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ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

X.6

Amendment 1
(03/2000)

SERIES X: DATA NETWORKS AND OPEN SYSTEM
COMMUNICATIONS

Public data networks – Services and facilities

Multicast service definition

**Amendment 1: Frame relay PVC multicast
service definition**

ITU-T Recommendation X.6 – Amendment 1

(Formerly CCITT Recommendation)

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Multicast service definition

AMENDMENT 1

Frame relay PVC multicast service definition

Summary

This amendment describes the optional configurations for Frame Relaying Bearer Service. These configurations are known as Frame Relay Multicast. The definition and description of these configurations are the basis for defining the network capabilities required for the support of multicast service in Frame Relay networks.

Source

Amendment 1 to ITU-T Recommendation X.6 was prepared by ITU-T Study Group 7 (1997-2000) and approved under the WTSC Resolution 1 procedure on 31 March 2000.

FOREWORD

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The World Telecommunication Standardization Conference (WTSC), 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 WTSC 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.

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ITU-T Recommendation X.6

Multicast service definition

AMENDMENT 1

Frame relay PVC multicast service definition

1) Clause 1

Add the following as a new paragraph at the end of clause 1:

Annex A describes the multicast services applicable in Frame Relay networks.

2) New Annex A

Add the following as a new Annex A:

ANNEX A

Frame relay PVC multicast service definition

A.1 Introduction

This annex describes optional multipoint configurations for the Frame Relaying Bearer Service. These configurations are known as Frame Relay Multicast. The definition and description of these configurations are the basis for defining the network capabilities required for the support of the service in an ISDN. ITU-T I.233.1 describes the ISDN Frame Relaying Bearer Service.

A.2 Definition

The multicast services provide the capability for frame relay service suppliers to offer point to multipoint frame delivery services. The services in this annex are *connection-oriented*. That is, before a user of a multicast service is able to send or receive any multicast data, the user must first establish a connection (permanent virtual connection) to the multicast server.

A.3 General description

This service description describes the frame relay multicast services from the user perspective. It addresses only the case where the multicast service is provided on a permanent virtual connection (PVC) and is configured by network administration. Multicast services on switched virtual connections (SVC) are for further study. Dynamic modifications to the multicast service configuration by the user is also for further study.

In general, a frame relay data unit is addressed to a specific destination. When the data unit arrives at the destination, the address has been modified and is delivered with an address reflecting the sender's return path. A multicast service may take advantage of this function and combine it with a copy function to allow a user to send a single message to multiple destinations. These destinations may reside on a single network or multiple networks.

A.4 Definitions

These terms are provided as a tool for better understanding of this annex.

A.4.1 active group: The subset of a Multicast Group which is currently operational.

A.4.2 data link connection identifier (DLCI): It is the identifier of a frame relay connection. These values have only local significance. DLCI is defined in Annex A/Q.922.

A.4.3 data link connection management interface (DLCMI): The term used to identify the PVC management interface, namely the procedures in Annex A/Q.933.

A.4.4 frame relay multicast service: One in which a single data unit transmitted by a source is Received by multiple destinations; it is a **one-in, many-out** service.

A.4.5 leaf: A member of a one-way or two-way multicast group which receives multicast frames.

A.4.6 multicast group ID: A set of members participating in a frame relay multicast service.

A.4.7 member: A participant in a multicast group.

A.4.8 multicast connection: A connection established for the purpose of facilitating the sending of a single frame to multiple destinations.

A.4.9 multicast DLCI (Mdlc): The DLCI assigned to designate a particular multicast connection at a particular frame relay access interface.

A.4.10 one-way: A type of multicast service.

A.4.11 root: The member of a one-way or two-way multicast group which transmits multicast frames.

A.4.12 two-way: A type of multicast service.

A.4.13 N-way: A type of multicast service.

A.4.14 station: A frame relay DTE. That is any machine (router, host, etc.,) that uses the services of a frame relay network. In the context of this annex, station does not refer to those devices that are a part of the frame relay network itself.

A.5 Multicast service model

This is a general purpose model and is consistent with the model described in clause 4 of the main body of this Recommendation; frame relay specifics are discussed in later sections of this annex.

A.5.1 One-way multicast service

This multicast service requires that the root have point-to-point frame relay connections established to all leaves in the multicast group. The root will also maintain a separate one-way multicast connection to the multicast server.

With this configuration, the root sends multicast frames via the one-way multicast connection identified by a one-way multicast DLCI (Mdlc). The multicast server will accept frames from the Mdlc and will send the frame to each leaf member of the active multicast group. Frames delivered in this manner arrive as though they were transmitted on the individual point-to-point connections established between the root and leaves. That is the DLCI (address) in the received frame reflects the source of the message and will not retain the Mdlc (multicast address).

For example, Figure A.1 shows the root, station A, with a single frame relay interface (station A may have other interfaces which are not shown here). The multicast group may be viewed logically as the group of PVCs b, c, and d. The one-way multicast service will accept a frame on Mdlc from Station A and transmit it to each destination designated by the active multicast group. As these frames traverse the network, they are treated no differently than other frames, and therefore arrive at the destination stations as though they had been transmitted on each of the separate PVCs from Station A. Station B will receive the frame on its connection t, Station C on its connection u and Station D on its connection v.

