABI), Logical Acknowledgement (LAM) messages.

Operator Messages : These messages shall contain free text. Their use shall be bilaterally agreed. For example, they may be used to exchange test information or to inform the other side about operator actions.

Status Messages : The use and the contents of these messages shall be bilaterally agreed. For example, they may be used to exchange system management information.

NOTES

1. The use of System messages is part of the operation of this protocol and their format is specified in paragraph A.4.10.3 of this Annex.
2. The use and format of Status messages are subject to bilateral agreement, and are not further specified in this Eurocontrol Standard.
3. The state of the protocol determines which types of messages can be transmitted, as specified in the following paragraphs.

A.4.3. Association Establishment

A.4.3.1. The protocol is initially in the IDLE state.

A.4.3.2. The MT-Associate-Request primitive is executed to establish an application association and bring the protocol into the DATA_READY state. The primitive has to be invoked by both the local and remote applications.

A.4.3.3. It is first necessary to establish an underlying transport connection, following the T-connect primitive procedures described in Annex B paragraph B.4.1, after which the protocol enters the READY state. At this stage only System messages (and possibly, by bilateral agreement, Operator messages) can be transferred. To transfer a System or Operator message, the sender uses the T-Data primitive (see B.4.4), with the message as parameter.

A.4.3.4. A STARTUP message (system message) shall then be transmitted, timer Tr (see A.4.7) shall be started, and the protocol enters the ASSOCIATION_PENDING state. If timer Tr expires while the protocol is still in this state, the STARTUP message shall be retransmitted and the timer shall be restarted.

NOTE - The protocol will remain in the ASSOCIATION_PENDING state until a STARTUP message is received. Continuous time-outs of the Tr timer could be signalled locally.

A.4.3.5. Receipt of the STARTUP message shall cause the following actions:

- in the ASSOCIATION_PENDING state, a further STARTUP message is transmitted, the protocol enters the DATA_READY state and the MT-Associate-Indication primitive is signalled;
- in any other state, the message is ignored.

A.4.3.6. Receipt of the STARTUP message in state ASSOCIATION_PENDING corresponds to either:

- the remote application issued a MT-Associate-Request primitive and its Message Transfer protocol has entered the ASSOCIATION_PENDING state, or
- the remote Message Transfer protocol is responding to a previously received STARTUP message and has entered the DATA_READY State.

NOTE - This uncertainty occurs because the same message is used for STARTUP and for response to STARTUP. As a result, the Message Transfer protocol that first entered the DATA_READY state will receive a further STARTUP message. As specified in A.4.3.5, this STARTUP message is ignored.

A.4.3.7. Once STARTUP messages have been exchanged, the association is established and all the identified types of messages can be transferred (DATA_READY state).

A.4.4. Data Transfer

Other types of messages are transferred in the same way as System messages, using the T-Data service, with the message as parameter. This corresponds to the MT-Data-Request and the MT-Data-Indication service primitives.

NOTE - Each message is sent as a single TSDU: there is no concatenation or segmentation of messages at this level.

A.4.5. Orderly Association Release

A.4.5.1. The Message Transfer association between two applications can be cleared by either one. This corresponds to the MT-Abort-Request service primitive.

A.4.5.2. The following actions shall be taken:

- in the DATA_READY state, a SHUTDOWN message (system message) shall be transmitted, timers Tr and Ts shall be stopped, and the transport connection shall be released;
- in the ASSOCIATION_PENDING state, a SHUTDOWN message (system message) shall be transmitted, timer Tr shall be stopped, and the transport connection shall be released;
- in the READY state the transport connection shall be released;
- otherwise no action is taken.

NOTE - The SHUTDOWN message is not an early warning – the association is terminated immediately. There is no confirmation of this message from the other side.

A.4.5.3. Receipt of a SHUTDOWN message shall cause the following actions:

- in the DATA_READY state, timer Ts (see A.4.7) shall be stopped, MT-Abort-Indication is signalled and the interface enters the ASSOCIATION_PENDING state without sending a STARTUP message;
- in any other state, no action is taken.

A.4.6. Association Re-establishment

The application which initiated the clearing of the association has the responsibility, when it is ready, for re-establishing the application association and any lower levels (if necessary).

NOTE - If the clearing of the association has resulted in the release of the underlying network connection, the association establishment procedure specified in paragraph A.4.3 must be followed.

A.4.7. Association Integrity

A.4.7.1. The integrity of the association between two applications is provided by the idle heartbeat facility.

A.4.7.2. On entering the DATA_READY state and on transmitting any type of message on the transport connection, a configurable timer Ts shall be (re)started. If the timer Ts expires in the DATA_READY state, a HEARTBEAT message (System message) shall be transmitted (and the timer shall be restarted).

A.4.7.3. Similarly, on entering the DATA_READY state and on receiving any message except a STARTUP message on the connection, a configurable timer Tr shall be (re)started. If the timer Tr expires in the DATA_READY state, MT-Abort-Indication is signalled, the transmission of all messages is stopped, timer Ts is stopped and the timer Tr is restarted. The interface is in the ASSOCIATION_PENDING state.

NOTE - The applications will recover and resynchronise through the exchange of STARTUP messages (see A.4.3).

A.4.8. Disorderly Association Release

A.4.8.1. There can be an abnormal association release if:

- the transport connection fails (e.g. line failure, protocol error),
- one of the two applications or systems fails (this could be due to hardware or software failure; in some cases, the underlying transport connection can still be working).

NOTE - Following the definition of the transport procotol in Annex B, there is no end-to-end transport connection. As a result, failure of the transport connection is a direct result of the network connection failure.

A.4.8.2. An application or system failure can be detected by the expiry of a time-out for the receipt of an expected HEARTBEAT message (see A.4.7) from this application.

A.4.9. Recovery From Failure

A.4.9.1. Two cases have to be considered:

- after a transport connection failure;
- after an application failure.

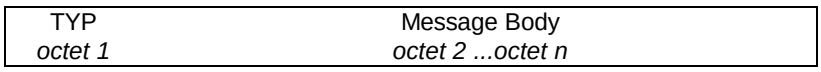
A.4.9.2. In both cases, the re-establishment involves the normal association establishment procedure (see A.4.3), including exchange of STARTUP messages.

NOTE - In the event of a failure at the application level that does not cause the underlying connection to be released, the failed system may transmit a SHUTDOWN message (i.e. L_shutdown invoked either manually or as part of the application logic) before attempting to restart the link. This will curtail the remote application's time-out Tr and may result in a quicker recovery with less chance of lost data.

A.4.10. Message Formats

A.4.10.1. General Message Structure

All messages consist of an integer type field ("TYP") from the range 1...63 followed by the message body. The "TYP" field is encoded in one octet as an ASCII character by adding '40'H to the binary representation of the field (e.g. the value 3 is encoded as '43'H, character 'C'). The message body consists of ASCII characters encoded one per octet. This gives the following format:



A.4.10.2. Message Body Length

Message bodies of length up to and including 4096 octets shall be supported.

A.4.10.3. System Message Formats

System messages are coded with TYP = 4, encoded as '44'H. The message body consists of a two octets, coded as follows:

- STARTUP message: '3031'H (ASCII digits "01");
- SHUTDOWN message: '3030'H (ASCII digits "00");
- HEARTBEAT message: '3033'H (ASCII digits "03").

A.4.10.4. Other Message Formats

Field TYP defines the message type, encoded as described above:

- value 1 (encoded as '41'H) Operational messages;
- value 2 (encoded as '42'H) Operator messages;
- value 5 (encoded as '45'H) Status messages.

NOTES

1. The format of the message body for Status messages is beyond the scope of this Eurocontrol Standard Document.
2. The format for Operational messages is specified in Eurocontrol Standards and Documents that define messaging applications such as On-Line Data Interchange [Reference 13].
3. Operator messages consist of printable ASCII text. If these messages are supported, a user interface must be provided to display received messages and to allow the composition of messages for transmission.

A.5. Protocol State Transition Tables

A.5.1. Introduction

The state tables given below are the definitive specification of the protocol. In case of discrepancy with the main text above, the specification below shall prevail.

NOTE - The notation used to describe states, events, timers and actions are based on the ST-ICD. However, the following definitions and resulting actions have been reviewed and may differ from the ST-ICD.

A.5.2. State Definitions

Table 1 - State Definitions

State	State Description	Additional State Information
state 0	IDLE	No transport connection
state 1	READY	Transport connection established, local user down, remote user down
state 2	ASSOCIATION_PENDING	Transport connection established, local user up, remote user down
state 3	DATA_READY	Local user up, remote user up

A.5.3. Possible Events

Table 2 - Possible Events

Event Description	Additional State Information
L_data	Indication that data (Operational, Operator, or Status message) is to be sent from the local to the remote user (MT-Data Request primitive)
L_shutdown	A command is given to stop the local user (MT-Abort Request)
L_startup	A command is given to start the local user (MT-Associate Request)
R_data	Indicates that data has been received from the remote user (T-Data Indication, TYP ≠ 'System')
R_heartbeat	A HEARTBEAT message is received from the remote user (T-Data Indication, TYP = 'System', Message code = HEARTBEAT)
R_shutdown	A SHUTDOWN message is received from the remote user (T-Data Indication, TYP = 'System', Message code = SHUTDOWN)
R_startup	A STARTUP message is received from the remote user (T-Data Indication, TYP = 'System', Message code = STARTUP)
Ts_timeout	Expiry of timer Ts
Tr_timeout	Expiry of timer Tr
TC_disconnect	A Transport connection release indication has been received (T-Disconnect Indication)
TC_setup	Event (e.g. explicit command, application request) which causes a T-Connect Request primitive

A.5.4. Timers

Table 3 - Timers

Timer	Timer information
Tr	Time-out when a HEARTBEAT or a data message is expected
Ts	Time-out for sending a HEARTBEAT to the remote user

The value of these timers shall be such that Tr = 2Ts + transit time.

NOTE - Typical values of these timers are: Ts = 30s, Tr = 70s.

A.5.5. State Transition Table

Table 4 - State Transitions

State	Event	Actions to be Taken	New State
state 0	TC_setup	The transport layer attempts to set up the lower layer connection(s) between the local and remote users; when the connection has been successfully established, the user is notified (1)	state 1
	TC_disconnect	The system takes appropriate actions but remains in state 0	state 0
	L_data L_shutdown L_startup Tr_timeout Ts_timeout	Ignored	state 0
	R_data R_heartbeat R_shutdown R_startup	Ignore (event should not happen)	state 0
state 1	L_startup	The local user sends a STARTUP message to the remote user, timer Tr is started (2)	state 2
	R_startup	The local user receives a STARTUP message from the remote user, this STARTUP message is ignored since an L_startup event has not occurred	state 1
	L_data R_data R_heartbeat R_shutdown TC_setup	Ignored	state 1
	Tr_timeout Ts_timeout	Ignored	state 1
	L_shutdown	The transport connection is cleared	state 0
	TC_disconnect	The local user is notified that the transport connection is disconnected (e.g. due to an error or a remote shutdown)	state 0

NOTES

1. When entering state 0, it may be considered to automatically generate the TC_setup event.
2. Only when entering state 1 via an automatically generated TC_setup event as described in state 0, then the L_startup event may be automatically generated.

