INTERNATIONAL TELECOMMUNICATION UNION

ITU-T X.235

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

(04/95)

DATA NETWORKS AND OPEN SYSTEM COMMUNICATIONS

OPEN SYSTEMS INTERCONNECTION – CONNECTIONLESS-MODE PROTOCOL SPECIFICATIONS

INFORMATION TECHNOLOGY – OPEN SYSTEMS INTERCONNECTION – CONNECTIONLESS SESSION PROTOCOL: PROTOCOL SPECIFICATION

ITU-T Recommendation X.235

(Previously "CCITT Recommendation")

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. Some 179 member countries, 84 telecom operating entities, 145 scientific and industrial organizations and 38 international organizations participate in ITU-T which is the body which sets world telecommunications standards (Recommendations).

The approval of Recommendations by the Members of ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, 1993). In addition, the World Telecommunication Standardization Conference (WTSC), which meets every four years, approves Recommendations submitted to it and establishes the study programme for the following period.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC. The text of ITU-T Recommendation X.235 was approved on 10th of April 1995. The identical text is also published as ISO/IEC International Standard 9548-1.

NOTE

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

ITU-T X-SERIES RECOMMENDATIONS

DATA NETWORKS AND OPEN SYSTEM COMMUNICATIONS

(February 1994)

ORGANIZATION OF X-SERIES RECOMMENDATIONS

Subject area	Recommendation Series
PUBLIC DATA NETWORKS	
Services and Facilities	X.1-X.19
Interfaces	X.20-X.49
Transmission, Signalling and Switching	X.50-X.89
Network Aspects	X.90-X.149
Maintenance	X.150-X.179
Administrative Arrangements	X.180-X.199
OPEN SYSTEMS INTERCONNECTION	
Model and Notation	X.200-X.209
Service Definitions	X.210-X.219
Connection-mode Protocol Specifications	X.220-X.229
Connectionless-mode Protocol Specifications	X.230-X.239
PICS Proformas	X.240-X.259
Protocol Identification	X.260-X.269
Security Protocols	X.270-X.279
Layer Managed Objects	X.280-X.289
Conformance Testing	X.290-X.299
INTERWORKING BETWEEN NETWORKS	
General	X.300-X.349
Mobile Data Transmission Systems	X.350-X.369
Management	X.370-X.399
MESSAGE HANDLING SYSTEMS	X.400-X.499
DIRECTORY	X.500-X.599
OSI NETWORKING AND SYSTEM ASPECTS	
Networking	X.600-X.649
Naming, Addressing and Registration	X.650-X.679
Abstract Syntax Notation One (ASN.1)	X.680-X.699
OSI MANAGEMENT	X.700-X.799
SECURITY	X.800-X.849
OSI APPLICATIONS	
Commitment, Concurrency and Recovery	X.850-X.859
Transaction Processing	X.860-X.879
Remote Operations	X.880-X.899
OPEN DISTRIBUTED PROCESSING	X.900-X.999

CONTENTS

Summary

This Recommendation | International Standard provides the protocol for the OSI connectionless-mode Session service which is defined in Recommendation X.215.

Introduction

The connectionless session protocol specification is one of a set of Recommendations | International Standards produced to facilitate the interconnection of computer systems. The set of standards covers the services and protocols required to achieve such interconnection.

The connectionless session protocol specification is positioned with respect to other related standards by the layers defined in the Reference Model for Open Systems Interconnection (see ITU-T Rec. X.200 | ISO/IEC 7498-1). In particular, it is a protocol of the Session Layer. It is most closely related to the Session Service Definition (see ITU-T Rec. X.215 | ISO/IEC 8326) and the Transport Service Definition (see ITU-T Rec. X.214 | ISO/IEC 8072). The interrelationship of these standards is depicted in Figure.

The structure of this Recommendation | International Standard is similar to the structure of the connection mode Session Protocol Specification (see ITU-T Rec. X.225 | ISO/IEC 8327-1) in order to facilitate cross reference between the two standards.

