International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

H.460.19

(03/2013)

SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Infrastructure of audiovisual services – Supplementary services for multimedia

Traversal of ITU-T H.323 media across network address translators and firewalls

Recommendation ITU-T H.460.19

ITU-T H-SERIES RECOMMENDATIONS

AUDIOVISUAL AND MULTIMEDIA SYSTEMS

CHARACTERISTICS OF VISUAL TELEPHONE SYSTEMS	H.100–H.199
INFRASTRUCTURE OF AUDIOVISUAL SERVICES	
General	H.200–H.219
Transmission multiplexing and synchronization	H.220–H.229
Systems aspects	H.230–H.239
Communication procedures	H.240–H.259
Coding of moving video	H.260–H.279
Related systems aspects	H.280–H.299
Systems and terminal equipment for audiovisual services	H.300–H.349
Directory services architecture for audiovisual and multimedia services	H.350–H.359
Quality of service architecture for audiovisual and multimedia services	H.360–H.369
Supplementary services for multimedia	**H.450–H.499**
MOBILITY AND COLLABORATION PROCEDURES	
Overview of Mobility and Collaboration, definitions, protocols and procedures	H.500–H.509
Mobility for H-Series multimedia systems and services	H.510–H.519
Mobile multimedia collaboration applications and services	H.520–H.529
Security for mobile multimedia systems and services	H.530–H.539
Security for mobile multimedia collaboration applications and services	H.540–H.549
Mobility interworking procedures	H.550–H.559
Mobile multimedia collaboration inter-working procedures	H.560–H.569
BROADBAND, TRIPLE-PLAY AND ADVANCED MULTIMEDIA SERVICES	
Broadband multimedia services over VDSL	H.610–H.619
Advanced multimedia services and applications	H.620–H.629
Ubiquitous sensor network applications and Internet of Things	H.640–H.649
IPTV MULTIMEDIA SERVICES AND APPLICATIONS FOR IPTV	
General aspects	H.700–H.719
IPTV terminal devices	H.720–H.729
IPTV middleware	H.730–H.739
IPTV application event handling	H.740–H.749
IPTV metadata	H.750–H.759
IPTV multimedia application frameworks	H.760–H.769
IPTV service discovery up to consumption	H.770–H.779
Digital Signage	H.780–H.789

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

Recommendation ITU-T H.460.19

Traversal of ITU-T H.323 media across network address translators and firewalls

Summary

Recommendation ITU-T H.460.19 extends Recommendation ITU-T H.323 by defining the NAT/FW traversal mechanism for media. Together with an appropriate mechanism for signalling traversal, such as ITU-T H.460.18, it may be used as a solution for the NAT/FW traversal problem by ITU-T H.323.

This revised version introduces a number of clarifications to the previous version by incorporating the technical and editorial corrections from the ITU-T H.323-series Implementers Guide (03/2011).

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T H.460.19	2005-09-13	16
2.0	ITU-T H.460.19	2013-03-16	16

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 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/.

Table of Contents

Recommendation ITU-T H.460.19

Traversal of ITU-T H.323 media across network address translators and firewalls

1 Scope

This Recommendation defines a mechanism for media communication between two ITU-T H.323 entities, separated by one or more NAT/FW devices.

This Recommendation addresses NAT/FW traversal for RTP, for RTP encrypted using ITU-T H.235 and for SRTP media streams.

NAT/FW traversal for media transported by other protocols is for further study.

It also defines a mechanism to use the same transport address for several media channels, which permits reduction of the number of "pinholes" opened in the NAT/FW device and reduces the number of Media Channel and Media Control Channel transport addresses used by ITU-T H.323 entities.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T H.225.0] Recommendation ITU-T H.225.0 (2009), *Call signalling protocols and media stream packetization for packet-based multimedia communication systems*.

[ITU-T H.245] Recommendation ITU-T H.245 (2011), *Control protocol for multimedia communication*.

[ITU-T H.323] Recommendation ITU-T H.323 (2009), *Packet-based multimedia communications systems*.

[ITU-T H.460.1] Recommendation ITU-T H.460.1 (2013), *Guidelines for the use of the generic extensible framework*.

[ITU-T H.460.18] Recommendation ITU-T H.460.18 (2013), *Traversal of ITU-T H.323 signalling across network address translators and firewalls*.

[IETF RFC 3550] IETF RFC 3550 (2003), *RTP: A Transport Protocol for Real-Time Applications*.

[IETF RFC 3711] IETF RFC 3711 (2004), *The Secure Real-time Transport Protocol (SRTP)*.

3 Definitions

This Recommendation defines the following terms:

3.1 apparent source address: The source IP address received in the IP packet header, combined with the source port number received in the UDP or TCP header of the same packet. The presence of NAT may cause this to differ from the sender's source address and source port number.

3.2 **client**: An endpoint compliant with ITU-T H.460.19 specifications and performing ITU-T H.460.19 client functionality. An ITU-T H.460.19 client is normally located on the internal network.

3.3 **demilitarized zone**: A network that sits between an organization's internal network and an external network, usually the Internet. Connections from the internal and the external network to the DMZ are permitted, whereas connections from the DMZ are only permitted to the external network.

