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SERIES X: DATA NETWORKS, OPEN SYSTEM
COMMUNICATIONS AND SECURITY

OSI networking and system aspects – Networking

Information technology – Enhanced communications transport protocol: Specification of QoS management for duplex multicast transport

Recommendation ITU-T X.607.1

ITU-T X-SERIES RECOMMENDATIONS
DATA NETWORKS, OPEN SYSTEM COMMUNICATIONS AND SECURITY

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For further details, please refer to the list of ITU-T Recommendations.

**Information technology – Enhanced communications transport
protocol: Specification of QoS management
for duplex multicast transport**

Summary

This Recommendation | International Standard describes quality of service (QoS) management functions for the duplex multicast transport defined in Recommendation ITU-T X.607 | ISO/IEC 14476-3. QoS management functions such as QoS negotiation, QoS monitoring and QoS maintenance are described. Protocol details such as packet format, parameter values and procedures are also described. This protocol can be used for applications that require many-to-one data delivery service with QoS managing facility; the protocol is expected to provide transport service to data gathering applications, etc.

Source

Recommendation ITU-T X.607.1 was approved on 13 November 2008 by ITU-T Study Group 11 (2009-2012) under Recommendation ITU-T A.8 procedure. An identical text is also published as ISO/IEC 14476-4.

FOREWORD

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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.

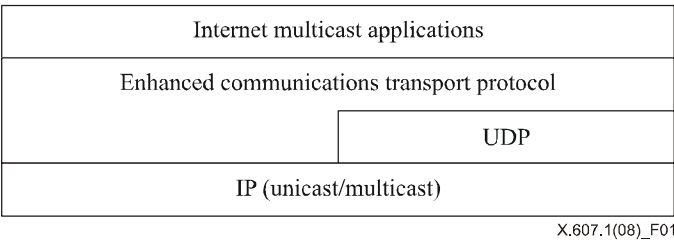


Figure 1 – ECTP Model

ECTP is designed to support tightly controlled multicast connections in simplex, duplex and N-plex applications. ECTP part 4 QoS management (this Recommendation | International Standard) specifies the quality of service (QoS) management functionality for stable management in the duplex multicast connection. The QoS management functionality consists of QoS negotiation, QoS monitoring and QoS maintenance operations. The procedures of reliability control in duplex connection have been defined in ECTP part 3 (Recommendation ITU-T X.607 | ISO/IEC 14476-3).

In ECTP-3 duplex multicast connection, the participants are classified into one Transport Connection Owner (TC-Owner) and many Transport Services users (TS-users). TC-Owner will be designated among the TS-users before the connection begins. In the duplex multicast connection, the two types of data transports are supported: multicast data transport from TC-Owner to all the other TS-users and unicast data transport from TS-users to TC-Owner. After the connection is created, TC-Owner can transmit multicast data to the group, whereas each TS-user is allowed to send unicast data to TC-Owner just after it gets a token from the TC-Owner.

For QoS management in the duplex multicast connection, the TC-Owner triggers the connection creation process. Some or all of the enrolled TS-users will participate in the connection and become the designated "active TS-users". The TS-users who are active at this stage are able to participate in negotiating the desired QoS level for the session. In the duplex multicast connection, TS-users can send the data to TC-Owner, which each TS-user negotiates with TC-Owner for a QoS parameter for backward unicast data channel. TC-Owner proposes the target value of QoS parameter for forward multicast data channel and backward unicast data channel. If QoS negotiation is enabled, each TS-user can propose modified values of QoS parameters for forward multicast data channel and backward unicast data channel. TC-Owner arbitrates these modified values of QoS parameters for two types of data transport. These arbitrated values are delivered to TS-users via subsequent Heartbeat (HB) or Join Confirm (JC) packets, and will be used for QoS monitoring and maintenance. Any enrolled TS-user that is not active at this stage may participate in the connection as a late-joiner, but will have to accept the established QoS level.

After the connection is created, TC-Owner begins to transmit multicast data and some of TS-users who get a token from TC-Owner can send unicast data to TC-Owner. While the connection is active, TC-Owner monitors the status of the session via feedback control packets from the active TS-users.

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

ECTP part 4 QoS management Specification can be used by the multicast applications that require supporting various QoS requirements and the corresponding billing/charging models.