"Table 4 - (concluded)"

State	Event	Actions to be Taken	New State
state 2	R_startup	The local user receives a STARTUP message from the remote user; timers Tr and Ts are started; the local user is notified that data can be sent on the association and the reception of the STARTUP message is explicitly notified by replying with another STARTUP message (1)	state 3
	Tr_timeout	The local user retransmits a STARTUP message if it did not receive a STARTUP message from the remote user within a specified time period Tr, timer Tr is restarted	state 2
	L_startup L_data R_data R_heartbeat R_shutdown Ts_timeout TC_setup	Ignored	state 2
	L_shutdown	The local user is directed to shut down the association : a SHUTDOWN message is transmitted, timer Tr is stopped and the transport connection is released	state 0
	TC_disconnect	The local user is notified that the transport connection is disconnected (e.g. due to an error), timer Tr is stopped and the association is aborted	state 0
state 3	L_data	Timer Ts is restarted	state 3
	R_data R_heartbeat	Timer Tr is restarted	state 3
	R_startup	If a STARTUP message is received from the remote user, it is considered as an acknowledgement of a previously sent STARTUP message; timer Tr is not restarted	state 3
	Ts_timeout	A HEARTBEAT message is sent and timer Ts is restarted	state 3
	L_startup TC_setup	Ignored	state 3(2)
	R_shutdown	Timer Ts is stopped; MT-Abort-Indication is signalled to the local user	state 2
	Tr_timeout	Timer Ts is stopped. MT-Abort-Indication is signalled to the local user; timer Tr is restarted	state 2
	L_shutdown	A SHUTDOWN message is transmitted; timers Tr and Ts are stopped and the transport connection is released	state 0
	TC_disconnect	The local user is notified that the transport connection is disconnected (e.g. due to an error); timers Tr and Ts are stopped and the association is aborted	state 0

NOTES

1. This method guarantees that a received STARTUP message from a remote user is always acknowledged by a STARTUP message.
2. Some existing implementations, pre-dating this Eurocontrol Standard Document, may treat this event as TC_disconnect, i.e. returning to state 0.

A.5.6. State Transition Diagram

NOTE - The protocol is described in Figure A.1 in the form of a state transition diagram. The diagram is only informative: in case of conflict between the diagram and the state tables above, the latter shall take precedence.

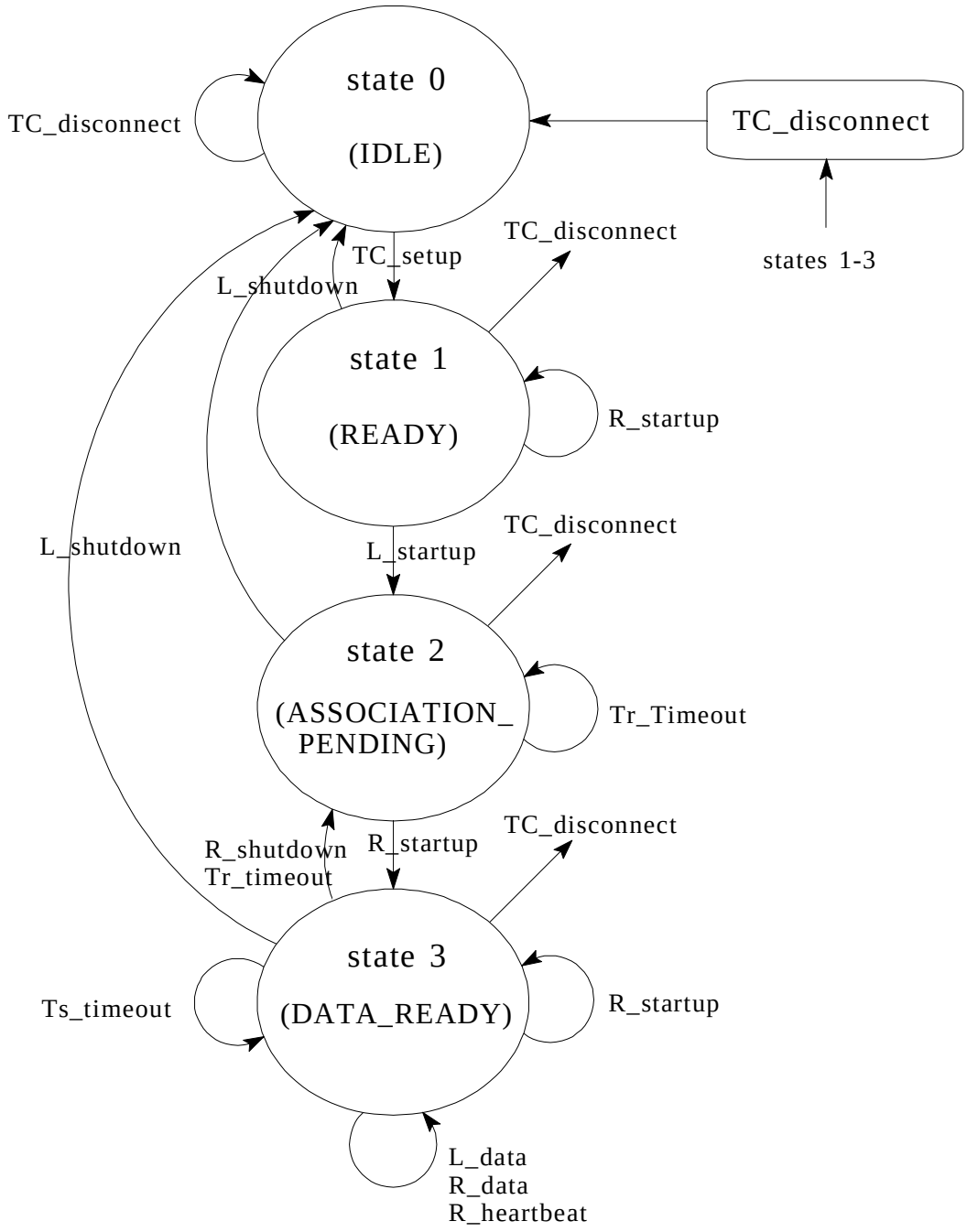


Figure A.1. Message Transfer Protocol: State Transition Diagram

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ANNEX B (NORMATIVE)
MESSAGE HEADER PROTOCOL

B.1. Introduction

This Annex defines the Message Header protocol, a minimal transport protocol to be used for applications such as OLDI.

B.2. Service Implemented

B.2.1. The Message Header protocol corresponds to a subset of the Connection-mode transport Service, as defined in ISO/IEC 8072 [Reference 11], comprising the following service primitives.

T-Connect : establish a transport connection for an application

T-Data : transfer ASCII data

T-Disconnect : terminate the transport connection of an application

B.2.2. The service does not support multiplexing, error recovery, or segmentation and reassembly.

B.3. Service Assumed

The protocol assumes a reliable basic network service as provided by the X.25 Packet Layer Protocol.

NOTE - Only a single transport connection is supported on each network connection.

B.4. Protocol Specification

B.4.1. Connection Establishment

The T-Connect primitive shall be implemented by using the N-Connect service of the underlying network service. There is a direct mapping between the two sets of (request, indication) primitives. Alternatively, an existing network connection may be used (e.g. one established by system management mechanisms).

Recommendations

1. *In the latter case above the network connection should be reset before use. The N-Connect primitive may be reissued automatically if no response has been received within a certain time.*
2. *If this automatic retry is implemented, retries should be attempted approximately every 15s.*

B.4.2. Avoidance of Redundant Network Connections

If an N-Connect-Request primitive is outstanding (i.e. no corresponding N-Connect-Confirm or N-Disconnect primitive has been signalled) and an N-Connect-Indication is signalled, then the incoming network establishment attempt shall be rejected or cleared, by responding with an N-Disconnect-Request primitive, only when both the following conditions apply:

- the calling NSAP address of the N-Connect-Indication is the same as the called NSAP address of the outstanding N-Connect-Request;
- the calling NSAP address of the outstanding N-Connect-Request is greater than the called NSAP address of the outstanding N-Connect-Request, the comparison being made on the bit strings formed by the preferred binary encoding of each NSAP address, as defined in ISO/IEC 8348 Annex A [Reference 10] (a string shall be considered greater than any of its proper initial substrings, e.g. '8800'H > '88'H).

B.4.3. Connection Release

B.4.3.1. Connection release shall use the N-Disconnect and N-Reset service primitives of the underlying network service.

B.4.3.2. To implement a T-Disconnect-Request, an N-Disconnect-Request shall be signalled. Alternatively, if the establishment of network connections using N-Connect primitives is not supported, the network connection shall not be explicitly released.

Recommendation *In the latter case, above the network connection should be reset.*

B.4.3.3. A T-Disconnect-Indication shall be signalled on the receipt of either of the following network service primitives on a network connection corresponding to a wholly or partly established transport connection:

- N-Disconnect-Indication;
- N-Reset-Indication.

B.4.4. Data Transfer

B.4.4.1. The T-Data primitive shall be implemented by using the N-Data primitive of the underlying network service. There is a direct mapping between the two sets of (request, indication) primitives. The mapping uses a Transport Protocol Data Unit (TPDU) which is transferred by the network service.

B.4.4.2. The TPDU shall have the following format, transmitted from left to right, whereby the message structure defined in A.4.10.1 is to be inserted in the data(1), data(2)...data(n) fields.

STX '02'H	LENG '48'H	ADEST '40'H	DEST '40'H	AEMM '40'H	EMM '40'H	data(1)	ADR '40'H	data(2) ... data(n)	ETX '03'H

NOTES

1. This header is defined so as to be identical to that used in the INTERCAUTRA procedure defined for ACT message exchange between CAUTRA Paris, the 9020D system of the London Air Traffic Control Centre and Digital Communications Terminal System (DCTS) Maastricht/Karlsruhe, when carrying the message formats defined in Annex A; in this case the field "data(1)" corresponds to the TYP field.
2. The use of the fields ADEST, DEST, AEMM, EMM, and ADR with values other than '40'H is beyond the scope of this Eurocontrol Standard Document, but may be subject to bilateral agreement.

B.4.4.3. The T-Data service shall be restricted to the transfer of printable ASCII character data. In particular, none of the data octets shall have the value '03'H (the character ETX).

B.4.4.4. A conforming implementation shall satisfy the requirement of supporting Network Service Data Unit (NSDU) sizes of up to and including 4105 octets.

B.4.4.5. A conforming implementation shall prohibit concatenation of multiple TSDUs into a single NSDU.

B.4.4.6. A conforming implementation shall prohibit segmentation of a single TSDU into multiple NSDU’s.

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ANNEX C (NORMATIVE) NETWORK PROTOCOL

C.1. Introduction

This Annex specifies a basic Network Protocol using the X.25 packet layer protocol, for use in both point-to-point and packet-switched network environments, to support the transfer of flight data. The protocol subset is compatible with that defined in versions of [Reference 1] from the 1980 edition on.

