



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

X.603

(03/2012)

SERIES X: DATA NETWORKS, OPEN SYSTEM
COMMUNICATIONS AND SECURITY

OSI networking and system aspects – Networking

Information technology – Relayed multicast protocol: Framework

CAUTION !

PREPUBLISHED RECOMMENDATION

This prepublication is an unedited version of a recently approved Recommendation. It will be replaced by the published version after editing. Therefore, there will be differences between this prepublication and the published version.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

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.

NOTE

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

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU [had/had not] received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

© ITU 2012

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

INTERNATIONAL STANDARD ISO/IEC 16512-1

RECOMMENDATION ITU-T X.603

Information technology – Relayed multicast protocol: Framework

Summary

The relayed multicast protocol (RMCP) is an application-layer protocol for providing end-to-end multicast services over an IP-based network environment. This Recommendation | International Standard specifies basic concepts of a relayed multicast scheme, data delivery models, service scenarios, required protocol functions for protocol operation, and basic message structures for subsequent protocols. This Recommendation | International Standard can be used to specify detailed relayed multicast protocols for various application requirements.

Keywords

End-to-end multicast service, Framework, Multicast agent, Relayed multicast, Session manager.

Introduction

This Recommendation | International Standard specifies the relayed multicast protocol (RMCP) used for realizing relayed multicast. Relayed multicast, also known as an overlay multicast or an application-layer multicast, is a data-delivery scheme for group communications applications over IP-based network environment. RMCP employs intermediate multicast agents for relaying application data from one or more senders to many receivers.

The design of RMCP has been motivated from the following observations:

In the marketplaces, diverse group applications and services have been provisioned commercially all over the world. Some of the examples include Internet TV, remote education, real-time media streaming applications, live broadcasting of special events such as the Victoria's Secret Fashion Show, stock-tickers, etc.

At present, most of the group applications mentioned above use a replicated IP unicast method to realize group services. As a result, those applications have scalability problems due to the limitation in supporting number of simultaneous users. In terms of business model, it would mean less revenue or profit.

IP multicast has been known as an effective transport technology for providing group communication services. Nevertheless, the IP multicast has not been deployed widely over the Internet due to several reasons, including the following:

- high deployment cost along with an uncertainty of return-on-investment (ROI);
- IP multicast alone cannot support all kinds of group applications.

Network services such as, group file transfer or network games, need a reliable multicast transport mechanism. However, even current reliable multicast transport mechanisms still have unresolved problems including scalability, flow control, congestion control, etc. Until an appropriate multicast transport mechanism is laid down, group communications applications requiring reliable data transfer will continue to depend on the server-based replicated unicast method.

Although IP multicast is not deployed globally, various local networks have already been equipped with IP multicast capability. For example, Ethernet-based LANs and private networks such as corporate and campus networks substantially provide the multicast transport capability within their local subnet or administrative domains.

Recognizing these observations, there is a crucial need to develop an alternative group delivery scheme. RMCP is one such scheme to realize group delivery over the IP-based network. RMCP utilizes existing unicast, multicast, and/or multicast tunnelling schemes. In addition, RMCP is designed in separate forms to support any kind of group service type. RMCP is expected to provide a substantial solution for group services over the IP-based network.

1 Scope

Relayed multicast protocol (RMCP) is a protocol which is used to realize a relayed multicast data transport scheme. Different from the conventional IP multicast, RMCP can configure a relayed multicast path that multicast traffic flows by using intermediate end-hosts. RMCP can be applied to the current unicast based IP network where IP multicast is not fully deployed.

This Recommendation | International Standard addresses the basic concepts needed to specify RMCP for relayed multicast. It defines the related terminology and proposes a framework for the future development of subsequent protocols. The framework covers network topology including network entities and the relationship among them, service scenarios, basic operations, and message format.

2 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.

This Recommendation | International Standard does not refer to any document.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation | International Standard uses the following terms defined elsewhere:

None.

3.2 Terms defined in this Recommendation | International Standard

This Recommendation | International Standard defines the following terms:

3.2.1 child multicast agent (CMA): A next downstream multicast agent (MA) in the relayed multicast protocol (RMCP) data delivery path.

3.2.2 IP multicast: Realizes a multicast scheme in the IP network with the help of multicast-enabled IP routers.

3.2.3 multicast agent (MA): An intermediate node which relays group application data.

3.2.4 multicast: A data delivery scheme where the same data unit is transmitted from a single source to multiple destinations in a single invocation of service.

3.2.5 N-plex: Wherein anyone can send something, and, if someone does so, all others may receive it.

3.2.6 parent multicast agent (PMA): A next upstream multicast agent (MA) in the relayed multicast protocol (RMCP) data delivery path.

3.2.7 receiver multicast agent (RMA): A multicast agent (MA) other than sender multicast agent (SMA).

3.2.8 relayed multicast protocol (RMCP): A protocol to realize the relayed multicast scheme using end hosts.

3.2.9 relayed multicast: A multicast data delivery scheme that can be used in unicast environments.

3.2.10 relayed multicast protocol (RMCP) session: A set of multicast agents (MAs) which configures the data delivery path using RMCP.

3.2.11 sender multicast agent (SMA): A multicast agent (MA) attached to a sender in the same system or local network.

3.2.12 session identification (SID): Corresponds to group name and identifies relayed multicast protocol (RMCP) session uniquely.

3.2.13 session manager (SM): A relayed multicast protocol (RMCP) entity that is responsible for the overall RMCP operations.

3.2.14 simplex: Wherein only one sender is send-only and all others are receive-only.

4 Abbreviations and acronyms

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

CMA	Child Multicast Agent
IPC	Inter-Process Communication
IPIP	IP in IP encapsulation
MA	Multicast Agent
PMA	Parent Multicast Agent
RMA	Receiver Multicast Agent
RMCP	Relayed Multicast Protocol
RMT	Reliable Multicast Transport
SID	Session ID
SM	Session Manager
SMA	Sender Multicast Agent
T/TCP	TCP extensions to Transactions
TCP	Transmission Control Protocol
TP	Transport Protocol
UDP	User Datagram Protocol

5 Conventions

None.