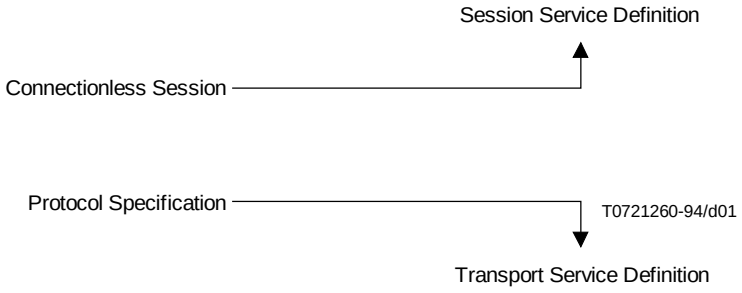

Figure Intro.1 – Relationship between the connectionless session protocol and adjacent services

INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY – OPEN SYSTEMS INTERCONNECTION – CONNECTIONLESS SESSION PROTOCOL: PROTOCOL SPECIFICATION

SECTION 1 – GENERAL

1 Scope

This Recommendation | International Standard specifies:

a) procedures for the connectionless transmission of data and protocol control information from one session entity to a peer session entity;

b) the encoding of the session protocol data units used for the transmission of data and control information;

c) procedures for the correct interpretation of session protocol control information; and

d) the functional requirements for implementations claiming conformance to this Recommendation | International Standard.

The procedures are defined in terms of:

e) the interactions among peer session entities through the exchange of session protocol data units;

f) the interactions between a session entity and a session service user through the exchange of session service primitives; and

g) the interactions between a session entity and a transport provider through the exchange of transport service primitives.

This Recommendation | International Standard specifies a connectionless session protocol. A connection-oriented session protocol is specified in ITU-T Rec. X.225 | ISO/IEC 8327-1.

2 Normative references

The following Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation | International Standard. At the time of publication, the editions indicated were valid. All Recommendations and Standards are subject to revision, and parties to agreements based on this Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent edition of the Recommendations and Standards listed below. Members of ISO and IEC maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau of the ITU maintains a list of currently valid ITU-T Recommendations.

2.1 Identical Recommendations | International Standards

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

– ITU-T Recommendation X.214 (1993) | ISO/IEC 8072:1994, *Information technology – Open Systems Interconnection – Transport service definition*.

- ITU-T Recommendation X.215 (1994) | ISO/IEC 8326:...[1)], *Information technology – Open Systems Interconnection – Session service definition*.
- ITU-T Recommendation X.225 (1994) | ISO/IEC 8327-1:...[1)], *Information technology – Open Systems Interconnection – Connection-oriented Session Protocol: Protocol specification*.

3 Definitions

3.1 Reference model definitions

This Recommendation | International Standard makes use of the following terms defined in ITU-T Rec. X.200 | ISO/IEC 7498-1:

a) Transport Layer;

b) Session Layer;

c) session service access point;

d) session service access point address;

e) session entity;

f) protocol;

g) service.

3.2 Additional definitions

For the purposes of this Recommendation | International Standard, the following definitions apply:

3.2.1 calling session address: Identifies the session service user that acts as the source of data during a particular instance of session connectionless mode transmission.

3.2.2 called session address: Identifies the session service user that acts as the sink of data during a particular instance of session connectionless mode transmission.

4 Abbreviations

4.1 Data Units

For the purposes of this Recommendation | International Standard, the following abbreviations apply:

SPDU	Session Protocol Data Unit
SDU	Service Data Unit
TSDU	Transport Service Data Unit

4.2 Session protocol data units

UD SPDU	Unit Data SPDU

4.3 SPDU fields

SI	SPDU Identifier
LI	Length Indicator
PI	Parameter Indicator
PV	Parameter Value

[1)] To be published.

4.4 Parameters

– calling session selector;

– called session selector.

4.5 Miscellaneous

SPM	Session Protocol Machine
SS	Session Service
SS-user	Session Service User
SSAP	Session Service Access Point
TSAP	Transport Service Access Point

5 Overview of the connectionless session protocol

5.1 Service provided by the session layer

The service provided by the protocol described in this Recommendation | International Standard is a connectionless session service. The connectionless session service is described in ITU-T Rec. X.215 | ISO/IEC 8326. The session service primitives provided are summarized in Table 1.

Table 1 – Connectionless session service primitives

Primitive	Parameters
S-UNIT-DATA request	Calling session address Called session address Quality of Service SS-User-Data
S-UNIT-DATA indication	Calling session address Called session address SS-User-Data

5.2 Service assumed from the transport layer

The session protocol described in this Recommendation | International Standard can operate only over the connectionless transport service defined in ITU-T Rec. X.214 | ISO/IEC 8072. When operating over that service, the service primitives summarized in Table 2 are used.