C.2. Service Provided

C.2.1. The protocol implements the connection-mode OSI Network Service as defined in ISO/IEC 8348 [Reference 10], with the following exceptions.

- NSAP addresses are restricted to the form defined in C.4.2;
- there is no facility for establishing agreement between the Network Service (NS) users and the NS provider on the quality of service associated with a network connection;
- transfer of NS-User-Data during network connection establishment and release is not supported except for provisions described in C.5.3.

C.2.2. The following NS provider-options are not offered:

- Receipt Confirmation;
- Expedited Data Transfer.

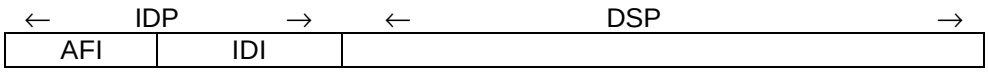
C.3. Service Assumed

The protocol assumes the provision of an OSI Datalink Service, such as that offered by ISO/IEC 7776 (LAPB) [Reference 6].

C.4. NSAP Addressing

C.4.1. Introduction

C.4.1.1. The structure of the NSAP addresses follows that defined in ISO/IEC 8348 Annex A [Reference 10], as illustrated below.



C.4.1.2. The components of the NSAP address are defined below:

IDP: Initial Domain Part, comprising the AFI and IDI fields

AFI: Authority and Format Identifier, and

IDI: Initial Domain Identifier

DSP: Domain Specific Part

C.4.2. NSAP Address Structure

C.4.2.1. For the purpose of this Eurocontrol Standard Document, the address components shall be limited to the following form.

C.4.2.2. The AFI value 48 shall be used, indicating a Local format IDI with decimal abstract syntax.

C.4.2.3. The IDI is null, following the Local format.

C.4.2.4. The DSP shall consist of 2 pairs of decimal digits, as follows:

- the first pair is an Air Traffic Control (ATC) unit identifier, which identifies an ATC system and thus indirectly a location;
- the second pair is an ATC unit selector, which may be used to identify a particular end point within an ATC unit.

C.4.2.5. The resulting NSAP address structure is illustrated below.

AFI	DSP	
48	ATC unit identifier	ATC unit selector

C.4.3. Assignment of ATC Unit Identifiers and Selectors

C.4.3.1. Assignment of unique ATC unit identifiers to each ATC system will be the responsibility of Eurocontrol, while ATC unit selectors will be assigned by the relevant authority within the ATC Administration or Organisation.

C.4.3.2. The allocation of ATC unit identifiers at the time of preparing this Standard is shown in Annex G

C.5. Protocol Specification

C.5.1. Overview

The protocol is based on the Subnetwork-Dependent Convergence Protocol for X.25(1980) defined in Annex A of ISO/IEC 8878 [Reference 12], with the following differences:

- the Fast Select user facility is not used; however, the encoding defined in Annex A of ISO/IEC 8878 [Reference 12] for use with the extended format User Data field available with the Fast Select facility is used here with the basic format User Data field in CALL REQUEST and INCOMING CALL packets, since restrictions on the allowed network service parameters ensure that the encoded information fits into 16 octets;
- of the network service parameters for which encodings are defined in ISO/IEC 8878 [Reference 12], only the called and calling NSAP addresses (and only in the form defined in C.4.2) are sent in the CALL REQUEST packet;
- the User Data field is not used in the CALL ACCEPTED, CALL CONNECTED, CLEAR REQUEST, or CLEAR INDICATION packets;
- the alternative procedures for network connection establishment and release are not used;
- receipt confirmation using the D-bit is not supported.

NOTE - The first three of these restrictions ensure that all information which will be transmitted between two DTEs will respect the limitations of the User Data field in X.25 (1980) PLP.

C.5.2. Address Encoding

The calling and called NSAP addresses shall be encoded using the preferred binary encoding defined in ISO/IEC 8348 Annex A [Reference 10].

C.5.3. Encoding of the User Data Field

C.5.3.1. As a result of the requirements stated above, the User Data field in CALL REQUEST and INCOMING CALL packets shall be encoded as illustrated below. All 16 octets shall be transmitted.

Table 1 - User Data Field Encoding

Field Description	High Order Semi-Octet	Low Order Semi-Octet
Octet 0: Protocol identity	bin(1000)	bin(0100)
Octet 1: Message code type	bin(0010)	bin(0000)
Octet 2: Message code value (N CR)	bin(0000)	bin(0001)
Octet 3: Parameter type = Called NSAP	bin(1100)	bin(1001)
Octet 4: Parameter length	bin(0000)	bin(0110)
Octet 5: Parameter value (1st octet) = AFI value	bin(0100)	bin(1000)
Octet 6: Parameter value (2nd octet) = ATC unit identifier	high order digit	low order digit
Octet 7: Parameter value (3rd octet) = ATC unit selector	high order digit	low order digit
Octet 8: Parameter type = Calling NSAP	bin(1100)	bin(1011)
Octet 9: Parameter length	bin(0000)	bin(0110)
Octet 10: Parameter value (1st octet) = AFI value	bin(0100)	bin(1000)
Octet 11: Parameter value (2nd octet) = ATC unit identifier	high order digit	low order digit
Octet 12: Parameter value (3rd octet) = ATC unit selector	high order digit	low order digit
Octet 13: Reserved for future use	bin(0000)	bin(0000)
Octet 14: Reserved for future use	bin(0000)	bin(0000)
Octet 15: Reserved for future use	bin(0000)	bin(0000)

C.5.3.2. Other parameters described in ISO/IEC 8878 [Reference 12] shall not be used.

C.5.4. Treatment of Addresses in INCOMING CALL Packets

C.5.4.1. DTE Addresses

The calling DTE address in an INCOMING CALL packet shall be validated against a local list of valid remote DTE addresses for the system. If an invalid address is detected, the call shall be cleared.

NOTES

1. The called DTE address, if present, in an INCOMING CALL packet, if present, may optionally also be validated against a list (typically of one item) of valid local DTE addresses for the system.
2. In some instances the DTE address of a unit may differ in value and/or length when the unit is acting as the calling or called system. Therefore, particular attention must be given to this issue when specifying or implementing the DTE address validation functionality

C.5.4.2. NSAP Addresses

The calling NSAP address encoded as described above in an INCOMING CALL packet shall be validated against a local list of valid remote NSAP addresses for the system. If an invalid address should be detected, the call shall be cleared.

NOTE - The called NSAP address may optionally also be validated against a list of (typically of one item) valid local NSAP addresses for the system.

C.5.5. Data Transfer

C.5.5.1. As described in ISO/IEC 8878 Annex A.5.3 [Reference 12], NSDUs are transferred in the User Data field of a DATA packet.

NOTE - As a consequence, it is prohibited to transmit more than one user message, such as an OLDI message, per X.25 packet or M-bit sequence.

C.5.5.2. NSDUs longer than the maximum User Data allowed for the virtual circuit shall be segmented and transmitted in the User Data fields of a sequence of DATA packets where all except the last shall have both maximum length and the M-bit set (i.e. a More-bit-sequence).

C.5.5.3. On reception, the User Data fields of a More-bit-sequence shall be reassembled in order to form the received NSDU.

ANNEX D (NORMATIVE) PROFILE-SPECIFIC PICS PROFORMAS

D.1. Introduction

D.1.1. The supplier of a protocol implementation which is claimed to conform to the specifications in Annexes A-C shall complete the following PICS proformas.

NOTE - Copyright release for PICS proformas : users of this Eurocontrol Standard Document may freely reproduce the PICS proformas in this Annex so that it can be used for the intended purpose and may further publish the completed PICS.

D.1.2. A completed PICS proforma is the PICS for the implementation in question. The PICS is a statement of which capabilities and options of the protocol have been implemented.

D.1.3. The PICS can have a number of uses, including use:

- by the protocol implementor, as a check-list to reduce the risk of failure to conform to the standard through oversight;
- by the supplier and acquirer, or potential acquirer, of the implementation, as a detailed indication of the capabilities of the implementation, stated relative to the common basis for understanding provided by the standard PICS proforma;
- by the user, or potential user, of the implementation, as a basis for initially checking the possibility of interworking with another implementation (note that, while interworking can never be guaranteed, failure to interwork can often be predicted from incompatible PICSs);
- by a protocol tester, as the basis for selecting appropriate tests against which to assess the claim for conformance of the implementation.

D.2. Instructions for Completing the PICS Proformas

D.2.1. General Structure of the PICS Proformas

D.2.1.1. The Implementation Identification and Protocol Summary is the first part of each PICS proforma and shall be completed as indicated with the information necessary to identify fully both the supplier and the implementation.

D.2.1.2. The main part of the PICS proforma is a fixed-format questionnaire. Answers to the questionnaire items shall be provided in the rightmost column, either by simply marking an answer to indicate a restricted choice (usually Yes or No), or by entering a value or a set or range of values.

NOTES

1. Each item is identified by a unique item reference in the first column; the second column contains the question to be answered; the third column contains the reference or references to the material that specifies the item in this Eurocontrol Standard. The remaining columns record the status of the item (whether support is mandatory, optional, prohibited or conditional) and provide space for the answers: see also D.2.4 below.
2. A supplier may also provide, or be required to provide, further information categorised as either Additional Information or Exception Information. When present, each kind of further information is to be provided in a further subclause of items labelled A<i> or X<i> respectively for cross-referencing purposes, where <i> is any unambiguous identification for the item (e.g. simply a numeral): there are no other restrictions on its format and presentation.

D.2.1.3. A completed PICS proforma, including any Additional Information and Exception Information, shall be referred to as the Protocol Implementation Conformance Statement for the implementation in question.

NOTE - Where an implementation is capable of being configured in more than one way, a single PICS may be able to describe all such configurations. However, the supplier has the choice of providing more than one PICS, each covering some subset of the implementation's configuration capabilities, in case that makes for easier and clearer presentation of the information.

D.2.2. Additional Information

Items of Additional Information allow a supplier to provide further information intended to assist the interpretation of the PICS.

NOTES

1. It is not intended or expected that a large quantity will be supplied, and a PICS can be considered complete without any such information. Examples might be an outline of the ways in which a (single) implementation can be set up to operate in a variety of environments and configurations; or a brief rationale (based perhaps upon specific application needs) for the exclusion of features which, although optional, are nonetheless commonly present in implementations of this protocol.
2. References to items of Additional Information may be entered next to any answer in the questionnaire, and may be included in items of Exception Information.

D.2.3. Exception Information

D.2.3.1. It may occasionally happen that a supplier will wish to answer an item with mandatory or prohibited status (after any conditions have been applied) in a way that conflicts with the indicated requirement. No pre-printed answer will be found in the Support column for this: instead, the supplier shall write the missing answer into the Support column, together with an X<i> reference to an item of Exception Information.

D.2.3.2. The supplier shall provide the appropriate rationale in the Exception item itself.

D.2.3.3. An implementation for which an Exception item is required in this way does not conform to this specification.

NOTE - A possible reason for the situation described above is that a defect in the standard has been reported, a correction for which is expected to change the requirement not met by the implementation.