3.4 **endpoint**: An ITU-T H.323 terminal, gateway or MCU. An endpoint can call and be called. It generates and/or terminates information streams.

3.5 **external network**: A network connected to the firewall through the firewalls public interface. Typically, but not limited to, the Internet.

3.6 **ITU-T H.460.19 entity**: A client or server.

3.7 **internal network**: A network connected to the NAT/FW through the NAT/FW's private interface.

3.8 **media channel**: An RTP or an SRTP channel.

3.9 **media control channel**: An RTCP or SRTCP channel.

3.10 **multiplexed media mode**: A mechanism which enables managing multiple RTP/RTCP or SRTP/SRTCP sessions on a single pair of transport addresses as described in clause 7.2. Receivers choose whether or not to multiplex.

3.11 **OLC request**: Any one of:

- the **openLogicalChannel** message;
- the **openLogicalChannel** Fast Connect proposal message for transmission from caller to callee;
- the **openLogicalChannel** Fast Connect proposal accept message for transmission from callee to caller.

3.12 **OLC response**: Any one of:

- the **openLogicalChannelAck** message;
- the **openLogicalChannel** Fast Connect proposal accept message for transmission from caller to callee;
- the **openLogicalChannel** Fast Connect proposal message for transmission from callee to caller.

NOTE – An OLC request message is the message that contains information relevant to the OLC for the media stream that is received by the addressee of this OLC request message, while an OLC response message is the message that contains information relevant to the OLC for the media stream that is sent by the addressee of this OLC response message.

3.13 **peer**: An ITU-T H.460.19 entity with which a particular ITU-T H.460.19 entity is communicating.

3.14 **pinhole**: A temporary binding of an internal and an external transport address in the NAT/FW which allows the bidirectional passage of packets between those addresses.

3.15 **server**: An ITU-T H.323 entity compliant with ITU-T H.460.19 specifications and performing ITU-T H.460.19 server functionality.

3.16 **transport address**: IP address and UDP/TCP port number.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

LC	Logical Channel
NAT/FW	Network Address Translator and/or Firewall
OID	Object Identifier
OLC	Open Logical Channel
RTCP	Real-time Transport Control Protocol
RTP	Real-time Transport Protocol
SRTCP	Secure Real-time Transport Control Protocol
SRTP	Secure Real-time Transport Protocol
SSRC	Synchronization Source
TCP	Transmission Control Protocol
TPKT	Transport Protocol Data Unit Packet

5 Conventions

In this Recommendation the following conventions are used:

"**Shall**" indicates a mandatory requirement.

"**Should**" indicates a suggested but optional course of action.

"**May**" indicates an optional course of action rather than a recommendation that something take place.

6 Architecture

This Recommendation addresses a network which is divided into an internal and external network by a NAT/FW (see Figure 1). Typically, the internal network will be a private network. The external network will typically be a public network such as the Internet, but may alternatively be another private network.

Figures 1, 2 and 3 show possible ways in which this Recommendation may be deployed. Items in bold text: ITU-T H.323 Endpoint with ITU-T H.460.19 Client, ITU-T H.460.19 Client Proxy and ITU-T H.460.19 Server are referred to in this Recommendation. Other devices are shown for completeness.

The internal network contains an ITU-T H.323 endpoint (the ITU-T H.460.19 client) and the external network contains an ITU-T H.460.19 server. These ITU-T H.323 endpoints may be terminals, gateways or MCUs. Extensions to ITU-T H.323 defined in this Recommendation provide modes that permit media streams to traverse NAT/FW devices.

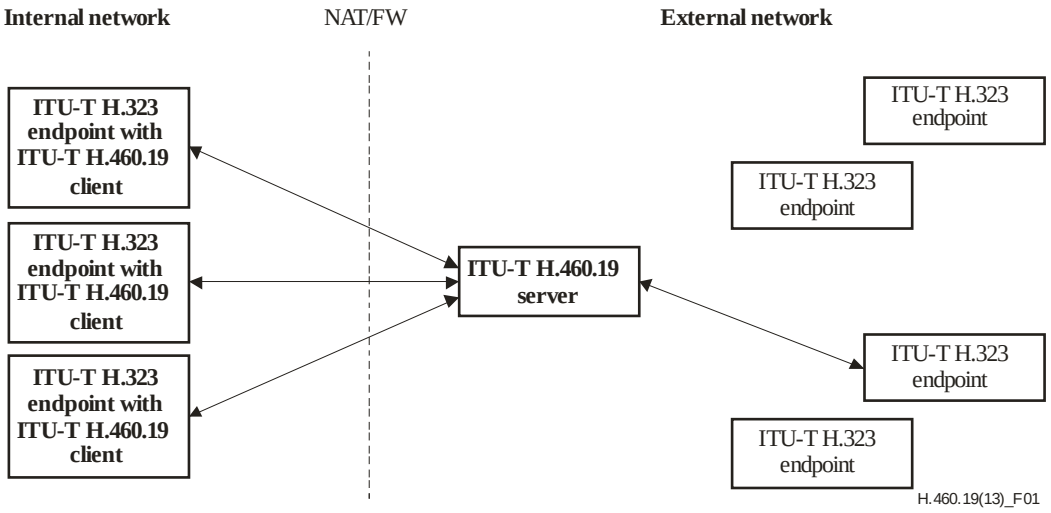

Figure 1 – Combined ITU-T H.460.19 architecture

This Recommendation defines the "NAT/FW traversal procedure" and the "multiplexed media mode".