Table 2 – Connectionless transport service primitives

Primitive	Parameters
T-UNIT-DATA request	Source address Destination address Quality of Service TS-User-Data
T-UNIT-DATA indication	Source address Destination address TS-User-Data
NOTE – Only those parameters pertinent to this session protocol are included in the above tables.	

5.3 Functions of the session layer

The functions of the session layer are:

a) to map session addresses onto transport addresses;

b) to select transport Quality of Service parameters needed;

c) to transfer session selectors; and

d) to transfer an SSDU.

5.4 Model of the session layer

A session protocol entity is comprised of one or more session protocol machines (SPMs). A SPM may be connection oriented or connectionless. The connectionless session protocol machine communicates with the SS-user through one or more SSAPs by means of the connectionless session service primitives (defined in ITU-T Rec. X.215 | ISO/IEC 8326). These session service primitives cause or result from the exchange of SPDUs between peer session entities engaged in connectionless mode transmission. These protocol exchanges are effected by making use of the services of the transport layer, as defined in the transport service definition.

The model of session connectionless mode transmission is presented in 6.2 of the session service definition covering connectionless mode transmission. The model of the session layer is illustrated in Figure 1.

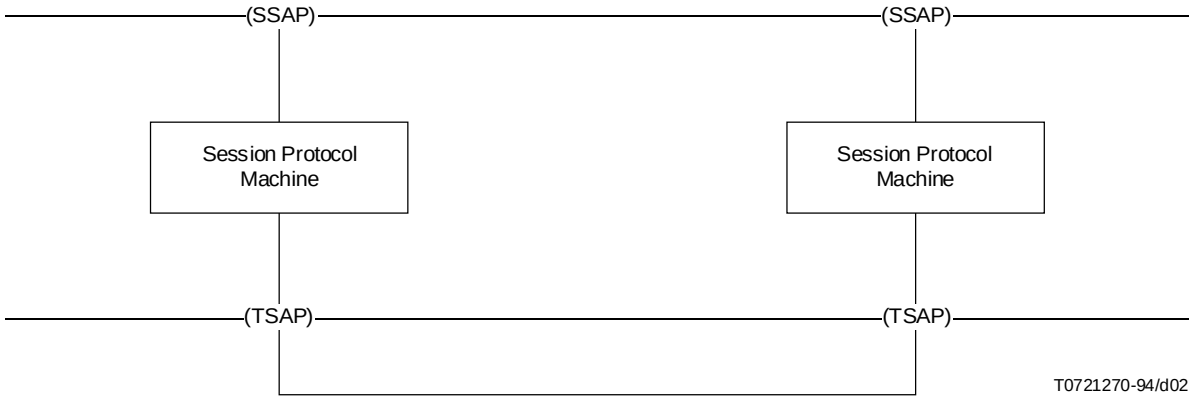

Figure 1 – Model of the connectionless session layer

SECTION 2 – CONNECTIONLESS SESSION PROTOCOL SPECIFICATION

6 Protocol mechanisms

The protocol mechanisms described below are those used for the connectionless session protocol.

6.1 Session protocol data unit (SPDU) transfer

6.1.1 Purpose

To convey session protocol data units in user data fields of transport service primitives.

6.1.2 Transport service primitives

The procedure uses the following transport service primitives:

T-UNIT-DATA request
T-UNIT-DATA indication

6.1.3 SPDUs used

The SPDUs defined for the connectionless protocol are listed below:

SPDU Name	Abbreviation
UNITDATA	UD

6.2 Connectionless mode transfer

6.2.1 Purpose

To transfer one SSDU from one SS-user to another SS-user without session connection establishment or release.

6.2.2 Transport service primitives

T-UNIT-DATA request
T-UNIT-DATA indication

6.2.3 SPDUs and fields used

UD SPDU
- version number
- calling session selector
- called session selector
- user data

6.2.4 Sending a UD SPDU

The called and calling session address parameters of the S-UNIT-DATA request service primitive are used to determine the source address, calling session selector, destination address, and called session selector.

If the length of the SPDU exceeds the maximum TSDU size supported by the transport service, then the S-UNIT-DATA request is discarded and a local report may be made to the SS-user indicating the inability of the session layer to provide the service requested.

A UD SPDU is constructed with a calling session selector, a called session selector, and user data supplied by the SS-user in the S-UNITDATA request. It also contains a protocol version number provided by the SPM.