**INTERNATIONAL STANDARD
RECOMMENDATION ITU-T**

**Information technology – Enhanced communications transport
protocol: Specification of QoS management
for duplex multicast transport**

1 Scope

This Recommendation | International Standard provides a specification of QoS management for accomplishing desirable QoS for a duplex multicast transport connection. For this purpose, this Specification describes the QoS management operations in duplex multicast transport connection such as QoS negotiation, QoS monitoring and QoS maintenance. This Recommendation | International Standard is an integral part of ECTP-3 (Rec. ITU-T X.607 | ISO/IEC 14476-3). All of the protocol components, including packet formats and protocol procedures specified in Rec. ITU-T X.607 | ISO/IEC 14476-3, 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.

- Recommendation ITU-T X.601 (2000), *Multi-peer communications framework*.
- Recommendation ITU-T X.602 (2004) | ISO/IEC 16513:2005, *Information technology – Group management protocol*.
- Recommendation ITU-T X.605 (1998) | ISO/IEC 13252:1999, *Information technology – Enhanced Communications Transport Service Definition*.
- Recommendation ITU-T X.606 (2001) | ISO/IEC 14476-1:2002, *Information technology – Enhanced Communications Transport Protocol: Specification of simplex multicast transport*.
- Recommendation ITU-T X.606.1 (2003) | ISO/IEC 14476-2:2003, *Information technology – Enhanced Communications Transport Protocol: Specification of QoS management for simplex multicast transport*.
- Recommendation ITU-T X.607 (2007) | ISO/IEC 14476-3:2008, *Information technology – Enhanced communications transport protocol: Specification of duplex multicast transport*.
- Recommendation ITU-T X.608 (2007) | ISO/IEC 14476-5:2008, *Information technology – Enhanced communications transport protocol: Specification of N-plex multicast transport*.

3 Definitions

3.1 Terms defined in Rec. ITU-T X.605 | ISO/IEC 13252

This Recommendation | International Standard is based on the concepts developed in Enhanced Communications Transport Service (Rec. ITU-T X.605 | ISO/IEC 13252):

- a) QoS parameters;
- b) QoS negotiation;
- c) QoS arbitration.

3.2 Terms defined in Rec. ITU-T X.606 | ISO/IEC 14476-1

This Recommendation | International Standard is described based on the concepts and terms developed in the specification of simplex multicast transport on ECTP-1:

- a) application;
- b) packet;

- c) sender;
- d) receiver;
- e) tree;
- f) parent;
- g) child.

3.3 Terms defined in Rec. ITU-T X.606.1 | ISO/IEC 14476-2

This Recommendation | International Standard is described based on the concepts and terms developed in the specification of simplex multicast transport on ECTP-2:

- a) QoS monitoring;
- b) QoS maintenance.

3.4 Terms defined in Rec. ITU-T X.607 | ISO/IEC 14476-3

This Recommendation | International Standard is described based on the concepts and terms developed in the specification of duplex multicast transport on ECTP-3:

- a) SU (Sending TS-User)
Some of the ECTP-3 TS-users can send unicast data to the TC-Owner. A sending TS-user (SU) is a TS-user who gets a token from TC-Owner. Only the SU is allowed to send unicast data to TC-Owner. In other words, before sending unicast data, each user must request a token to TC-Owner.
- b) Token
It represents the rights for a TS-user to transmit data. The TS-user who has a token is called a Sending TS-User (SU). The tokens are managed by TC-Owner.
- c) Forward data channel
It represents the multicast data channel from TC-Owner to the group members. TC-Owner sends multicast data to all the other group members over IP multicast address.
- d) Backward data channel
It represents the unicast data channel, in which the data packet flows from an SU to TC-Owner. An SU can send unicast data to TC-Owner over IP unicast address.

4 Abbreviations

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

4.1 Packet types

ACK	Acknowledgment
CC	Connection Creation Confirm
CR	Connection Creation Request
CT	Connection Termination Request
DT	Data
HB	Heartbeat
HBACK	Heartbeat Acknowledgment
JC	Late Join Confirm
ND	Null Data
TC	Tree Join Confirm
TGC	Token Get Confirm
TGR	Token Get Request
TRC	Token Return Confirm
TRR	Token Return Request