For communication between ITU-T H.460.19 clients and ITU-T H.460.19 servers, the multiplexed media mode is used together with the NAT/FW traversal procedure. The NAT/FW traversal procedure is used for client-to-server communication but not for client-to-client and server-to-server communication.

NAT/FWs typically permit traffic from the internal network, and typically permit traffic toward the internal network received in response to the original traffic toward the external network.

The Media Control Channel is inherently bidirectional and its packets in the direction toward the external network are used by the NAT/FW traversal procedure to permit Media Control Channel packets to traverse the NAT/FW toward the internal network.

Media Channel traffic is unidirectional. To permit Media Channel packets toward the internal network, this Recommendation defines a keep-alive channel. The client sends keep-alive media packets to the **keepAliveChannel** transport address provided by the server.

In the NAT/FW traversal procedure, the ITU-T H.460.19 server sends Media Channel and Media Control Channel packets to the ITU-T H.460.19 client to the address from which Keep Alive Channel and Media Control Channel packets were received by the ITU-T H.460.19 server, instead of to the addresses specified in the **H2250LogicalChannelParameters.mediaChannel** and **H2250LogicalChannelParameters.mediaControlChannel** ITU-T H.245 structures as in normal ITU-T H.323 operation. The NAT/FW traversal procedure also requires usage of a keep-alive mechanism. The goal of the keep-alive mechanism is to ensure that there are no extended periods of "network silence" between the communicating Transport Addresses, which might result in closure of pinholes by the NAT/FW. Implementation of the keep-alive mechanism is mandatory in client to server direction.

The multiplexed media mode enables sending the Media Channel/Media Control Channel packets of several media sessions (which may be part of multiple calls) to the same pair of transport addresses on the ITU-T H.460.19 client or server (or both), which can significantly reduce the number of pinholes in the NAT/FW. To facilitate multiplexed media mode, the multiplexing layer for use with media and media control packets is defined in this Recommendation.

The capability of a particular entity to send packets with this multiplexing layer is independent of the capability of the same entity to receive such packets. The multiplexed media mode may be supported for transmit and receive directions independently.

The capability of transmitting the multiplexed media mode means the capability to add the multiplexing layer to media and media control packets.

The capability of receiving the multiplexed media mode means the capability to remove the multiplexing layer from media and media control packets.

The procedures in this Recommendation allow negotiation of the support of these extensions and signalling of the specific extension parameters.

In order to support non-ITU-T H.460.19 enabled (pre-existing) ITU-T H.323 endpoints, the ITU-T H.460.19 client functionality may be implemented by a proxy located on the internal network (see Figure 2).

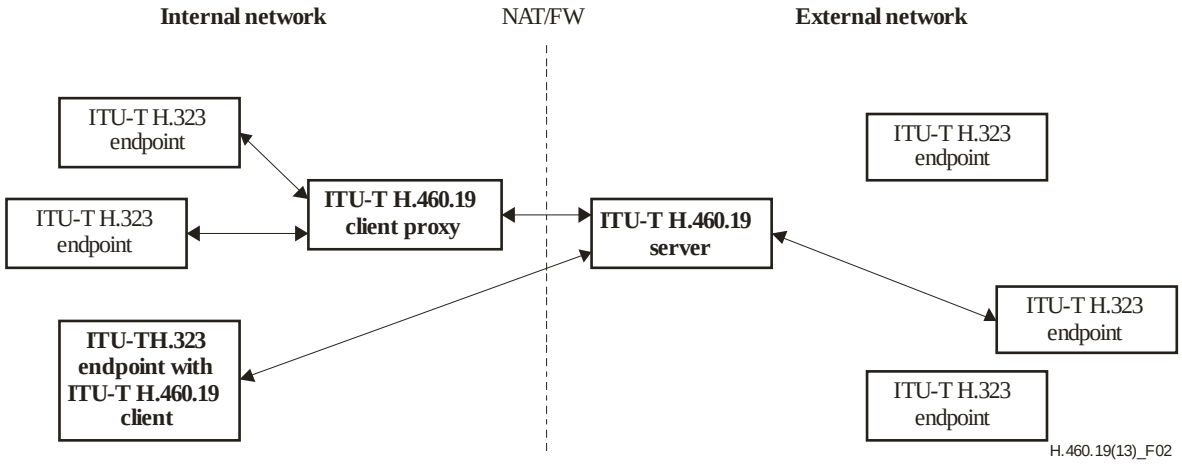

Figure 2 – Decoupled ITU-T H.460.19 architecture

In Figure 3, Organization A on the left has a mix of ITU-T H.460.19-enabled endpoints, and of non-ITU-T H.460.19 H.323 endpoints making use of an ITU-T H.460.19 proxy. Organization A has an ITU-T H.460.19 server on their demilitarized zone (shown as part of the external network in the figure), which provides media traversal and access to the external network for Organization A endpoints.