A T-UNIT-DATA request service primitive is issued with the source and destination addresses determined above, the Quality of Service requested and a TS-user-data parameter containing the UD SPDU.

6.2.5 Receiving a UD SPDU

The UD SPDU arrives in the TS-user-data field of a T-UNIT-DATA indication.

A valid incoming UD SPDU results in an S-UNIT-DATA indication, provided that the version number parameter in the incoming UD SPDU indicates at least one protocol version which is supported by the receiving SPM. Parameters corresponding to the highest common protocol version are supplied in the S-UNIT-DATA indication.

The source address from the T-UNIT-DATA indication and the calling session selector from the UD SPDU will be used to determine the calling session address parameter for the S-UNIT-DATA indication. The destination address from the T-UNIT-DATA indication and the called session selector from the UD SPDU will be used to determine the called session address parameter for the S-UNIT-DATA indication.

The user information field of the UD SPDU will be mapped to the user data parameter of the S-UNIT-DATA indication.

If the data cannot be immediately delivered to a SS-user due to non-existent recipient, recipient not ready to receive, or too large data field size, that unit data is discarded without any notification.

7 Encoding of the unit data (UD) SPDU

7.1 TSDU structure

Each UD SPDU is contained within a single TSDU and consists of octets that are numbered sequentially starting from 1.

Each octet within an SPDU consists of eight bits numbered 8 to 1 where 1 is the low ordered bit.

The sequence of octets within an SPDU and the sequence of data within an octet are defined for each SPDU in 7.3, with the additional convention that where the text refers to bits within a two octet field and the bits are numbered 16 to 1, then 1 is the low order bit and the octet containing bits 16 to 9 precedes the octet containing bits 8 to 1 in the SPDU.

Within each TSDU:

a) the ordering of the octets is maintained to the same order as in the SPDU;

b) the ordering of bits within each TSDU is maintained in the same order as in the SPDU (i.e. the low order bit is mapped onto the low order bit and the high order bit is mapped onto the high order bit).

NOTES

1 The TSDU structure is illustrated in Figure 2. The integrity of this structure is maintained over a transport service. This Recommendation | International Standard does not define the way in which the TSDU is transmitted.

2 When the structure of an SPDU is illustrated in this Recommendation | International Standard, the following convention is used:

a) octets are shown with the lowest numbered octet to the left, higher numbered octets being shown further to the right;

b) within an octet, bits are shown with bit 8 to the left and bit 1 to the right.

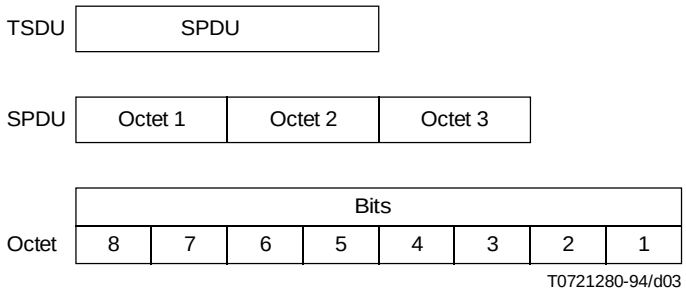

Figure 2 – Illustration of definition of TSDU structure

7.2 SPDU structure

This subclause specifies the general structure of SPDUs in terms of their constituent fields. This structure is illustrated in Figure 3.

Codings and structural requirements specific to particular SPDUs are specified in 7.3.

Examples of valid SPDU structure are illustrated in Figure 4.

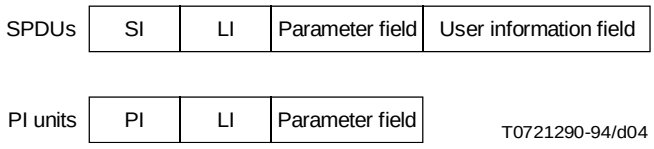

Figure 3 – Illustration of structure of SPDUs and PI units

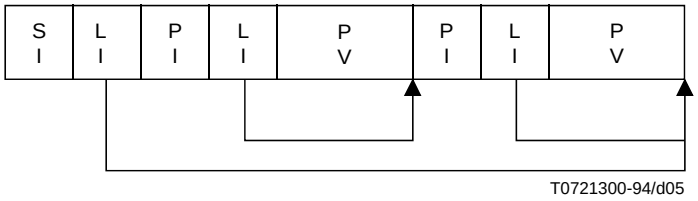

Figure 4 – Examples of SPDU structure

7.2.1 SPDUs

SPDUs shall contain, in the following order:

a) the SI field that identifies the type of SPDU;

b) the LI field that indicates the length of the associated parameter field defined in c);

c) the parameter field which, if present, consists of the PI units (see 7.2.2) defined for the SPDU;

d) the user information field, if defined for the SPDU and if present.