D.2.4. Conditional Items

D.2.4.1. Individual conditional items are indicated by a conditional symbol of the form "<item>: <s>" in the Status column, where "<item>" is an item reference that appears in the first column of the table for some other item, and "<s>" is a status symbol, M, O, O.<n> or X.

NOTE - A PICS proforma may contain a number of conditional items. These are items for which both the applicability of the item itself, and its status if it does apply (mandatory, optional or prohibited) are dependent upon whether or not certain other items are supported.

D.2.4.2. If the item referenced by the conditional symbol is marked as supported, the conditional item is applicable, and its status is given by "<s>": the support column shall be completed in the usual way. Otherwise, the conditional item is not relevant and the Not Applicable (NA) answer shall be marked.

D.2.4.3. Each item whose reference is used in a conditional symbol is indicated by an asterisk in the Item column.

D.3. PICS Proforma for the Message Transfer Protocol

D.3.1. Abbreviations and Special Symbols

D.3.1.1. Status Symbols

M: Mandatory
O: Optional

D.3.1.2. Item References

Items in the PICS proforma are identified by mnemonic item references. PICS items dealing with related functions are identified by item references sharing the same initial letter or letter-pair (in capitals). There follows a list of those initials, in the order in which the groups of items occur in the PICS proforma.

- MTsy, MTop, MTst, MTor — message types
- MAE, MAR, MCI, MDT, MAV — procedures
- MEsu, MEsd, MEhb, MEty — encodings
- MNmsg — message size
- Ts, Tr — timers

D.3.2. Identification

Table 1 - Message Transfer Implementation Identification

Supplier	
Contact point for queries about the PICS	
Implementation name/version	
Machine name/version	
Operating system name/version	
Other hardware and operating systems claimed	
System name (if applicable)	

D.3.3. Protocol Implementation

Table 2 - Message Transfer Protocol Implementation

Item	Feature	References	Status	Support
	Are the following message types supported:	A.4.2		
MTsy	- system messages ?		M	Yes❑
MTop	- operational messages ?		M	Yes❑
MTst	- status messages ?		O	No ❑ Yes ❑
MTor	- operator messages ?		O	No ❑ Yes ❑
MAE	Association establishment procedures	A.4.3	M	Yes❑
MAR	Association release procedure	A.4.5	M	Yes❑
MCI	Association integrity procedure	A.4.7	M	Yes❑
MDT	Data transfer procedure	A.4.4	M	Yes❑
MAV	Association recovery procedure	A.4.9	M	Yes❑
	Encoding of System Messages:	A.4.10.1, A.4.10.3		
MEsu	- STARTUP ?	A.4.10.3	M	Yes❑
MEsd	- SHUTDOWN ?	A.4.10.3	M	Yes❑
MEhb	- HEARTBEAT ?	A.4.10.3	M	Yes❑
MEty	Encoding of TYP field for other message types	A.4.10.1, A.4.10.4	M	Yes❑
MNmsg	Maximum message body size supported	A.4.10.2	at least 4096 octets	Value:
	Timer values supported:	A.4.7		
Ts	- Association integrity heartbeat		M	Yes❑ Values:
Tr	- Association integrity timeout		Tr > 2Ts	Yes❑ Values:

D.4. PICS Proforma for the Message Header Protocol

D.4.1. Abbreviations and Special Symbols

D.4.1.1. Status Symbols

M mandatory
O optional
O.<n> optional, but support of at least one of the group of options labelled by the same numeral <n> is required
X prohibited
<item>: conditional-item symbol, dependent upon the support marked for <item> (see D.2.4)

D.4.1.2. Abbreviations

NA not applicable

D.4.1.3. Item References

Items in the PICS proforma are identified by mnemonic item references. PICS items dealing with related functions are identified by item references sharing the same initial letter or letter-pair (in capitals). There follows a list of those initials, in the order in which the groups of items occur in the PICS proforma.

- IHC1, IHC2, IHC3, IHC4, IHCC connection establishment
- IHR1, IHR2 connection release
- IHT1, IHTx data transfer
- Tcr timer

D.4.2. Identification

Table 3 - Message Header Implementation Identification

Supplier	
Contact point for queries about the PICS	
Implementation name/version	
Machine name/version	
Operating system name/version	
Other hardware and operating systems claimed	
System name (if applicable)	

D.4.3. Protocol Implementation

Table 4 - Message Header Protocol Implementation

Item	Feature	References	Status	Support
	Does the connection establishment procedure:	B.4.1		
IHC1*	- use N-Connect?		O.1	Yes❑ No ❑
IHC2*	- rely on a pre-established network connection?		O.1	No ❑ Yes ❑
IHC3	- reset the pre-established connection		**IHC2**: O	NA ❑ Yes ❑ No ❑
IHC4*	- retry the N-Connect automatically		**IHC1**: O	NA ❑ No ❑ Yes ❑
IHCC	Connection collision resolution procedure	B.4.2	M	Yes❑
	Does the connection release procedure:	B.4.3		
IHR1	- use N-Disconnect?		**IHC1**: M **IHC2**: X	NA ❑ Yes ❑ No ❑
IHR2	- retain the network connection?		**IHC2**: M **IHC1**: X	NA ❑ No ❑ Yes ❑
IHT1	Data Transfer PDU encoding	B.4.4	M	Yes❑
IHTx	Use of the fields ADEST, DEST, AEMM, EMM, and ADR with values other than '40'H	B.4.4	O	No ❑ Yes ❑
	Timer values supported:			
Tcr	- Connection establishment retry timer	B.4.1	**IHC4**:M	NA ❑ No ❑ Yes ❑ Values:

NOTES:

1. IHC1 is used in items IHC4, IHR1 and IHR2.
2. IHC2 is used in items IHC3, IHR1 and IHR2.
3. IHC4 is used in item Tcr.

D.5. PICS Proforma for the Network Protocol

D.5.1. Abbreviations and Special Symbols

D.5.1.1. Status Symbols

M mandatory
O optional

D.5.1.2. Item References

Items in the PICS proforma are identified by mnemonic item references. PICS items dealing with related functions are identified by item references sharing the same initial letter or letter-pair (in capitals). There follows a list of those initials, in the order in which the groups of items occur in the PICS proforma.

- SNDCP1 protocol ID field
- NCRdae, NCRgae, NCCx, NDRx parameters in protocol messages
- NCD1, NCD2, NCN1, NCN2 validation of addresses
- NDT data transfer

D.5.2. Identification

Table 5 - Network Implementation Identification

Supplier	
Contact point for queries about the PICS	
Implementation name/version	
Machine name/version	
Operating system name/version	
Other hardware and operating systems claimed	
System name (if applicable)	

D.5.3. Protocol Implementation

Table 6 - Network Protocol Implementation

Item	Feature	References	Status	Support	
SNDCP1	Protocol ID field in Call User Data field of CALL REQUEST	C.5.1	M	Yes❑	
	Parameters in N-CR message:	C.5.1			
NCRdae	- called address extension		M	Yes❑	
NCRgae	- calling address extension		M	Yes❑	
NCCx	Parameters in N-CC message: none	C.5.1	M	Yes❑	
NDRx	Parameters in N-DR message: none	C.5.1	M	Yes❑	
	Validation of addresses:	C.5.4			
NCD1	- calling DTE address		M	Yes❑	
NCD2	- called DTE address		O	No ❑	Yes ❑
NCN1	- calling NSAP address		M	Yes❑	
NCN2	- called NSAP address		O	No ❑	Yes ❑
NDT	Data transfer procedures	C.5.5	M	Yes❑	

NOTE - 'address extensions' are those encoded in the Call User Data field according to ISO/IEC 8878 Annex A.5 [Reference 12], and not the X.25 address extension facilities, whose use is prohibited in this protocol.

ANNEX E (NORMATIVE) PROFILE REQUIREMENTS LIST

E.1. Introduction

E.1.1. This Annex provides the PRL for the FDE ICD profile defined in this Eurocontrol Standard Document. The Implementation Conformance Statement for an implementation claiming conformance to this profile shall be generated in accordance with the instructions given below.

NOTE - The proformas in this Annex are based on those accompanying the referenced base standards.

E.1.2. A conforming implementation shall satisfy the mandatory conformance requirements of the base standards referenced in this profile.

E.2. The Role of the PRL and PICS Proformas

The status of this section (E.2) is informative: it does not constitute a provision of this Part of this Eurocontrol Standard.

- The objective of presenting the conformance requirements in the tabular form of the PRL and PICS proformas is to provide a check-list of the features which must or may be implemented. The underlying concepts are defined and described in ISO/IEC 9646-1 [Reference 14] (ITU-T Recommendation X.290 is equivalent) and ISO/IEC TR 10000-1 [Reference 2]
- A profile combines and selects the options of several base standards in order to fulfil a specific information processing function. Each base standard has a PICS proforma, listing the requirements of the standard. The PRL comprises the subset of the base standard PICS proforma items that are constrained by the profile, together with the specific profile requirements; it defines answers required on the base standard PICS proformas to conform with the profile. In addition, the PRL will contain PICS-type items which are specific to the profile (at the least, there will be a item testing whether all the required PICS proformas have been correctly completed); these items must be completed together with the base standard PICS proformas. The completed proformas together constitute the profile Implementation Conformance Statement (ICS).
- Following the methodology of ISO/IEC TR 10000-1 [Reference 2], a claim of conformance to a profile has to be supported by PICS proformas completed in accordance with the PRL. The use of this material will depend on the procurement approach for an FDE ICD implementation.
- Several possible approaches to an FDE implementation can be imagined :
  - In-house implementation by a National Administration or Organisation: the PRL should be used as the basis of the requirements specification and acceptance test specification for the implementation; the completed ICS should be produced as part of the acceptance procedure.
  - Implementation of the profile by a contractor: the material will be used and produced as for an in-house implementation, but the contractor should provide the ICS and the need for this must be a contractual requirement.

- Implementation of the profile by a contractor as part of a turn-key or system integration contract: the material will be used and produced as for an in-house implementation, but the contractor must be required to do this internally as well as providing the completed ICS. Conformance to the profile ensures, for instance, that a supplier working for two administrations cannot introduce its proprietary protocols to meet the FDE requirement and thus helps to give control to the contracting administrations.
- Integration of off-the-shelf products into a profile implementation in any of the previous cases: the supplier of a product should be required to provide those PICS proformas relevant to the product completed in accordance with the PRL given here and to warrant the conformance of the product with the applicable profile requirements; this PICS can then be forwarded as part of the profile ICS.

• Following implementation, the ICS should be maintained as part of the documentation of the implementation; it can be used to predict interoperability with other administrations, and to identify changes that may be needed in moving to different protocols.