Organization B, on the right of Figure 3, has a pair of endpoints communicating with each other on the internal network, and ITU-T H.460.19-enabled endpoints which communicate with endpoints on the external network (including, indirectly, Organization A endpoints) via an ITU-T H.460.19 server operated by a service provider.

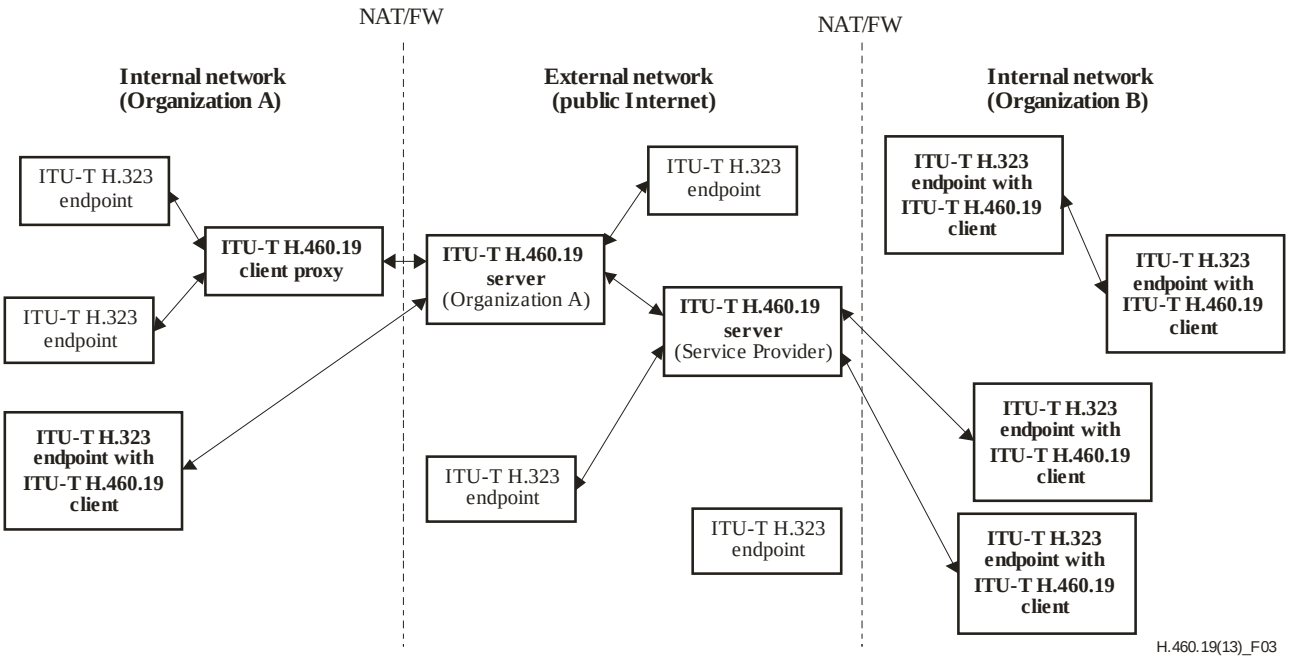

Figure 3 – ITU-T H.460.19 double NAT/FW architecture

6.1 General requirements

ITU-T H.460.19 entities shall support [ITU-T H.460.18]. Alternative call setup mechanisms may be supported as well.

Support of the NAT/FW traversal procedure, defined in clause 7.3.1, is mandatory for both ITU-T H.460.19 clients and ITU-T H.460.19 servers.

Support of multiplexed media mode transmission defined in clause 7.3.2 is mandatory for ITU-T H.460.19 clients and optional for ITU-T H.460.19 servers.

Support of multiplexed media mode reception defined in clause 7.3.2 is optional for both ITU-T H.460.19 clients and ITU-T H.460.19 servers.

The use of these procedures with multicast channels is for future study.

7 Procedures

7.1 Signalling procedures

7.1.1 Capabilities signalling

The capability to support ITU-T H.460.19 functionality shall be signalled by including the **mediaNATFWTraversal** feature identifier defined in clause 7.4.1 in the **supportedFeatures** field of the following ITU-T H.225.0 call signalling messages sent in each call:

a) For outgoing calls the feature identifier shall be included in the SETUP message.

b) For incoming calls the feature identifier shall be included in CALL PROCEEDING, ALERTING and CONNECT messages, and in FACILITY messages with **facilityReason** set to **forwardedElements**.

The capability to transmit in multiplexed media mode shall be signalled by the servers by including the **supportTransmitMultiplexedMedia** parameter, defined in clause 7.4.2, in the same **supportedFeatures** field.

Clients shall support transmission of multiplexed media and shall always include the **supportTransmitMultiplexedMedia** parameter in their **supportedFeatures** field.

The capability to receive in multiplexed media mode (to de-multiplex) shall be indicated by the presence of the **multiplexID** field in the Traversal Parameters in the OLC Request and OLC Response messages as defined in clause 7.4.5.

The ITU-T H.460.19 server shall include the **mediaTraversalServer** parameter, defined in clause 7.4.3 in the same **supportedFeatures** field.

