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INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

Amendment 3

X.233

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

(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 3: RECORD ROUTE TIMESTAMPS

Amendment 3 to

ITU-T Recommendation X.233

Superseded by a more recent version

(Previously "CCITT Recommendation")

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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 3, 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.

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DATA NETWORKS AND OPEN SYSTEM COMMUNICATIONS

(February 1994)

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Summary

This amendment to ITU-T Rec. X.233 | ISO/IEC 8473-1 adds features to the connectionless Network protocol that support record route timestamps – the ability to associate a timestamp with each Network Entity Title in the “recording of route” option.

Introduction

This amendment to ITU-T Rec. X.233 | ISO/IEC 8473-1 adds features to the protocol that support record route timestamps – the ability to associate a timestamp with each Network Entity Title in the “recording of route” option.

INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

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

AMENDMENT 3
Record Route Timestamps

1) Subclause 6.15

Replace the text of 6.15, in its entirety, with the following:

"The record route function records the path taken by a PDU as it traverses a series of intermediate systems, and optionally also records timing information. A recorded route consists of a list of entries held in a parameter within the options part of the PDU header. Each entry consists of either a Network entity title, or a timestamp followed by a Network entity title: in addition, the first entry in a timestamped list can consist of a timestamp without a Network entity title, inserted by the originator of the PDU. The length of this parameter is determined by the originating Network entity, and does not change during the lifetime of the PDU.

The list is constructed as the PDU is forwarded along a path towards its destination. The originator of the PDU shall either initialize the list as empty, or insert an initial entry containing a timestamp and no Network entity title: the originator is not required to insert such an initial entry in a timestamped list. All octets in the list, other than an initial timestamp entry when present, shall be initialized to zero. Subsequently, only entries corresponding to intermediate system Network entities shall be included in the recorded route.

When an intermediate system Network entity processes a PDU containing the record route parameter, the Network entity adds its own entry at the end of the list. An indicator is maintained to identify the next available octet to be used for recording of route. This indicator is updated as entries are added to the list as follows. The length of the entry to be added to the list is added to the value of the next available octet indicator, and this sum is compared with the length of the record route parameter. If the addition of the entry to the list would exceed the size of the parameter, the next available octet indicator is set to indicate that route recording has been terminated. The entry is not added to the list. The PDU may still be forwarded to its final destination, without further addition of entries.

If the addition of the entry would not exceed the size of the route parameter, the next available octet indicator is updated with the new value, and the entry is added to the end of the list.

Two forms of the record route function are provided. The first form is referred to as complete route recording. It requires that the list of Network entity titles (with or without associated timestamps) be a complete and accurate record of all intermediate systems visited by a PDU (including Derived PDUs), except when a shortage of space in the record route option field causes termination of recording of route, as described above. When complete route recording is selected, PDU reassembly at intermediate systems may be performed only when the Derived PDUs that are reassembled all took the same route.

The second form is referred to as partial route recording. It also requires a record of intermediate systems visited by a PDU. When partial route recording is selected, PDU reassembly at intermediate systems may be performed whether or not the Derived PDUs that are reassembled all took the same route; the route recorded in any of the Derived PDUs may be placed in the PDU resulting from the reassembly.

NOTE – The record route function is intended to be used, for example, in the diagnosis of subnetwork problems, to provide a return path that could be used as a source route in a subsequent PDU, or in monitoring and controlling transit delays within the Network layer."

2) Subclause 7.5.5

Replace the text to the right of "Parameter Value:", *at the beginning of the subclause, with the following:*

"2 octets of control information followed by a concatenation of entries, as described below."

Add the following two entries to the list of type codes:

"0000 0010	partial recording of route in progress (with timestamps)
0000 0011	complete recording of route in progress (with timestamps)"

In the paragraph that immediately follows the type code list, replace the term "Network entity title" *with the term* "entry", *and replace the term* "Network entity titles" *with the term* "entries".

Replace the second paragraph after the type code list with the following:

"The third octet begins the list of recorded route entries. Entries are always added to the end of the list. The first octet of each entry gives the length in octets of the remainder of the entry. For type codes 0000 0000 and 0000 0001, the remainder of each entry consists of a Network entity title. For type codes 0000 0010 and 0000 0011, the remainder of each entry consists of a fixed-length 32-bit timestamp followed by a Network entity title.

The timestamp value should be the time in milliseconds since midnight UT, represented as a 32-bit binary value. If the time is not available in milliseconds or cannot be provided with respect to midnight UT, the most significant bit of the timestamp value shall be set to "1", and the remaining bits may take any time value.

For type codes 0000 0010 and 0000 0011, the first entry in the list may consist just of a length octet with value 4 and a 32-bit timestamp. Such an entry shall be inserted only by the originator of the PDU: the originator is not required to insert such an entry."