E.3. Notation

E.3.1. The following notations from ISO/IEC TR 10000-1 [Reference 2] are used in the PRL to indicate the status of features:

m : mandatory
o : optional
– : not applicable (i.e. logically impossible in the scope of the profile)
x : excluded

NOTES

1. Two-character combinations may be used, in which case the first character refers to the static (implementation) status, and the second to the dynamic (use); thus 'mo' means 'mandatory to be implemented, optional to be used'.
2. The 'o.<n>' notation is used to show a set of selectable options (i.e. at least one of the set must be implemented) with the same identifier n.
3. A feature marked 'x' may nonetheless be part of an implementation so long as it is not used when the implementation is operating in conformance with the profile.
4. Use of features marked 'x' would require bilateral agreement. In this event, the status of the features should be revised as they may be of interest to other implementations.

E.3.2. The following predicate notation is used:

<predicate>:: introduces a group of items, all of which are conditional on <predicate> (the extent of the group is shown by the layout).
<predicate>: introduces a single item which is conditional on <predicate>.

NOTE - In each case, the predicate may be the identifier of a profile feature, or a boolean combination of predicates ('¬' is the symbol for logical negation).

E.3.3. Base standard requirements are shown using the equivalent notations in upper case (i.e. M, O, O.<n>, X).

E.4. Instructions for Completing the PICS Proformas

E.4.1. To provide the profile ICS, the PICS proformas for the referenced base standards shall be completed, together with the additional profile-related PICS items provided in this Annex.

E.4.2. Where this profile refines the features of the base standards, the requirements expressed in this PRL shall be applied (as indicated in PRL items with a 'Profile features' column) to constrain the allowable responses in the base standard PICS proformas.

E.4.3. Where this profile makes additional requirements, the response column for such items shall be completed. In this column, each response shall either be selected from the indicated set of responses, or comprise a parameter value or values or range of values as requested.

E.4.4. If a mandatory requirement is not satisfied, exception information must be supplied, by entering a reference X<i>, where <i> is a unique identifier, to an accompanying rationale for the non-compliance.

NOTE - A possible reason for such an exception is compliance with a pending defect report on a provision of the profile; if the defect report is accepted, the implementation will then be conformant.

E.5. References

E.5.1. This profile references the following protocol specifications:

- Message Transfer Protocol (Annex A to this Eurocontrol Standard Document);
- Message Header Protocol (Annex B to this Eurocontrol Standard Document);
- Connection-mode Network Protocol using ISO/IEC 8208 (Annex C to this Eurocontrol Standard Document);
- ISO/IEC 7776 [Reference 6];
- Physical Layer Standards called up by ITU-T Recommendation X.25 (1993) clause 1 [Reference 1].

E.5.2. As there are no explicit PICS proformas for the relevant Physical Layer Standards, the interim physical layer PICS proformas in ISO/IEC ISP 10609-9 clause A.4 [Reference 8] shall be used.

E.6. Conformance Statement

E.6.1. Conformance Overview

Table 1 - Conformance Overview

Supplier	
Contact point for queries about the PICS	
Implementation name/version	
Machine name/version	
Operating system name/version	
Other hardware and operating systems claimed	
System name (if applicable)	
Date of statement	
Have the features of the base standards been implemented in accordance with requirements of this PRL? - Annex A of this profile - Annex B of this profile - Annex C of this profile - ISO/IEC 8208 - ISO/IEC 7776 - ITU-T X.25(1993) clause 1	 Yes ❑ Yes ❑ Yes ❑ Yes ❑ Yes ❑ Yes ❑
Are the completed PICS proformas for the base standards attached?	Yes ❑
NOTE - Failure to respond 'Yes' to all of these questions indicates a failure of conformance to this profile	

E.6.2. Dynamic Conformance Requirements

Table 2 - Dynamic Conformance Requirements

Are TSDU sizes of at least 4097 octets supported?	Yes ❑
Are NSDU sizes of at least 4105 octets supported?	Yes ❑
Is the concatenation and segmentation of TSDUs prohibited?	Yes ❑
Is the Non-standard Default Packet Size of 256 supported for both directions of transmission?	Yes ❑
Are NSAP addresses sent only in the format defined in Annex C?	Yes ❑
Is D-bit set to 0 in CALL REQUEST, CALL ACCEPTED and DATA packets?	Yes ❑

E.7. Upper Layer Requirements

Table 3 - Message Transfer Protocol

Base Standard Features				Profile Features	
Item	**Message Transfer Protocol**	**References**	**Status**	**References**	**Status**
MTst	- status messages	A.4.2	O		ox
MTor	- operator messages	A.4.2	O		ox

E.8. Lower Layer Requirements

E.8.1. Transport Layer Requirements

Table 4 - Message Header Protocol

Base Standard Features				Profile Features	
Item	**Message Header Protocol**	**References**	**Status**	**References**	**Status**
IHTx	Use of the fields ADEST, DEST, AEMM, EMM and ADR with values other than '40'H	B.4.4	O		ox

E.8.2. Network Layer Requirements

The PRLs given in this section are based on the PICS proforma for ISO/IEC 8208:1993 [Reference 7]. The entries in the 'References' column under 'Base standard features' of the following tables are references to clauses in that standard.

E.8.2.1. General DTE Characteristics

Table 5 - General DTE Characteristics

Base Standard Features				Profile Features	
Item	**General DTE Characteristics**	**References**	**Status**	**References**	**Status**
	Service supported:				
Vs	- virtual call		O.1		m
Vp	- permanent virtual circuit		O.1		x
	Environments supported:	3, 3.2			
Ec/3	- DTE/DCE(1993)		O.2	6.3.2	o.2
Ec/8	- DTE/DCE(1988)		O.2	6.3.2	o.2
Ec/4	- DTE/DCE(1984)		O.2	6.3.2	o.2
Ec/0	- DTE/DCE(1980)		O.2	6.3.2	o.2
Et/t	- DTE/DTE in fixed role as DTE		O.2	6.3.2	o.2
Et/c	- DTE/DTE in fixed role as DCE		**Vs**: O.2	6.3.2	o.2
Et/d	- DTE/DTE with dynamic role selection	4.5	**Vs**: O.2		x
	Packet sequence numbering supported:				
M8	- Modulo 8	13.2, 12.1.1, Table 3	O.3		m
M128	- Modulo 128	13.2, 12.1.1, Table 3	O.3		x
	Reference Number optional user facility supported, for alternative Logical Channel Identifier assignment:	13.29, 13.29.1, 13.29.2, 13.29.3, 13.29.4, Fig 31			
RNa	- without reversion to use of logical channel ranges	13.29.2.1	**Et**: O **¬Et**: X		x
RNb	- with possible reversion to use logical channel ranges	13.29.2.1	**Et**: O **¬Et**: X		x

E.8.2.2. Procedures, Packet Types and Packet Formats

Table 6 - Packet Layer Functions Independent of Logical Channels

Base Standard Features				Profile Features	
Item	**Packet Layer Functions Independent of Logical Channels**	**References**	**Status**	**References**	**Status**
	Are the following packet layer functions supported:				
Z2s	Sending diagnostic packet	12.7, Table 24	**Et**: O **¬Et**: X		x
Z4i	Initiating On-line Facility Registration:	13.1, 13.1.1.1, 13.1.1.3, 13.1.1.4	O		ox
	- send REGISTRATION REQUEST	12.9.1			
	- receive REGISTRATION CONFIRMATION	12.9.2, Table 10			
Z4r	Responding to On-line Facility Registration:	13.1, 13.1.1.1, 13.1.1.4	**Et**: O		–
	- receive REGISTRATION REQUEST	12.9.1			
	- send REGISTRATION CONFIRMATION	12.9.2, Table 10			

Table 7 - Call Setup

Base Standard Features				Profile Features	
Item	**Call Setup**	**References**	**Status**	**References**	**Status**
	Are outgoing Virtual Calls supported:	5.2.1, 5.2.5, Table 33			
S1a	- Fast Select, no restriction on response?	5.2.4, 13.16	O		x
S1b	- Fast Select with restricted response?	13.16	O		x
S1c	- non-Fast Select?	5.2.4	O		m
SP1b	CALL REQUEST, basic format	12.2.3.1	**S1c**: M **S1ab**: O.4		m
SP1e	send CALL REQUEST, extended format	12.2.3.1, 12.2.3.2	**S1ab**: O.4		x
SP2b	receive CALL CONNECTED, basic format	12.2.4.1	**S1ac**: M		m
SP2e	receive CALL CONNECTED, extended format	12.2.4.1, 12.2.4.2	**S1a**: M		–
	Is alternative addressing supported for outgoing Virtual Calls:	13.28			
	- using A = 1 and expanded Address Block format?	13.28.2.1, 12.2.1.2	**Ec/3**: O **¬Ec/3**: X		x
	- using the Called Address Extension Facility?	13.28.2.2.	**Ec/3**: O **¬Ec/3**: X		x
	Are incoming Virtual Calls supported:	5.2.2, 5.2.5, Table 33			
S2a	- Fast Select with acceptance possible?	5.2.3, 13.17	O		–
S2b	- Fast Select, always cleared?	13.17	O		m
S2c	- non-Fast Select with acceptance possible?	5.2.3	O		m
S2d	- non-Fast Select, always cleared?	5.2.3	O		x
SP3b	receive INCOMING CALL, basic format	12.2.3.1	**S2**: M		m
SP3e	receive INCOMING CALL, extended format	12.2.3.1, 12.2.3.2	**S2ab**: M **S2axc**: O.5		–
SP4b	send CALL ACCEPTED, basic format	12.2.4.1	**S2c**: M **S2axc**: O.5		m
SP4e	send CALL ACCEPTED, extended format	12.2.4.1, 12.2.4.2	**S2axc**: O.5 **S2anc**: O		–
	Is D-bit negotiation supported:				
DN1	- for outgoing Virtual Calls	6.3	**S1ac**: O		m
DN2	- for incoming Virtual Calls	6.3	**S1ac**: O		m

NOTE - The D-bit shall always be negotiated to 0.