7.1.2 Logical channel signalling

The use of the procedures defined in this Recommendation shall be negotiated for each Logical Channel (LC) using the ITU-T H.245 **openLogicalChannel** procedure or in the **openLogicalChannel** request or response in the case of Fast Connect.

To signal a request to use the procedures of this Recommendation on a particular LC, the ITU-T H.460.19 server shall include the Traversal Parameters field defined in this Recommendation in the **genericInformation** field of the messages defined in Table 1, according to the procedures in clause 7.4:

Table 1 – Messages used to initiate ITU-T H.460.19 procedures

LC direction	Message
Toward H.460.19 server	**OLC Response message**
Toward H.460.19 client	**OLC Request message**

ITU-T H.460.19 entities shall setup LCs according to the procedures given in the following clauses, and using the transport addresses given in Table 2 below.

The ITU-T H.460.19 server shall include the **keepAliveChannel** field in the **Traversal Parameters** of the OLC Request message.

In all cases, the ITU-T H.460.19 client shall send keep-alive packets as defined in clause 7.3.1.1.

Table 2 – Transport addresses for channels between ITU-T H.460.19 client and server

Channel	Source	Source transport address	Dest.	Destination transport address
Media Channel	client	Any port on ITU-T H.460.19 client.	server	**mediaChannel** destination address on ITU-T H.460.19 server in server's OLC Response message.
Media Channel	server	**keepAliveChannel** destination address on ITU-T H.460.19 server in server's OLC Request message.	client	Apparent keep-alive source address on ITU-T H.460.19 client (media sent only after receipt of keep-alive from ITU-T H.460.19 client).
Keep-alives	client	ITU-T H.460.19 client's desired Media Channel destination port.	server	**keepAliveChannel** destination address on ITU-T H.460.19 server in server's OLC Request message.

Table 2 – Transport addresses for channels between ITU-T H.460.19 client and server

Channel	Source	Source transport address	Dest.	Destination transport address
Media Control Channel	client	ITU-T H.460.19 client's desired Media Control Channel destination port. The **mediaControlChannel** destination address in all OLC Request and OLC Response messages sent by a given client for a given call and value of **sessionID** shall contain this same transport address. NOTE – The ITU-T H.460.19 server ignores this **mediaControlChannel** value.	server	**mediaControlChannel** destination address on ITU-T H.460.19 server in server's OLC Request or OLC Response message – whichever was received more recently for the given call and value of **sessionID**.
Media Control Channel	server	**mediaControlChannel** destination address on ITU-T H.460.19 server in ITU-T H.460.19 server's OLC Request or OLC Response message – whichever was transmitted more recently for the given call and value of **sessionID**.	client	Apparent Media Control Channel source address on ITU-T H.460.19 client (media control packets are sent only after receipt of media control packets from ITU-T H.460.19 client).

7.1.2.1 Establishment of LCs from ITU-T H.460.19 client to ITU-T H.460.19 server

Figure 4 illustrates the establishment of an LC from an ITU-T H.460.19 client to an ITU-T H.460.19 server.

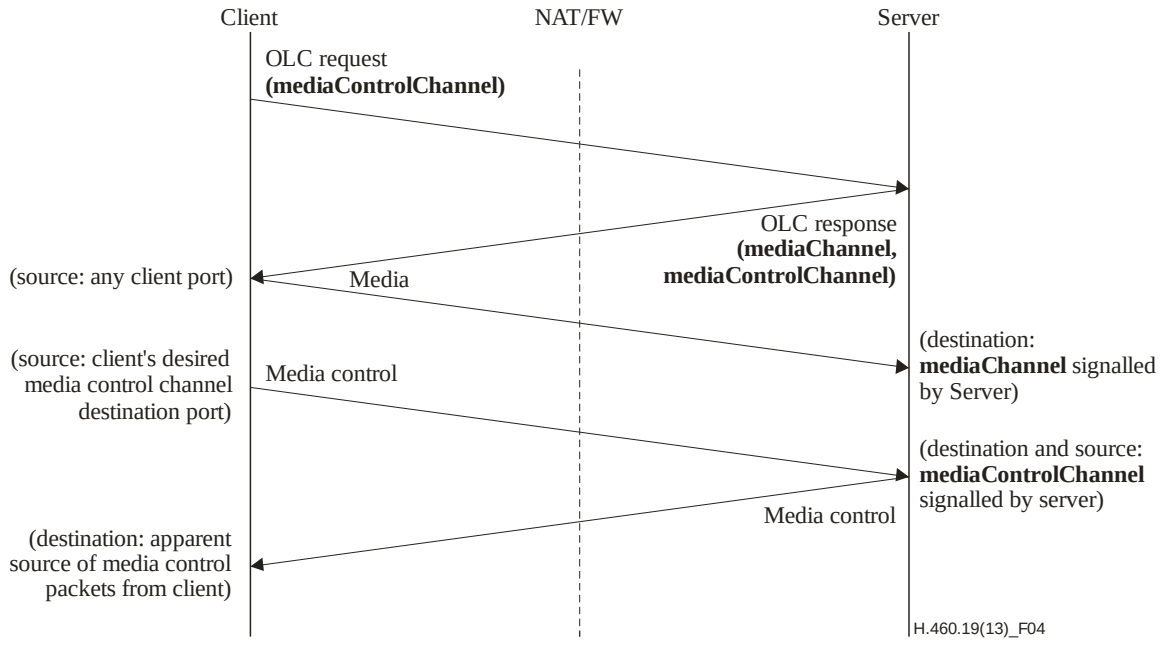

Figure 4 – Opening an LC toward the ITU-T H.460.19 server

The ITU-T H.460.19 client shall transmit Media Channel and Media Control Channel packets to the transport addresses indicated in the **mediaChannel** and **mediaControlChannel** fields, respectively, of the ITU-T H.460.19 server's OLC Response message.

