

**Superseded by a more recent version**



INTERNATIONAL TELECOMMUNICATION UNION

**ITU-T**

**Amendment 2**

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

**X.233**

(11/95)

**DATA NETWORKS AND OPEN SYSTEM  
COMMUNICATIONS –  
OPEN SYSTEMS INTERCONNECTION –  
CONNECTIONLESS-MODE PROTOCOL  
SPECIFICATIONS**

---

**INFORMATION TECHNOLOGY –  
PROTOCOL FOR PROVIDING THE  
CONNECTIONLESS-MODE NETWORK  
SERVICE: PROTOCOL SPECIFICATION**

**AMENDMENT 2: EXTENSIBILITY AND QUALITY  
OF SERVICE**

**Amendment 2 to  
ITU-T Recommendation X.233  
Superseded by a more recent version**

(Previously "CCITT Recommendation")

---

# Superseded by a more recent version

## 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.233, Amendment 2, was approved on 21st of November 1995. The identical text is also published as ISO/IEC International Standard 8473-1.

---

## NOTE

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

© ITU 1996

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the ITU.

# Superseded by a more recent version

ITU-T X-SERIES RECOMMENDATIONS

DATA NETWORKS AND OPEN SYSTEM COMMUNICATIONS

(February 1994)

## ORGANIZATION OF X-SERIES RECOMMENDATIONS

Subject area	Recommendation Series
<b>PUBLIC DATA NETWORKS</b>	
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
<b>OPEN SYSTEMS INTERCONNECTION</b>	
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
<b>INTERWORKING BETWEEN NETWORKS</b>	
General	X.300-X.349
Mobile Data Transmission Systems	X.350-X.369
Management	X.370-X.399
<b>MESSAGE HANDLING SYSTEMS</b>	X.400-X.499
<b>DIRECTORY</b>	X.500-X.599
<b>OSI NETWORKING AND SYSTEM ASPECTS</b>	
Networking	X.600-X.649
Naming, Addressing and Registration	X.650-X.679
Abstract Syntax Notation One (ASN.1)	X.680-X.699
<b>OSI MANAGEMENT</b>	X.700-X.799
<b>SECURITY</b>	X.800-X.849
<b>OSI APPLICATIONS</b>	
Commitment, Concurrency and Recovery	X.850-X.859
Transaction Processing	X.860-X.879
Remote Operations	X.880-X.899
<b>OPEN DISTRIBUTED PROCESSING</b>	X.900-X.999



# Superseded by a more recent version

## CONTENTS

	<i>Page</i>
Summary .....	ii
Introduction.....	ii
1) Clause 3 .....	1
2) Subclause 6.4 .....	1
3) Subclause 6.9 .....	1
4) Subclause 6.21 .....	1
5) Subclause 7.5.1 .....	1
6) Subclause 7.5.6 .....	2
7) Subclause 7.5.6.1 .....	3
8) Subclause 7.5.6.2 .....	3
9) Subclause 7.5.6.3 .....	3
10) Subclause 7.9.5 .....	3

# Superseded by a more recent version

## Summary

This amendment adds features to the connectionless Network protocol that support:

- i) extensibility – the ability to add new protocol features with minimal impact on existing implementations; and
- ii) Quality of Service maintenance – provision of “strong” forwarding (if QOS criteria can be satisfied) and “weak” forwarding (even if QOS criteria cannot be satisfied).

## Introduction

This amendment to ITU-T Rec. X.233 | ISO/IEC 8473-1 adds features to the protocol that support:

- extensibility – the ability for a system to classify each option in a received PDU according to whether or not the option can be ignored, even if it does not recognize the individual option type code (so that new options can be added to future revisions of the standard with minimal impact on existing implementations); and
- “strong” forwarding as well as “weak” forwarding with respect to Quality of Service maintenance – the ability for Intermediate Systems to identify PDUs containing Type 3 options that have been forwarded by one or more systems that do not support those options.

This amendment also corrects the specification for decrementing the lifetime field, which originally could be interpreted as permitting or requiring an implementation to decrement to below zero.

INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY – PROTOCOL FOR PROVIDING  
THE CONNECTIONLESS-MODE NETWORK SERVICE:  
PROTOCOL SPECIFICATION

AMENDMENT 2  
Extensibility and Quality of Service

1) **Clause 3**

*Definitions: Add the following two definitions to clause 3, immediately after 3.7.7:*

**3.7.8 “strong” forwarding:** Forwarding only PDUs for which the QOS criteria can be satisfied.

**3.7.9 “weak” forwarding:** Forwarding PDUs even if the QOS criteria cannot be satisfied.

2) **Subclause 6.4**

*Add to the beginning of the second to last paragraph of 6.4:*

“When a Network entity decrements the value of the lifetime field, it shall place a value of 0 into this field if the current value is less than the amount it is to decrement by.”

3) **Subclause 6.9**

*Add a new item to the list in 6.9:*

- j) A PDU is received with QOS maintenance parameter indicating “Globally unique with strong forwarding” and the required QOS is not available.