Table 8 - Call Clearing

Base Standard Features				Profile Features	
Item	**Call Clearing**	**References**	**Status**	**References**	**Status**
	Is call clearing supported, for:	5.5.4, Table 33			
C1	- response to indication of clearing	5.5.2	O		m
C2a	- aborting an outgoing Virtual Call attempt?	5.4, 5.5.1, 5.5.3	**S1**: O		o
C2b	- rejecting an incoming Virtual Call?	5.3, 5.5.1, 5.5.3	**S2bd**: M **S2acxbd**: O		m
C2c	- originating clearing of an established Virtual Call?	5.5.1, 5.5.3	O		o
CP1b	receive CLEAR INDICATION, basic format	12.2.5.1	**Cany**: M		m
CP1e	receive CLEAR INDICATION, extended format	12.2.5.1, 12.2.5.2	**Cany**: M		–
CP2b	send CLEAR CONFIRMATION, basic format	12.2.6.1	**C1**: M		m
CP2e	send CLEAR CONFIRMATION, extended format	12.2.6.1, 12.2.6.2	**C1rn**: M		x
CP3b	send CLEAR REQUEST, basic format	12.2.5.1	**C2a**: M **C2bcxa**: O.6		m
CP3e	send CLEAR REQUEST, extended format	12.2.5.1,12.2.5.2	**C2bcxa**: O.6 **C2axbc**: X		x
CP4b	receive CLEAR CONFIRMATION, basic format	12.2.6.1	**C2**: M		m
CP4e	receive CLEAR CONFIRMATION, extended format	12.2.6.1, 12.2.6.2	**C2rnci**: M		–

Table 9 - Resetting of Logical Channels

Base Standard Features				Profile Features	
Item	**Resetting of Logical Channels**	**References**	**Status**	**References**	**Status**
	Is resetting supported:	8, 8.4, Table 34			
RSi	- as initiator?	8.1, 8.3	O		mm
	send RESET REQUEST	12.5.1			
	receive RESET CONFIRMATION/ INDICATION	12.5.2, 12.5.1			
RSr	- as responder?	8.2	O		mm
	receive RESET INDICATION	12.5.1			
	send RESET CONFIRMATION	12.5.2			

Table 10 - Error Procedures

Base Standard Features				Profile Features	
Item	**Error Procedures (Virtual Call Service)**	**References**	**Status**	**References**	**Status**
	Is ERROR-C procedure:	5.2.1, 5.4, 8.1, Table 33			
W1a	- clear the Virtual Call?		O.7		m
W1b	- restart the packet layer?		O.7		x
	Is ERROR-R procedure for virtual calls:	6.3, 6.4, 6.6, 6.8.1, 6.8.2, 7.1.3, 7.1.4, 8.2, 11.2.1, 13.4.1, Tables 34-36			
W2sc	- restart the packet layer?		O.8		x

Table 11 - Interrupt Transfer

Base Standard Features				Profile Features	
Item	**Interrupt Transfer**	**References**	**Status**	**References**	**Status**
Is	Is sending interrupts supported?	6.8, 6.8.1, 6.8.3, Table 35	O		ox
	- send INTERRUPT REQUEST	12.3.2			
	receive INTERRUPT CONFIRMATION	12.3.3			
Ir	Is receiving interrupts supported?	6.8, 6.8.2, 6.8.3 Table 35	O		–
	- receive INTERRUPT INDICATION	12.3.2			
	- send INTERRUPT CONFIRMATION	12.3.3			

Table 12 - Sending Data

Base Standard Features				Profile Features	
Item	**Sending Data**	**References**	**Status**	**References**	**Status**
DS1	Is sending of DATA packets supported?	6, 6.1, 7.1.1, 7.1.2, 7.1.3, 12.3.1	O		mm
	Are the following supported:				
DS2	- send-window rotation on receiving updated P(R) values?	7.1, 7.1.2, 7.1.3	O		mm
DS4a	- sending M = 0 in DATA packets?	6.4, 6.5, 6.7	M		mo.9
DS4b	- sending M = 1 in DATA packets?	6.4, 6.5, 6.7	O		mo.9
DS5a	- sending Q = 0 in DATA packets?	6.6	O.10		mm
DS5b	- sending Q = 1 in DATA packets?	6.6	O.10		ox
DS6	- responding to packet retransmission requests (received REJECT packets)?	13.4.2 12.8	**Et**: O		–
	- Window Rotation Timer procedure:				
DS7a	- ERROR-R action on expiry	11.2.1(a)	O		ox
DS7b	- packet retransmission on expiry	11.2.1(b)	**Et**: O ¬**Et**: X		ox
DS8	- discard of over-length flow control packets (instead of ERROR-R)?	Table 36 Note 2	O		ox

Table 13 - Receiving Data

Base Standard Features				Profile Features	
Item	**Receiving Data**	**References**	**Status**	**References**	**Status**
DR1	Is receiving of DATA packets supported?	6, 6.1, 6.2, 7.1.1, 7.1.2, 7.1.3, 12.3.1	O		mm
	Are the following supported:				
DR2	- receive-window rotation by sending updated P(R)values?	7.1.2, 7.1.3	O		mm
DR3	- flow control by sending RECEIVE NOT READY and RECEIVE READY?	7.1.5, 7.1.6, 12.4.1, 12.4.2	O		mm
DR4b	- receiving M = 1 in DATA packets?	6.4, 6.5, 6.7	O		mm
DR5a	- receiving Q = 0 in DATA packets?	6.6	O.11		mm
DR5b	- receiving Q = 1 in DATA packets?	6.6	O.11		–
DR6	- requesting packet retransmission by sending REJECT packets?	13.4.1, 12.8	O		ox
	- recovery from receipt of DATA packets containing invalid P(S), by:				
DR7a	- ERROR-R action?	11.3(a)	O.12		mm
DR7b	- requesting packet retransmission ?	11.3(b)	O.12		ox
DR7c	- ignoring the packet and waiting for a correct retransmitted packet?	11.3(c)	O.12		ox
	- recovery from receipt of DATA packets with invalid User Data field, by:				
DR8a	- ERROR-R action?	11.3(a)	O.13		mm
DR8b	- requesting packet retransmission?	11.3(b)	O.13		ox
DR8c	- ignoring the packet and waiting for a correct retransmitted packet?	11.3(c)	O.13		ox
DR9	- Window Status Transmission Timer procedure?	11.2.2	O		ox

Table 14 - Delivery Confirmation

Base Standard Features				Profile Features	
Item	**Delivery Confirmation**	**References**	**Status**	**References**	**Status**
DC	Is Delivery Confirmation supported?	6.3, 6.5, 6.7, 7.1.4	O		x

E.8.2.3. Miscellaneous Features and Options

Table 15 - Values of Cause and Diagnostic Codes

Base Standard Features				Profile Features	
Item	**Values of Cause and Diagnostic Codes**	**References**	**Status**	**References**	**Status**
	In RESTART REQUEST packets sent:	12.6.1.1, 12.6.1.2, Tables 24-25			
Y1d	- Cause = 128, private diagnostic codes		O.14		ox
	In RESTART INDICATION packets received:	12.6.1.1, Table 9, 12.6.1.2			
Y2b	- Cause not 0 or 128, any diagnostic code value		**EC**: M **¬EC**: O		m
	In CLEAR REQUEST packets sent:	12.2.3.1.1, 12.2.3.1.2, Tables 24-25			
Y3d	- Cause = 128, private diagnostic codes		O.15		ox
	In CLEAR INDICATION packets received:	12.2.3.1.1, Table 7 12.2.3.1.2,			
Y4b	- Cause not 0 or 128, any diagnostic code value		**EC**: M **¬EC**: O		m
	In RESET REQUEST packets sent:	12.5.1.1, 12.5.1.2, Tables 24-25			
Y5d	- Cause = 128, private diagnostic codes		O.16		ox
	In RESET INDICATION packets received:	12.5.1.1, Table 8, 12.5.1.2			
Y6b	- Cause not 0 or 128, any diagnostic code value		**EC**: M **¬EC**: O		m

E.8.2.4 Facilities

Table 16 - Facilities Sent in CALL REQUEST Packets

Base Standard Features				Profile Features	
Item	**Facilities Sent in CALL REQUEST Packets**	**References**	**Status**	**References**	**Status**
FS1pi	Flow Control Parameter Negotiation, packet size	13.12, 15.2.2.1.1	O		x
FS1wi	Flow Control Parameter Negotiation, window size	13.12, 15.2.2.1.2	O		x
FS2ib	Basic Throughput Class Negotiation	13.13, 15.2.2.2.1, Table 20a	O		x
FS2ie	Extended Throughput Class Negotiation	13.13, 15.2.2.2.2, Table 20b	O		x
FS3b	Closed User Group Selection, basic format	13.14.6, 15.2.2.3.1	O		o
FS3e	Closed User Group Selection, extended format	13.14.6, 15.2.2.3.2	O		x
FS4b	Closed User Group With Outgoing Access Selection, basic format	13.14.7, 15.2.2.4.1	O		x
FS4e	Closed User Group With Outgoing Access Selection, extended format	13.14.7, 15.2.2.4.2	O		x
FS5	Bilateral Closed User Group Selection	13.15, 15.2.2.5	O		x
FS6a	Fast Select	13.16, 15.2.2.6	O		x
FS6b	Reverse Charging	13.18, 15.2.2.6	O		x
FS6c	ICRD Status Selection	13.25.4.2, 15.2.2.6	O		x
FS7i	Network User Identification	13.21, 13.21.3, 15.2.2.7	O		x
FS8i	Charging Information, requesting service	13.22, 15.2.2.8.1	O		x
FS9b	RPOA selection, basic format	13.23, 13.23.2, 15.2.2.9.1	O		x
FS9e	RPOA selection, extended format	13.23, 13.23.2, 15.2.2.9.2	O		x
FS12	Transit Delay Selection and Indication	13.27, 15.2.2.13	O		x
FS99i	Local non-X.25 facilities, following Facility Marker	15.1, Table 18	O		x
FS98i	Remote non-X.25 facilities, following Facility Marker	15.1, Table 18	O		x
FS20i	Facility Marker, CCITT-specified DTE facilities	15.1	O		x
FS21i	Calling Address Extension	14.1, 15.3.2.1			x
FS22i	Called Address Extension	14.2, 15.3.2.2			x
FS23ib	Minimum Throughput Class Negotiation, basic format	14.3, 15.3.2.3.1, Table 20a	O		x
FS23ie	Minimum Throughput Class Negotiation, extended format	14.3, 15.3.2.3.2, Table 20b	O		x
FS24i	End-to-end Transit Delay Negotiation	14.4, 15.3.2.4	O		x
FS25i	Expedited Data Negotiation	14.7, 15.3.2.7	O		x
FS26i	Priority	14.5, 15.3.2.5	O		x
FS27i	Protection	14.6, 15.3.2.6	O		x

Table 17 - Facilities Sent in CALL ACCEPT Packets

Base Standard Features				Profile Features	
Item	**Facilities Sent in CALL ACCEPT Packets**	**References**	**Status**	**References**	**Status**
FS1pr	Flow Control Parameter Negotiation, packet size	13.12, 15.2.2.1.1, Table 13	O		x
FS1wr	Flow Control Parameter Negotiation, window size	13.12, 15.2.2.1.2, Table 13	O		x
FS2rb	Basic Throughput Class Negotiation	13.13, 15.2.2.2.1, Table 20a	O		x
FS2re	Extended Throughput Class Negotiation	13.13, 15.2.2.2.2, Table 20b	O		x
FS7r	Network User Identification	13.21, 13.21.3 15.2.2.7	O		x
FS8r	Charging Information, requesting service	13.22, 15.2.2.8.1	O		x
FS10r	Called Line Address Modified Notification	13.26, 15.2.2.12	O		x
FS99r	Local non-X.25 facilities, following Facility Marker	15.1 Table 18	O		x
FS98r	Remote non-X.25 facilities, following Facility Marker	15.1, Table 18	O		x
FS20r	Facility Marker, CCITT-specified DTE facilities	15.1	O		x
FS22r	Called Address Extension	14.2, 15.3.2.2	O		x
FS24r	End-to-end Transit Delay Negotiation	14.4, 15.3.2.4	O		x
FS25r	Expedited Data Negotiation	14.7, 15.3.2.7	O		x
FS26r	Priority	14.5, 15.3.2.5	O		x
FS27r	Protection	14.6, 15.3.2.6	O		x