The ITU-T H.460.19 server shall wait for receipt of at least one Media Control Channel packet from the ITU-T H.460.19 client for the LC, and then send Media Control Channel packets for the LC to the ITU-T H.460.19 client, with a destination transport address equal to the apparent source transport address of the Media Control Channel packet received from the ITU-T H.460.19 client.

7.1.2.2 Establishment of LCs from ITU-T H.460.19 server to ITU-T H.460.19 client

Figure 5 illustrates the establishment of an LC from an ITU-T H.460.19 server to an ITU-T H.460.19 client.

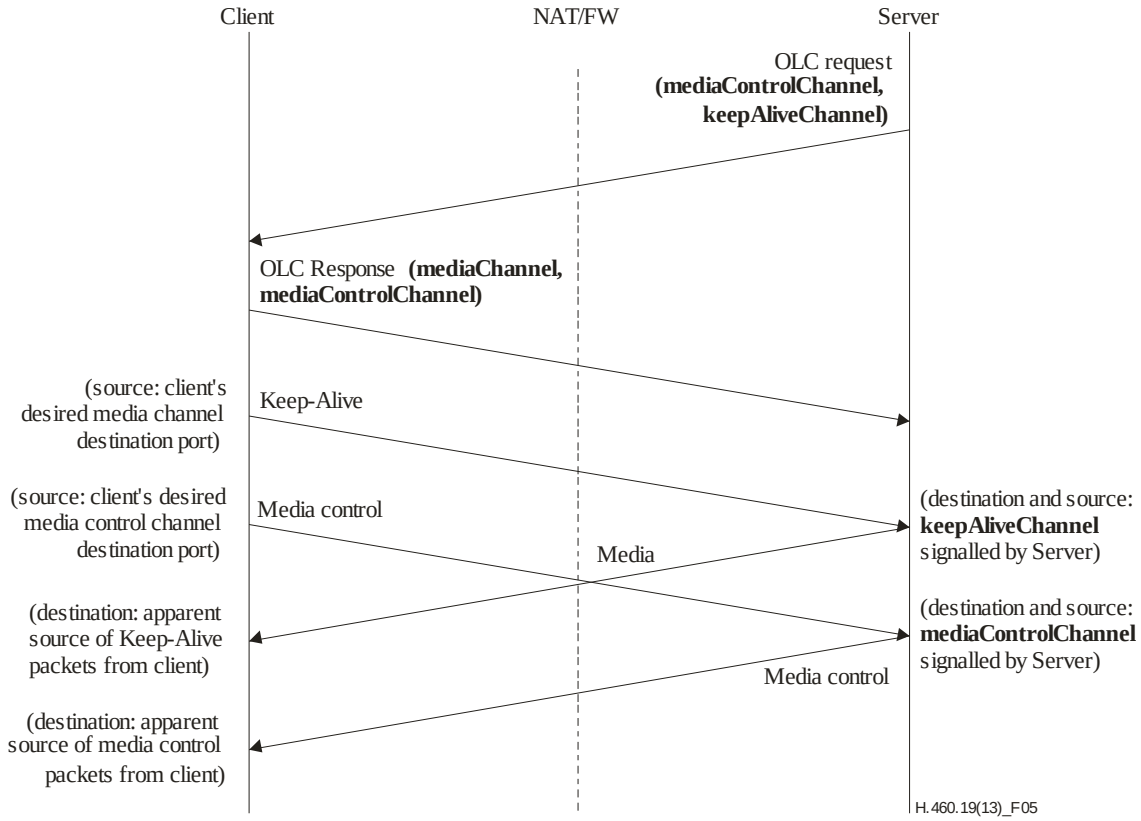

Figure 5 – Opening an LC toward the ITU-T H.460.19 client

The ITU-T H.460.19 client shall transmit Media Control Channel and keep-alive packets to the transport addresses indicated in the **mediaControlChannel** and **keepAliveChannel** fields, respectively, of the ITU-T H.460.19 server's OLC Request message.

The ITU-T H.460.19 server shall wait for receipt of at least one keep-alive packet from the ITU-T H.460.19 client for the LC, and then send Media Channel packets for the LC to the ITU-T H.460.19 client, with a destination transport address equal to the apparent source transport address of the keep-alive packet received from the ITU-T H.460.19 client.

The ITU-T H.460.19 server shall wait for receipt of at least one Media Control Channel packet from the ITU-T H.460.19 client for the LC, and then send Media Control Channel packets for the LC to the ITU-T H.460.19 client, with a destination transport address equal to the apparent source transport address of the Media Control Channel packet received from the ITU-T H.460.19 client.

