
**Information technology — Enhanced
communications transport protocol:
Specification of QoS management for
simplex multicast transport**

*Technologies de l'information — Protocole de transport de
communications amélioré. Spécification de gestion QoS pour
le transport simplex en multidiffusion*

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the technical committee are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 14476-2 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*, in collaboration with ITU-T. The identical text is published as ITU-T Rec. X.606.1.

ISO/IEC 14476 consists of the following parts, under the general title *Information technology — Enhanced communications transport protocol*:

- *Part 1: Specification of simplex multicast transport*
- *Part 2: Specification of QoS management for simplex multicast transport*
- *Part 3: Specification of duplex multicast transport*
- *Part 4: Specification of QoS management for duplex multicast transport*
- *Part 5: Specification of n-plex multicast transport*
- *Part 6: Specification of QoS management for n-plex multicast transport*

Introduction

This Recommendation | International Standard specifies the Enhanced Communications Transport Protocol (ECTP), which is a transport protocol designed to support Internet multicast applications running over multicast-capable networks. ECTP operates over IPv4/IPv6 networks that have the IP multicast forwarding capability with the help of IGMP and IP multicast routing protocols, as shown in Figure 1. ECTP could possibly be provisioned over UDP.

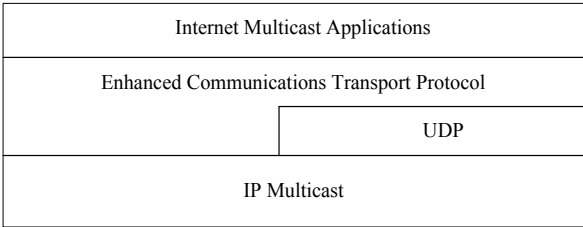


Figure 1 – ECTP model

ECTP is targeted to support tightly controlled multicast connections in simplex, duplex and N-plex applications. This part of ECTP (part 2) specifies the QoS management functions for stable management of the QoS of connection users in a simplex multicast connection. QoS management functionality consists of QoS negotiation, QoS monitoring, and QoS maintenance operations. The protocol procedures for reliability control in simplex multicast transport are defined in ECTP part 1 (ITU-T Rec. X.606 | ISO/IEC 14476-1), which forms an integral part of this Recommendation | International Standard. Further parts of the standard will define control procedures and associated QoS management functions respectively for the duplex case (X.ectp-3 | ISO/IEC 14476-3 and X.ectp-4 | ISO/IEC 14476-4) and for the N-plex case (X.ectp-5 | ISO/IEC 14476-5 and X.ectp-6 | ISO/IEC 14476-6).

In ECTP, all prospective members are enrolled into a multicast group, before a connection or session is created. Those members define an enrolled group. Each receiver in the enrolled group is referred to as an enrolled receiver. In the enrolment process, each member will be authenticated. The group information, including group key and IP multicast addresses and port numbers, will be distributed to the enrolled members during the enrolment process. An ECTP connection is created for these enrolled group members.

The sender is at the heart of multicast group communications. A single sender in the simplex multicast connection is assigned the role of the connection owner, designated top owner (TO) in this Specification. The connection owner is responsible for overall connection management by governing the connection creation and termination, the connection pause and resumption, and the late join and leave operations.

The sender triggers the connection creation process. Some or all of the enrolled receivers will participate in the connection, becoming designated "active receivers". Receivers active at this stage are able to participate in negotiating the desired quality of service for the session. Any enrolled receiver that is not active at this stage may participate in the connection as a late-joiner, but will have to accept the established QoS. An active receiver can leave the connection.

After the connection is created, the sender begins to transmit multicast data. While the connection is active, the sender monitors the status of the session via feedback control packets from the active receivers.

The sender may take a range of actions if network problems (such as severe congestion) are indicated by the feedback received from active receivers. These actions include adjusting the data transmission rate, suspending multicast data transmission temporarily, or in the last resort, terminating the connection.

This QoS management specification can be used in the multicast applications that want to support various QoS requirements and the corresponding billing/charging models.

**INTERNATIONAL STANDARD
ITU-T RECOMMENDATION**

**Information technology – Enhanced Communications Transport Protocol:
Specification of QoS management for simplex multicast transport**

1 Scope

This Recommendation | International Standard is an integral part of ITU-T Recs X.606.x | ISO/IEC 14476 "ECTP: Enhanced Communications Transport Protocol", which is a family of Protocol Specifications designed to support multicast transport services.

ITU-T Rec. X.606 | ISO/IEC 14476-1 provides a specification of various protocol operations for simplex multicast transport. Those protocol operations include connection management such as connection creation/termination and connection pause/resume, membership management such as late join, user leave and membership tracking, and error control for multicast data transport such as error detection and recovery.

This part of the Recommendation | International Standard provides a specification of QoS management for accomplishing desirable quality of service in simplex multicast transport connection.

This Specification describes the following QoS management operations:

a) *QoS negotiation*

For QoS negotiation, this Specification assumes that a desired QoS level for multicast application service can be expressed in terms of a set of QoS parameters. QoS negotiation is performed via exchange of control packets between sender and receivers. Sender proposes the target values of QoS parameters obtained from the application's requirements, and then each receiver can propose modified values based on its system and/or network capacity. Sender arbitrates the modified values proposed by receivers. Target values for QoS parameters can be used as input parameters for reservation of network resources.

b) *QoS monitoring*

QoS control in ECTP is based on feedback of control packets from receivers. The feedback messages from receivers enable the sender to keep track of the number of active receivers and also to monitor the connection status for multicast data transport. QoS monitoring is designed to allow the sender to diagnose the connection status in terms of QoS parameter values, and thus to take the necessary actions for maintaining the connection status at a desired QoS level. The monitored connection status will be reported to the application at the sender side. The information conveyed could provide statistics useful for billing purposes, for example.

c) *QoS maintenance*

Based on feedback information from receivers, the sender takes one or more actions so as to maintain the connection status at a desired QoS level. These QoS maintenance actions include adjustment of the data transmission rate, connection pause and resume, troublemaker ejection and connection termination operations. These QoS monitoring and maintenance functions, based on monitored parameter status, provide rate-based congestion control.

This Recommendation | International Standard is an integral part of ITU-T Recs X.606.x | ISO/IEC 14476, which has 6 parts. All of the protocol components, including packet formats and protocol procedures specified in ITU-T Rec. X.606 | ISO/IEC 14476-1, are also valid in this Recommendation | International Standard.

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 IEC and ISO maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau of the ITU maintains a list of currently valid ITU-T Recommendations.

- ITU-T Recommendation X.601 (2000), Multi-peer communications framework.
- ITU-T Recommendation X.605 (1998) | ISO/IEC 13252:1999, *Information technology – Enhanced Communications Transport Service definition*.

ISO/IEC 14476-2:2003 (E)

- ITU-T Recommendation X.606 (2001) | ISO/IEC 14476-1:2002, *Information technology – Enhanced Communications Transport Protocol: Specification of Simplex Multicast Transport*.