Table 18 - Facilities Sent in CLEAR REQUEST Packets

Base Standard Features				Profile Features	
Item	**Facilities Sent in CLEAR REQUEST Packets**	**References**	**Status**	**References**	**Status**
FS10d	Called Line Address Modified Notification	13.26, 15.2.2.12	O		x
FS13	Call Deflection Selection	13.25.2.2, 15.2.2.10	O		x
FS99d	Local non-X.25 facilities, following Facility Marker	15.1, Table 18	O		x
FS98d	Remote non-X.25 facilities, following Facility Marker	15.1, Table 18	O		x
FS20d	Facility Marker, CCITT-specified DTE facilities	15.1	O		x
FS22d	Called Address Extension	14.2, 15.3.2.2	O		x

Table 19 - Facilities Received in INCOMING CALL Packets

Base Standard Features				Profile Features	
Item	**Facilities Received in INCOMING CALL Packets**	**References**	**Status**	**References**	**Status**
FR1pi	Flow Control Parameter Negotiation, packet size	13.12, 15.2.2.1.1	O		x
FR1wi	Flow Control Parameter Negotiation, window size	13.12, 15.2.2.1.2	O		x
FR2ib	Basic Throughput Class Negotiation	13.13, 15.2.2.2.1 Table 20a	O		x
FR2ie	Extended Throughput Class Negotiation	13.13, 15.2.2.2.2 Table 20b	O		x
FR3b	Closed User Group Selection, basic format	13.14.6, 15.2.2.3.1	O		o
FR3e	Closed User Group Selection, extended format	13.14.6, 15.2.2.3.2	O		x
FR4b	Closed User Group With Outgoing Access Selection, basic format	13.4.7, 15.2.2.4.1	O		x
FR4e	Closed User Group With Outgoing Access Selection, extended format	13.4.7, 15.2.2.4.2	O		x
FR5	Bilateral Closed User Group Selection	13.15, 15.2.2.5	O		x
FR6a	Fast Select	13.16, 13.17, 15.2.2.6	O		x
FR6b	Reverse Charging	13.18, 13.19, 15.2.2.6	O		x
FR11	Call Redirection or Call Deflection Notification	13.25.3, 15.2.2.11	O		x
FR12i	Transit Delay Selection and Indication	13.27, 15.2.2.13	O		x
FR99i	Local non-X.25 facilities, following Facility Marker	15.1, Table 18	O		x
FR20i	Facility Marker, CCITT-specified DTE facilities	15.1	O		x
FR21	Calling Address Extension	14.1, 15.3.2.1			x
FR22i	Called Address Extension	14.2, 15.3.2.2			x
FR23b	Minimum Throughput Class Negotiation, basic format	14.3, 15.3.2.3.1, Table 20a	O		x
FR23e	Minimum Throughput Class Negotiation, extended format	14.3, 15.3.2.3.2, Table 20b	O		x
FR24i	End-to-end Transit Delay Negotiation	14.4, 15.3.2.4	O		x
FR25i	Expedited Data Negotiation	14.7, 15.3.2.7	O		x
FR26i	Priority	14.5, 15.3.2.5	O		x
FR27i	Protection	14.6, 15.3.2.6	O		x

Table 20 - Facilities Received in CALL CONNECTED Packets

Base Standard Features				Profile Features	
Item	**Facilities Received in CALL CONNECTED Packets**	**References**	**Status**	**References**	**Status**
FR1pr	Flow Control Parameter Negotiation, packet size	13.12, 15.2.2.1.1, Table 14	O		x
FR1wr	Flow Control Parameter Negotiation, window size	13.12, 15.2.2.1.2, Table 14	O		x
FR2rb	Basic Throughput Class Negotiation	13.13, 15.2.2.2.1, Table 20a	O		x
FR2re	Extended Throughput Class Negotiation	13.13, 15.2.2.2.2, Table 20b	O		x
FR10r	Called Line Address Modified Notification	13.26, 15.2.2.12	O		x
FR12r	Transit Delay Selection and Indication	13.27, 15.2.2.13	O		x
FR99r	Local non-X.25 facilities, following Facility Marker	15.1, Table 18	O		x
FR20r	Facility Marker, CCITT-specified DTE facilities	15.1	O		x
FR22r	Called Address Extension	14.2, 15.3.2.2	O		x
FR24r	End-to-end Transit Delay Negotiation	14.4, 15.3.2.4	O		x
FR25r	Expedited Data Negotiation	14.7, 15.3.2.7	O		x
FR26r	Priority	14.5, 15.3.2.5	O		x
FR27r	Protection	14.6, 15.3.2.6	O		x

Table 21 - Facilities Received in CLEAR INDICATION Packets

Base Standard Features				Profile Features	
Item	**Facilities Received in CLEAR INDICATION Packets**	**References**	**Status**	**References**	**Status**
FR8ad	Charging information, monetary unit	13.22, 15.2.2.8.2	O		x
FR8bd	Charging information, segment count	13.22, 15.2.2.8.3	O		x
FR8cd	Charging information, call duration	13.22, 15.2.2.8.4	O		x
FR10d	Called Line Address Modified Notification	13.26, 15.2.2.12	O		x
FR99d	Local non-X.25 facilities, following Facility Marker	15.1, Table 18	O		x
FR20d	Facility Marker, ITU-T-specified DTE facilities	15.1	O		x
FR22d	Called Address Extension	14.2, 15.3.2.2	O		x

Table 22 - Facilities Received in CLEAR CONFIRMATION Packets

Base Standard Features				Profile Features	
Item	**Facilities Received in CLEAR CONFIRMATION Packets**	**References**	**Status**	**References**	**Status**
FR8af	Charging information, monetary unit	13.22, 15.2.2.8.2	O		x
FR8bf	Charging information, segment count	13.22, 15.2.2.8.3	O		x
FR8cf	Charging information, call duration	13.22, 15.2.2.8.4	O		x

E.8.2.5. Parameter Values and Ranges

Table 23 - Parameter Values and Ranges

Base Standard Features				Profile Features	
Item	**Parameter Values and Ranges**	**References**	**Status**	**References**	**Status**
	What values are supported:				
V1s	- Default packet sizes (sending)?	16.2.2.5	16, 32, 64, 128, 256, 512, 1024, 2048, 4096 octets	6.3.2	At least 128 and 256
V1r	- Default packet sizes (receiving)?	16.2.2.5	16, 32, 64, 128, 256, 512, 1024, 2048, 4096 octets	6.3.2	At least 128 and 256
V2s	- Default window sizes, sending?	16.2.2.6	(**M8**: in the range 1-7)		2
V2r	- Default window sizes, receiving?	16.2.2.6	(**M8**: in the range 1-7)		2

E.8.3. Datalink Layer Requirements

The PRLs given in this section are based on the PICS proforma for ISO/IEC 7776:1994 [Reference 6]. The entries in the 'References' column under 'Base standard features' of the following tables are references to clauses in that standard.

Table 24 - Datalink Protocol

Base Standard Features				Profile Features	
Item	**Data Link Protocol**	**References**	**Status**	**References**	**Status**
Lm	Multilink procedure	6	O		ox
Lc	DTE/DCE operation	1, 5.1	M		mo.1
Lt	DTE/DTE operation	1, 5.1	O		mo.1
M8	Basic (Modulo 8) operation	1, 3, 4.1.1	O.1		mm
M128	Extended (Modulo 128) operation	1, 3, 4.1.1	O.1		ox
T4	Timer T4 procedure	5.3.2, 5.6.1	O		mm
SPN1	Maximum number (N1) of bits in an I-frame	5.7.3	N1 ≥ 1080		N1 ≥ 2104
SPk	Maximum number of outstanding frames (k)	5.7.4	$1 \leq k \leq 7$		$k = 7$

E.8.4. Physical Layer Requirements

See ISO/IEC TR 10609-9 clause A.4 [Reference 8].

ANNEX F (INFORMATIVE) CONFORMANCE TESTING METHODOLOGY

F.1. Introduction

F.1.1. It is important that implementations of this ICD are such that there is a high level of confidence for interoperation between Air Traffic Control Centres (ATCCs) interworking across the interface.

F.1.2. Implementations of the interface are undertaken by member states in a manner that is likely to rely on procurement from various sources. To achieve a high level of confidence that such implementations will interoperate, a common set of conformance test requirements is required to standardise preparation for test, testing and presentation of results.

F.2. Purpose and Scope

F.2.1. This Annex defines requirements for the testing of conformance of implementations of this Eurocontrol Standard of which this Annex is a part.

F.2.2. It identifies mechanisms whereby confidence in the declared interface is established through a process of test to validate the claim.

F.3. Bibliography

The following document is relevant to the testing of implementations of this Eurocontrol Standard Document :

Eurocontrol(Maastricht Upper Area Control (UAC) Systems Division) FDE ICD Part 1 Integration Test Plan Version 1.0, dated 10 May 1996 [Reference 15].

F.4. Development Methods and Practices

F.4.1. Implementations of the ICD can be effected using certain options and versions of the ICD itself. In order to establish the potential for interworking, a Member State implementing the interface must identify which parts of the ICD are supported with a defined statement as to the capability and what limitations, if any, on variable parameters are supported.

F.4.2. Any implementation should be subject to a conformance test as described below.

F.5. Tests

F.5.1. Introduction

F.5.1.1. In order to provide confidence in and support for FDE Interface within an ATCC to the interworking between co-operating FDE applications, it is desirable for each to be tested for conformance to the standards of which this Annex forms a part. Such testing is against the external behaviour of the System Under Test (SUT) and is intended to test for interworking rather than the serviceability of the end system.

F.5.1.2. The results of such testing can serve as evidence in support of claims of conformance made in accordance with Section 5.1 of this part of this Eurocontrol Standard Document. The PICS proformas and PRLs called up by this profile specification can be used as the basis of conformance tests; in addition, international standards (e.g. ISO/IEC 8208 [Reference 7]) may already have abstract test suites defined that can be used in conformance testing.

F.5.1.3. The intention of this document is to provide for a standardised programme of test relying on a standardised test suite, use of which should lead to comparability of test results, wide acceptance of such test results and a minimisation of conformance testing required. The standardised test suite has been developed, in part, by Eurocontrol.

F.5.1.4. Based on Figure 2, the testing of the complete end system takes the form of tests on the lower 3 layers. It is advisable that testing include tests on the FDE application, Status, System and Operator Messages.

F.5.1.5. Each test described below should be conducted in order. The latter test will only be successful if the lower layers are functioning correctly and it is likely that this will be ascertained with the earlier tests.

F.5.1.6. Notwithstanding the above, the testing described in this section is voluntary.

F.5.2. Testing of the Lower Layers (Layers 1 - 3)

In support of the requirement for inter-operation between any one ATCC and its peers, it is recommended that any testing shall be based on the use of the test plan given in the Eurocontrol(Maastricht UAC Systems Division) FDE ICD Integration Test Plan. Test procedures are to be bilaterally agreed between co-operating ATCCs.

F.5.3. Testing of the Application Layer

A series of bilaterally agreed tests should be agreed and conducted between co-operating ATCCs.