This service is useful in applications where the stations are routers or bridges. The multicast frame will typically be used for obtaining or verifying the presence or identification of the multicast group members.

As defined, the Mdlci is a one-way DLCI. That is, frames are never sent from the network to the root on it. Frames transmitted on the Mdlci which arrive at Station B have no different characteristics from those frames sent from Station A on DLCI "b". Frames from the one-way multicast group members to Station A are transmitted on DLCIs "t-v" and arrive on DLCIs "b-d" respectively. Station A may also exchange frames with a single member of the multicast group over one of the DLCIs "b-d".

It is important to remember that multicast and unicast are separate services offered by the frame relay network. Frames maintain time ordering within a service, not among services. For example, if, in Figure A.1, station A sends one frame on DLCI b and then another on the Mdlci. If the service provider merges unicast and multicast traffic to station B on DLCI t, the frames are not guaranteed to arrive at station B with the unicast frame first and the multicast frame second.

Note that the one-way multicast model does not mandate that all PVCs registered to Station A participate. Conversely, any and all PVCs registered to Station A may participate regardless of their destination. That is, Station A may have many other PVCs that are not associated with the multicast group for the one-way multicast connection. Station A may also have several PVCs for the same destination station included in the multicast group without conflict.

PVCs that are members of the multicast group and the Mdlci itself are required to share the same physical frame relay interface. There is no conceptual limit to the number of one-way multicast connections allowed per interface. The number may be limited, however, by the ability to report multicast connections and PVC status via the Data Link Connection Management Interface (DLCMI) if it is in use.

A.5.2 Two-way multicast service

The two-way multicast service provides for duplex transmissions. In one direction the data units are multicast, while in the other, they are concentrated. One participant in a two-way multicast connection is defined as the root; it functions to send the data units into the multicast server for multicasting. The rest of the participants are defined as the leaves. The following rules apply to the two-way multicast service.

Any data units sent by the root are transmitted to all leaves in the active multicast group.

Any data units sent by a leaf are transmitted to the root of the active multicast group, but not to the other leaves.

Figure A.2 depicts the two-way multicast service.

Station A is the root and station B, C, and D are the leaf members of the multicast group. Each participant (both the root and leaves) has two-way connections. The multicast service will accept a frame from Station A on the Mdlci, a, and transmit it to each of the leaf members of the active multicast group.

Leaves may return data to the root via the same DLCI. For example Station C will send frames to Station A on DLCI c and they will arrive on station A's Mdlci, a.

This service is useful in an environment where the root does not need to communicate individually with the leaves and where the number of leaf stations prohibits the establishment of individual PVCs between the root and each of the leaves. For example, when using SDLC or similar polled protocols, there may be many terminals connected to a limited number of host ports. The host broadcasts to a group of terminals over a multi-drop line; only one terminal has permission to respond at a time. The two-way multicast service could be used to transparently replace multi-drop lines, between the host and terminals.