7.1.2.3 Overlapping establishment of LCs between ITU-T H.460.19 client and ITU-T H.460.19 server

Figure 6 illustrates the simultaneous establishment of LCs between an ITU-T H.460.19 client and an ITU-T H.460.19 server.

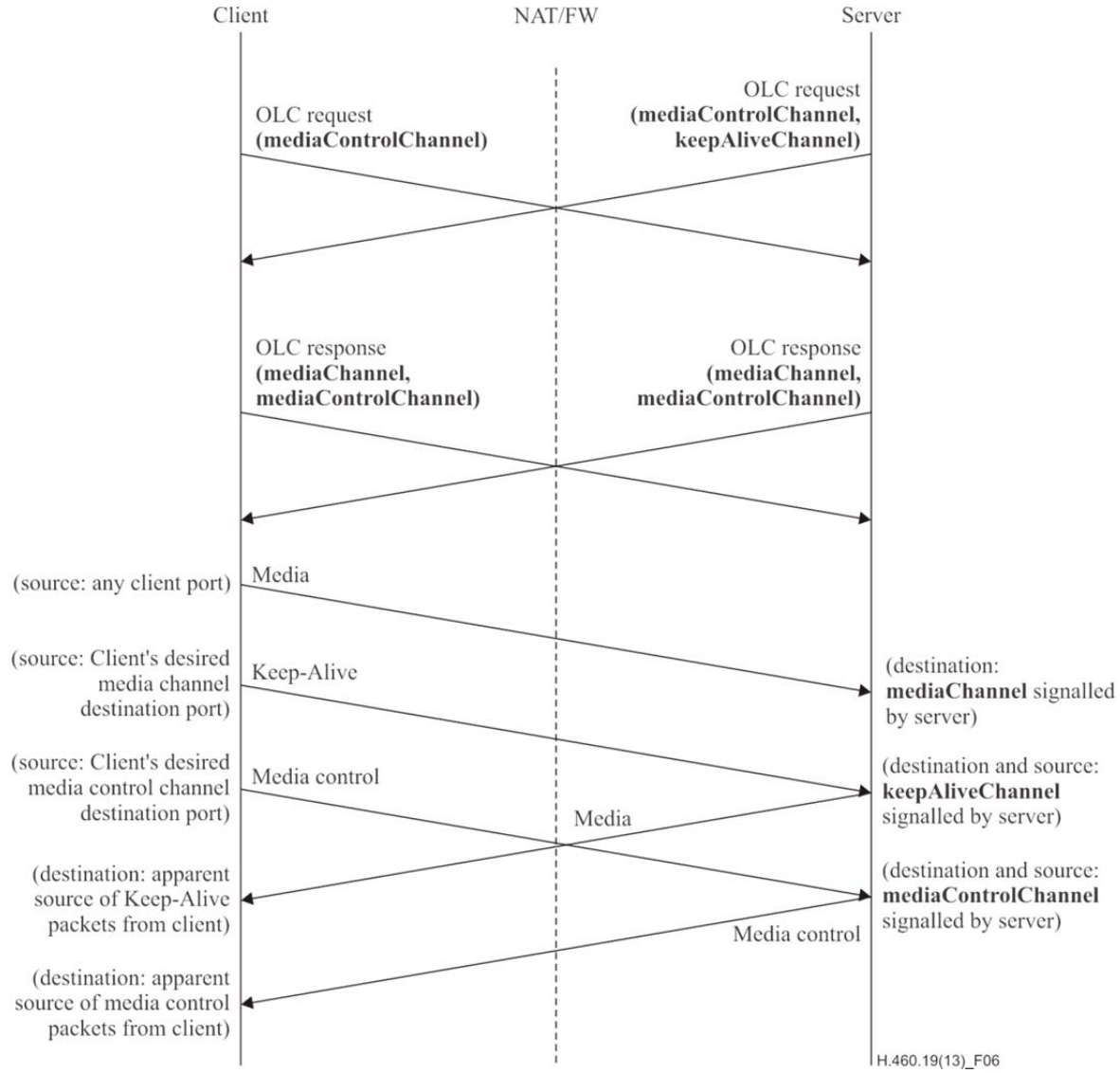

Figure 6 – Overlapping opening of a bidirectional pair of LCs between an ITU-T H.460.19 server and an ITU-T H.460.19 client (informative)

The ITU-T H.460.19 client shall transmit Media Channel, Media Control Channel, and keep-alive packets to the transport addresses indicated in the **mediaChannel**, **mediaControlChannel**, and **keepAliveChannel** fields, respectively, of the ITU-T H.460.19 server's OLC Request or OLC Response message, whichever was received more recently for the same call and using the same value of **sessionID**.

The ITU-T H.460.19 server shall wait for receipt of at least one keep-alive packet from the ITU-T H.460.19 client for the LC, and then send Media Channel packets for the LC to the ITU-T H.460.19 client, with a destination transport address equal to the apparent source transport address of the keep-alive packet received from the ITU-T H.460.19 client.