F.5.4. Certification

The results of tests should be recorded and agreed between the co-operating parties.

F.5.5. Notification

Member states should pass details of the results of any tests to Eurocontrol.

ANNEX G (INFORMATIVE)
ASSIGNMENT OF ATC UNIT IDENTIFIERS

The following table shows the ATC unit identifiers assigned as at April 22nd, 1997. The Eurocontrol can provide information on the current assignment of identifiers. The table also shows in hexadecimal the binary encoding of the identifier as part of the NSAP address encoding defined in Annex C.

Table 1 - ATC Unit Identifiers

ATC Unit Identifier	Encoding	Description
00		Reserved
01	'01'H	CATCAS, Copenhagen
02	'02'H	MADAP, Maastricht
03	'03'H	ZKSD, Frankfurt/Main
04	'04'H	CANAC Brussels
05	'05'H	Generic CAUTRA, France
06	'06'H	Dublin
07	'07'H	Shannon
08	'08'H	LATCC, London
09	'09'H	Oslo ATCC
10	'10'H	Karlsruhe ATCC
11	'11'H	Langen (future German system)
12	'12'H	FATMI-system, Tampere
13	'13'H	ROVA-system, Rovaniemi
14	'14'H	VAS, Vienna
15	'15'H	CFMU Haren
16	'16'H	CFMU Brétigny
17	'17'H	Geneva ACC/FMP
18	'18'H	Zurich ACC/FMP
19	'19'H	Barcelona
20	'20'H	Madrid
21	'21'H	Palma
22	'22'H	Milan
23	'23'H	Rome
24	'24'H	Jersey
25	'25'H	Shanwick
26	'26'H	Athis-Mons
27	'27'H	Reims
28	'28'H	Brest
29	'29'H	Bordeaux
30	'30'H	Aix-en-Provence
31	'31'H	Bratislava
32	'32'H	Stockholm-Arlanda
33	'33'H	Malmö-Sturup
34	'34'H	Sundsvall
35	'35'H	Lisbon
36	'36'H	Seville
37	'37'H	Gran Canaria
38	'38'H	Prague
39	'39'H	Amsterdam
40	'40'H	LIZ Offenbach

“Table 1 - (concluded)”

ATC Unit Identifier	Encoding	Description
41	'41'H	German Military System
42	'42'H	German Military System
43	'43'H	German Military System
44	'44'H	German Military System
45	'45'H	German Military System
46	'46'H	German Military System
47	'47'H	German Military System
48	'48'H	German Military System
49	'49'H	German Military System
50	'50'H	Munchen (Future German System)
51	'51'H	Zagreb
52	'52'H	Hahn Airport, Germany
53	'53'H	Santa Maria FIR
54	'54'H	Ljubljana
55	'55'H	Belgian Military System
56	'56'H	Budapest
57	'57'H	Warsaw

ANNEX H (INFORMATIVE)
GUIDANCE ON RELIABILITY, AVAILABILITY AND SECURITY

H.1. Introduction

It is expected that ATC applications such as OLDI shall make use of interconnected X.25 networks and/or public or private telecommunication services. As a consequence, it is deemed necessary to provide guidance to FDE ICD Part 1 implementations.

H.2. Purpose and Scope

H.2.1. The purpose of this Annex is to give guidance on issues relating to reliability, availability and security.

H.2.2. The scope of this Annex is based on two scenarios. The first scenario is a point-to-point connection over leased line. The second scenario is based within an interconnected X.25 network environment.

NOTE - For the second scenario, issues relating to the interconnection of the X25 networks are not considered.

H.2.3. It is assured that implementations are physically protected against intrusion, power failures and other external threats that can affect normal operation.

H.3. Bibliography

The following document is a detailed technical analysis of which this Annex is an overview:

Eurocontrol FDE ICD Part 1: Reliability, Availability and Security – Technical Report [Reference 16].

H.4. Leased Line Implementations

H.4.1. Reliability

To increase service reliability, leased line, PSTN, Integrated Services Digital Network (ISDN) cables must follow physically different paths and linked to different telecommunication operator switches (this must be specified to the telecommunication operator).

H.4.2. Availability

H.4.2.1. Due to long setup times on PSTN which are incompatible with time constraining applications, ISDN should be used as a backup medium.

H.4.2.2. In event of DTE switchover, the standby DTE should generate a DISC frame to accelerate connection re-establishment.

H.4.3. Security

H.4.3.1. When using ISDN as backup medium, the called ISDN terminal adapter (TA) should validate the caller's E.164 address [Reference 18].

H.4.3.2. The calling DTE should comply to ITU-T Recommendation X.32 [Reference 17] by including caller identification and for authentication information.

H.4.4. Configuration Example

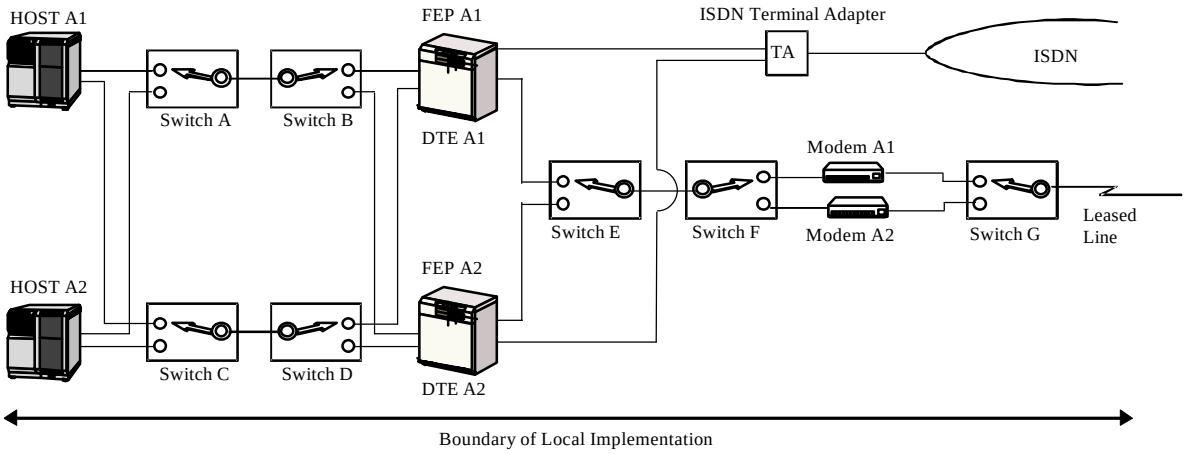


Figure H.1. - Leased Line Configuration Example

H.5. Network Implementation

H.5.1. Reliability

To increase service reliability, hosts on a given site should be connected to two DCEs belonging to different network switches (this requirement should be specified to the network operator).

H.5.2. Availability

H.5.2.1. The hunt group facility should be used so as to be able to assign a single X.121 address [Reference 20] to the DCEs located on a given site, thereby optimising network routing and limiting unsuccessful calls.

H.5.2.2. In the event other call mechanisms are implemented resulting in a different called DTE address value in the CALL REQUEST and CALL ACCEPT packets, the calling DTE should be configured so there is no impact on the setting up of the call.

H.5.2.3. In the event of DCE disconnection due to a network failure and a second access to the network is available, call re-establishment should be made via this second access.

H.5.3. Security

Within the scope of this Annex, the Closed User Group (CUG) facility is the only applicable network facility that should be used.

H.6. General Guidance for Leased Line and Network Implementations

H.6.1. Reliability

H.6.1.1. As a full host switchover can be long, it is advantageous to consider the use a front-end processor (FEP) to cater for host failures.

H.6.1.2. An architecture based on an FEP can increase service reliability.

NOTE - Inclusion of a transport stack in the profile specification may be developed in the context of a future FDE ICD Part 2 standard.

H.6.2. Availability

When a call is unsuccessful, the calling site should make a second call using the second X.121 address (if available).

H.6.3. Systems Management

H.6.3.1. The use of switches that are automatically toggled by scanning of the interface signals should be used where possible.

H.6.3.2. A local error indication during data transmission can be used to trigger a host switchover.

H.6.3.3. The switchover of a FEP should generate a TC-disconnect to ensure the local host is in the IDLE state.

H.6.3.4. On expiry of the time-outs on the X.25 network or datalink layers, the higher layers should be released.

H.6.3.5. A total FEP failure should generate a TC-disconnect.

H.6.3.6. The management system should poll the Message Transfer Protocol layer (Annex A) and check the state machine to distinguish between a Message Transfer Protocol failure and an application failure.

H.6.4. Configuration Example

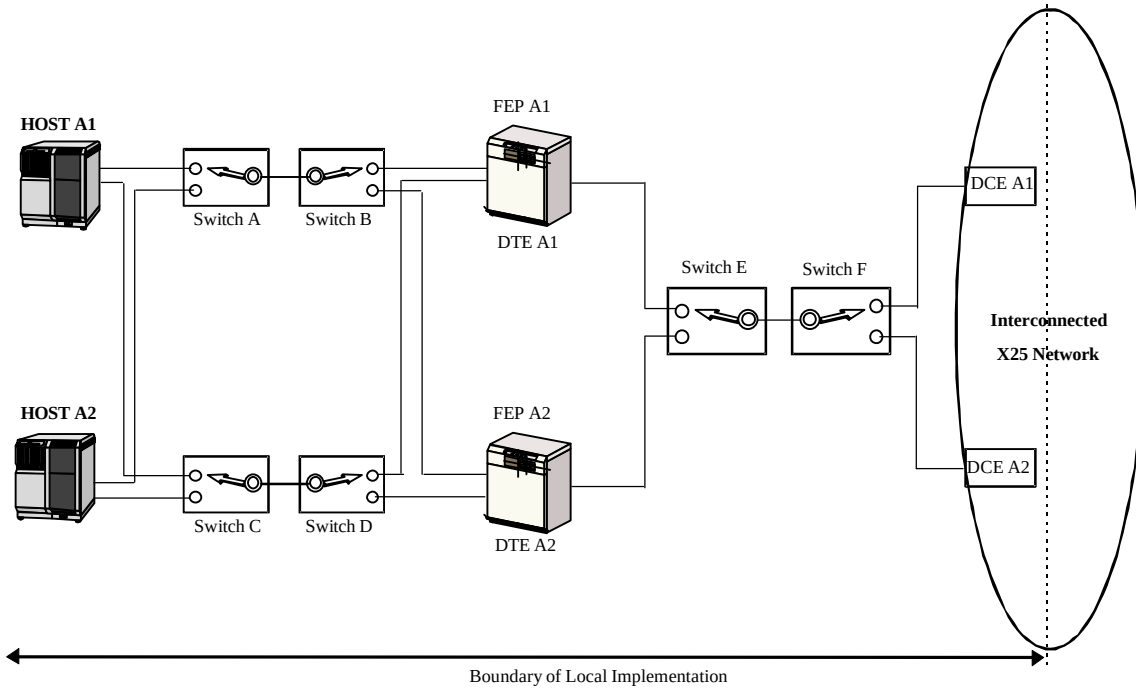


Figure H.2. - Network Configuration Example

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