7.2.2 PI units

PI Units shall contain, in the following order:

a) the PI field that identifies the parameter;

b) the LI field that indicates the length of the associated parameter field defined in 7.2.3;

c) the parameter field which, if present, consists of the parameter value.

7.2.3 Length indicator field

The value of the LI field is expressed as a binary number representing the length, in octets, of the associated field (see Note). A value of zero indicates that the associated parameter field is absent.

LI fields indicating lengths within the range 0-254 shall comprise one octet.

LI fields indicating lengths within the range 255-65 555 shall comprise three octets. The first octet shall be coded 1111 1111 and the second and third octets shall contain the length of the associated parameter field with the high order bits in the first of these two octets.

NOTE – The LI field does not include either itself or any subsequent user information.

7.2.4 Parameter fields

PI units defined as mandatory in Table 3 shall contain a parameter field of one or more octets.

Any PI units defined as non-mandatory in Table 3 may be omitted if it is not required for conveying information (i.e. a parameter value). If a PI unit contains on LI field with the value zero, the associated parameter field is absent (see Note) and the value of the parameter field shall be considered as its default value.

NOTE – It is recommended that if a non-mandatory parameter is absent, the associated PI and LI fields should not be included in the SPDU.

PI units within the same nesting level shall be ordered in increasing value of their PI codes.

PI units containing a PI code that is not specified in 7.3 shall be ignored.

PI codes are expressed as decimal numbers in Table 3 and shall be encoded as binary numbers.

7.2.5 User information fields

An SSDU shall be contained in the User Information Field of a single SPDU. The order of the octets and the order of the bits in the SSDU shall be maintained in the SPDU.

7.3 SPDU identifiers and associated parameter fields

7.3.1 Unit data (UD) SPDU

7.3.1.1 The SI field shall contain the value 64.

7.3.1.2 The parameter fields shall be as specified in Table 3.

7.3.1.3 In the Version Number PV field, bit 1 shall have the value 1, indicating that this version of the Recommendation | International Standard is implemented. All other bits are reserved. If this PI unit or PV field is absent, the default shall be protocol version 1.

7.3.1.4 The Calling Session Selector, if present, shall be derived from the Calling Session Address supplied by the calling SS-user.

7.3.1.5 The Called Session Selector, if present, shall be derived from the Called Session Address supplied by the calling SS-user.

7.3.1.6 The User Information Field shall contain user data supplied by the SS-user. The length of this field is restricted to the maximum TSDU size (specified in ITU-T Rec. X.214 | ISO/IEC 8072) minus the size of the UD header.

Table 3 – Parameters of the UNIT DATA SPDU

PI	m/nm	Code	Length	Reference and PV
Version Number	nm	22	1 octet	7.3.1.3
Calling session selector	nm	51	16 octets maximum	7.3.1.4
Called session selector	nm	52	16 octets maximum	7.3.1.5
User Information Field			7.3.1.6	7.3.1.6
m Mandatory (7.2.4) nm Not mandatory (7.2.4)				

8 Conformance

The implementations claiming conformance shall meet the elements of procedure described in clause 6.

Annex A

State table

(This annex forms an integral part of this Recommendation | International Standard)

This annex describes the connectionless session protocol in terms of a state table.

Table A.1 specifies the incoming event list.

Table A.2 specifies the outgoing event list.

Table A.3 specifies the state table.

There are no predicates.

There are no actions.

Table A.1 – Incoming Event List

Abbreviated name	Category	Name and description
S-UNIT-DATAreq UD	SS-user SPDU	S-UNIT-DATA request primitive Session Unit Data SPDU

Table A.2 – Outgoing Event List

Abbreviated name	Category	Name and description
S-UNIT-DATAind UD	SS-provider SPDU	S-UNIT-DATA indication primitive Session Unit Data; sent as TS-user-data on a T-UNIT-DATA request primitive

Table A.3 – Unit Data Transfer State Table

State Event	Idle
S-UNIT-DATAreq	UD Idle
UD	S-UNIT-DATAind Idle