4) **Subclause 6.21**

*Insert a new entry in Table 3:*

QOS Maintenance (format code 00)	2	2	N/A
----------------------------------	---	---	-----

*Change the “Function” column entry in Table 3 for “QOS Maintenance” to read:*

QOS Maintenance (other format codes)

5) **Subclause 7.5.1**

*Replace the entire paragraph immediately following Figure 7, which begins “The parameter code field is ..”, with the following:*

“The parameter code field is encoded in binary and provides for a maximum of 252 different parameters. The high-order two bits of the parameter code field contain a processing requirement code, which is used to classify the parameter with

respect to whether or not it can be ignored, or must be processed, by end and intermediate systems. The processing requirement codes are shown in Table 5, in which “may be ignored” means that the end system or intermediate system is permitted, but is not required, to process the PDU containing the option exactly as though the option were not present, and “shall be processed” means that the end system or intermediate system is required to process the parameter identified by the remainder of the parameter code in accordance with the specification of the parameter.

**Table 5 – Processing requirement codes**

Processing requirement code	Processing requirements
00	May be ignored by ESs and ISs
01	May be ignored by ESs
10	May be ignored by ISs
11	Shall be processed by ESs and ISs

NOTE – The purpose of the processing requirement code is to permit the future extension of this Recommendation | International Standard by the definition of new option parameters, while permitting the continued use of implementations that pre-date the extensions (by permitting them to ignore a new option parameter, when it is possible to do so, without knowing what the option is).

An option identified by a processing requirement code of 00 represents information that is not essential for either the relaying or the delivery of PDUs containing the option; end systems and intermediate systems are permitted to process the PDU as if it did not contain the option.

An option identified by a processing requirement code of 01 represents information that is not essential for the delivery of PDUs containing the option, but is essential for the relaying of those PDUs; end systems are permitted to process the PDU as if it did not contain the option, but an intermediate system that cannot process an option with a processing requirement code of 01 shall discard the PDU.

An option identified by a processing requirement code of 10 represents information that is not essential for the relaying of PDUs containing the option, but is essential for the delivery of those PDUs; intermediate systems are permitted to process the PDU as if it did not contain the option, but an end system that cannot process an option with a processing requirement code of 10 shall discard the PDU.

An option identified by a processing requirement code of 11 represents information that is essential for both the relaying and the delivery of PDUs containing the option; an end system or intermediate system that cannot process an option with a processing requirement code of 11 shall discard the PDU.”

**6) Subclause 7.5.6**

*Amend Table 6 so that code 00 (which is currently reserved) is assigned to a new “Type of QOS Field” named “Globally unique with strong forwarding” and rename the “Type of QOS Field” to which code 11 is assigned (currently “Globally unique”) “Globally unique with weak forwarding”.*

*Change the first two sentences of the paragraph immediately following Table 6 to read as follows:*

“For QOS format codes 00 and 11, the remainder of the first octet is reserved for use by the globally unique QOS format, as described in 7.5.6.3. If any other QOS format code is selected, bits 5-1 of the first octet shall be zero (0).”



**7) Subclause 7.5.6.1**

*Add the following new paragraph at the end of the subclause:*

“A value of 1 in bit 6 of the QOS format code indicates that the PDU has at some point been forwarded on a path that did not support the specified source address specific QOS parameter. If an IS does not support the specified source address specific QOS parameter, it shall set the bit 6 to 1.”

**8) Subclause 7.5.6.2**

*Add the following new paragraph at the end of the subclause:*

“A value of 1 in bit 6 of the QOS format code indicates that the PDU has at some point been forwarded on a path that did not support the specified destination address specific QOS parameter. If an IS does not support the specified destination address specific QOS parameter, it shall set the bit 6 to 1.”

**9) Subclause 7.5.6.3**

*Replace the first paragraph of the subclause with the following:*

“The QOS format code value of binary 11 indicates that the remainder of the parameter value field specifies a globally unique with weak forwarding QOS maintenance field, and that this parameter shall be treated as a Type 3 function (see 6.21). The QOS format code value of binary 00 indicates that the remainder of the parameter value field specifies a globally unique with strong forwarding QOS maintenance field, and that this parameter shall be treated as a Type 2 function (see 6.21). When the value of the QOS format code is 00 or 11, the parameter value field shall have a total length of one octet, which is assigned the values shown in Table 7.”

*In Table 7, replace the entry in the “Usage” column of the row for bits 8 and 7 with the following:*

“QOS format codes of binary 00 or 11.”

*In Table 7, replace the entry in the “Usage” column of the row for bit 6 with the following:*

“QOS unavailable”

*Replace the first paragraph immediately after Table 7 with the following:*

“When the value of the QOS format code is 11, bit 6 is set to one by an intermediate system if it could not forward the PDU in accordance with the QOS maintenance field value contained in bits 5, 3, 2, and 1, but forwarded the PDU anyway (as it is permitted to do in the case of Type 3 options, such as QOS maintenance). A value of 1 in bit 6 of QOS format code indicates that the PDU has at some point been forwarded on a path that could not respect the QOS maintenance field value. When the value of the QOS format code is 00, bit 6 is reserved.”

**10) Subclause 7.9.5**

*Add a new entry to Table 8, “PDU Discarded” block:*

“0101	Unsupported or unavailable QOS”
-------	---------------------------------