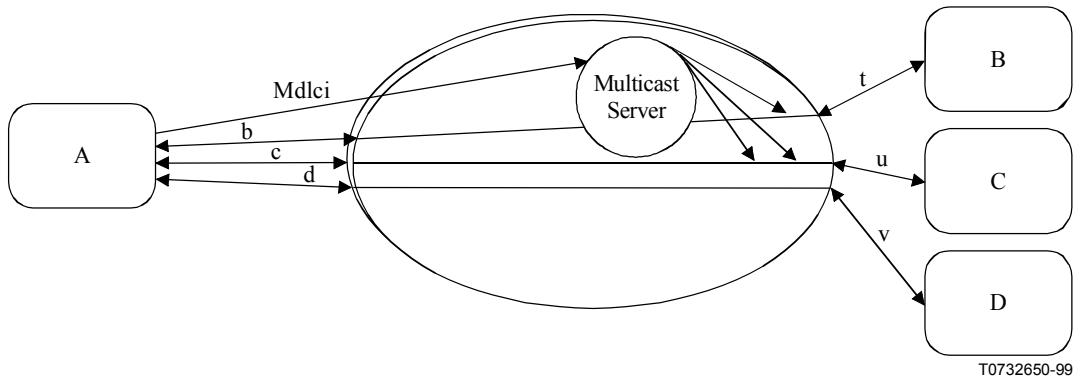


Figure A.1/X.6 – One-way multicast

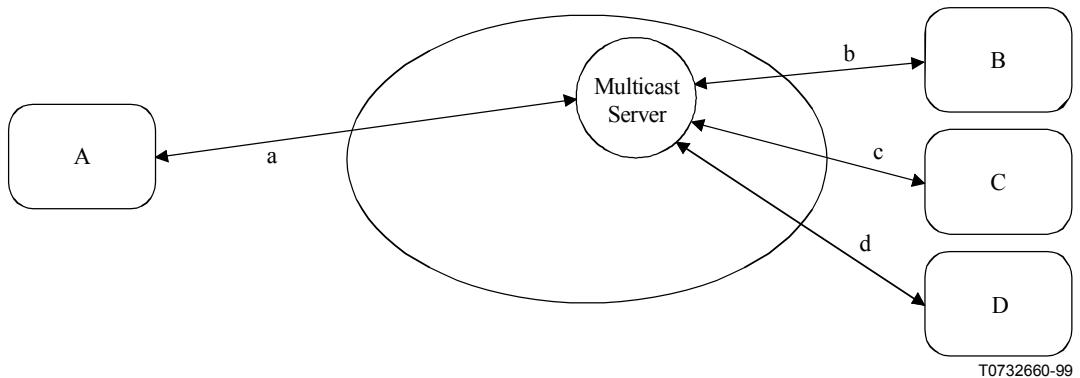


Figure A.2/X.6 – Two-way multicast

A.5.3 N-way multicast service

The third multicast service is n-way multicasting. All transmissions in this scheme are duplex and all are multicast. All members of the multicast group are transmission peers. Any data sent on a n-way multicast connection is sent to every other member of the active multicast group.

For example, Figure A.3 shows four stations participating in an n-way multicast exchange. The n-way multicast service will accept a frame on the Mdlci from Station A and transmit it to each of the other members of the active multicast group (stations, B, C and D). When the frames reach the destination stations, the DLCI will reflect the multicast connection which the station may use to address the multicast group.

This type of multicast service is convenient for applications that require all participants to acquire the same data. One might envision this type of multicast for use with teleconferencing or routing update protocols.

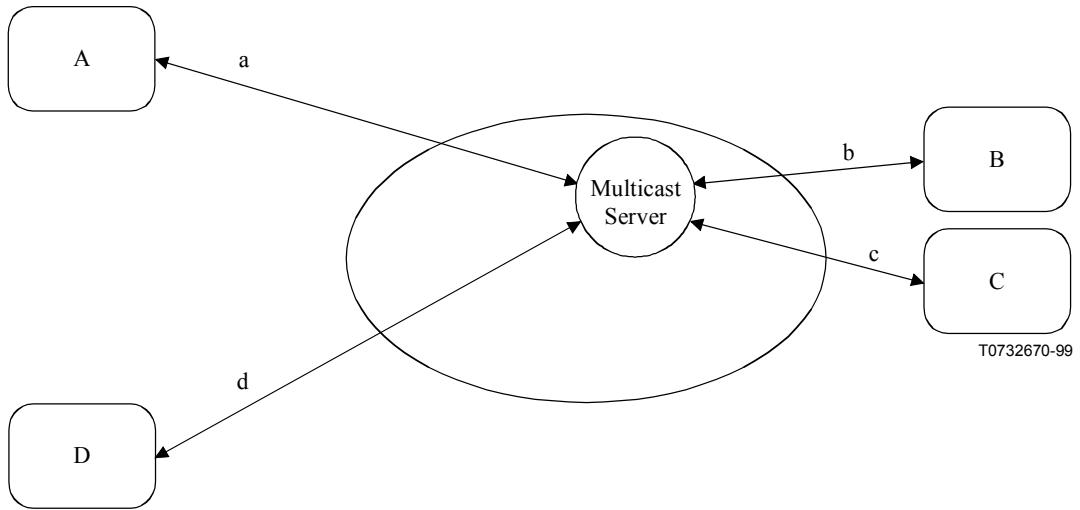


Figure A.3/X.6 – N-way multicast

A.6 Data transfer

A.6.1 General

All frames transmitted on any multicast connection should in accordance with Annex A/Q.922.

A.6.1.1 Bandwidth management

A service provider may assign a Committed Information Rate (CIR) as well as a committed burst (Be) and Excess Burst (Be) to the multicast connection. The assignment and interpretation of these parameters shall be in accordance with ITU-T I.370 with respect to policing actions at the ingress to the network.

For a point-to-point circuit, implicitly, the CIR in one direction of the circuit is the same at the ingress and egress ports of the VC. CIRs are assigned such that the access rate of the egress port is greater than or equal to the CIR. In multicast, this implicit definition no longer holds. The traffic from all sources in the multicast group must be considered.

The strictest interpretation of CIR would mandate that the access rate of the egress port of a VC must be greater than or equal to the sum of the CIRs of all ingress port DLCIs which will be delivered to this egress port DLCI by the multicast service. It is recognized, however, that some multicast applications may regulate which sources use the multicast service simultaneously, and may therefore wish to allow the sum of the CIRs of all the ingress port DLCIs which will be delivered to an egress port DLCI to exceed the egress port access speed.

Thus the exact relation between **CIR** and the access rate at the egress port is a matter between the service provider and the user.

Frames sent to the multicast connection are delivered to each member of the active group. That is, if a member of a multicast group is temporarily unavailable or disabled, the multicast service will not maintain multicast frames for delivery upon the station's recovery. The unavailable member will not receive frames, either multicast or unicast, until it is once again available.

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