The ITU-T H.460.19 server shall wait for receipt of at least one Media Control Channel packet from the ITU-T H.460.19 client for the LC, and then send Media Control Channel packets for the LC to the ITU-T H.460.19 client, with a destination transport address equal to the apparent source transport address of the Media Control Channel packet received from the ITU-T H.460.19 client.

7.1.2.4 Establishment of LCs from ITU-T H.460.19 client to ITU-T H.460.19 client

Establishment of LCs between two ITU-T H.460.19 clients shall be according to normal ITU-T H.323 procedures.

The ITU-T H.460.19 client shall not transmit keep-alive packets when the peer is also ITU-T H.460.19 client.

The procedures for the multiplexed media mode may be used between two ITU-T H.460.19 clients.

7.1.2.5 Establishment of LCs from ITU-T H.460.19 server to ITU-T H.460.19 server

Establishment of LCs between two ITU-T H.460.19 servers shall be according to normal ITU-T H.323 procedures.

The procedures for the multiplexed media mode may be used between two ITU-T H.460.19 servers.

An ITU-T H.460.19 server may include the **keepAliveChannel** parameter in its OLC Request message.

The ITU-T H.460.19 server shall not transmit keep-alive packets when the peer is also ITU-T H.460.19 server.

7.2 Multiplexed media mode

In the multiplexed media mode, multiple RTP/RTCP or SRTP/SRTCP sessions may be carried on a single pair of transport addresses.

In the following clauses, the term multiplexing means the ability to add the multiplexing layer as defined in clause 7.3.2, and the term de-multiplexing means the ability to understand and remove the multiplexing layer as defined in clause 7.3.2.

NOTE – Use of the multiplexing layer does not necessarily require or cause actual multiplexing of media or media control packets onto the same transport addresses. Destination transport addresses in all cases are chosen by the receiver of each stream. In the multiplexed media mode, receivers are free to either reuse the destination transport address (actual multiplexing) or to choose unique destination transport addresses for each received stream.

Support of multiplexing of Media Channel and Media Control Channel packets is mandatory for ITU-T H.460.19 clients.

Support of multiplexing of Media Channel and Media Control Channel packets is optional for ITU-T H.460.19 servers and is signalled by specifying the **supportTransmitMultiplexedMedia** parameter as defined in clause 7.4.2.

Both ITU-T H.460.19 clients and ITU-T H.460.19 servers may support de-multiplexing of received Media Channel and Media Control Channel packets. Support of this optional mode is signalled by including the **multiplexID** field in the Traversal Parameters in the OLC Request and OLC Response messages as defined in clause 7.4.5. Support of de-multiplexing may be chosen on a LC-by-LC basis.

7.2.1 Requesting the multiplexed media mode

Only ITU-T H.460.19 entities that support de-multiplexing may initiate use of the multiplexed media mode.

An ITU-T H.460.19 entity "A" (either an ITU-T H.460.19 server or an ITU-T H.460.19 client) may initiate multiplexing of the Media, Media Control and keep-alive channels sent from an ITU-T H.460.19 client to entity A.

An ITU-T H.460.19 entity "A" (either an ITU-T H.460.19 server or an ITU-T H.460.19 client) may initiate multiplexing of the Media, Media Control and keep-alive channels sent from an ITU-T H.460.19 server to entity A, only if the ITU-T H.460.19 server supports multiplexing as indicated by **supportTransmitMultiplexedMedia** parameter of the server's feature identifier as defined in clause 7.4.2.

To initiate multiplexing toward itself for a given LC, entity A shall include a **multiplexID** field in its OLC Request or OLC Response message sent to the peer ITU-T H.460.19 entity.

NOTE 1 – A **multiplexID** field may be included in an OLC Request message in order to request multiplexing of the Media Control Channel and keep-alive channel in the direction toward the requesting entity.

Entity A shall assign a unique **multiplexID** value for each set of multiplexed LCs for the given call and value of **sessionID**.

NOTE 2 – The pair of LCs for the given call and value of **sessionID** establishes a Media Channel and a Media Control Channel in the direction toward the client and a keep-alive channel and a Media Control Channel in the direction toward the server. The packets, of these channels, sent towards either of the entities include the **multiplexID** provided by the entity.

If the **multiplexID** field was present in the message, the peer ITU-T H.460.19 entity shall transmit Media Channel, Media Control Channel and keep-alive packets for the LCs in the multiplexed mode, identifying each packet with the **multiplexID** value as defined in clause 7.3.2.

Entity A shall receive Media Channel, Media Control Channel and keep-alive packets for the LCs in the multiplexed media mode, and use the received value of the **multiplexID** in each packet as defined in clause 7.3.2.

If an OLC Request message contains **multiplexID**, then the OLC Response message sent by the same entity for the same call and value of **sessionID** shall contain **multiplexID** with the same value.

NOTE 3 – These OLC Request and OLC Response messages belong to two different LCs established in opposite directions for the given call and **sessionID**.

If an OLC Request message contains a **multiplexID** field, then it also shall contain a **multiplexedMediaControlChannel** field specifying the destination transport address for the multiplexed Media Control packets.

If an OLC Response message contains a **multiplexID** field, then it also shall contain **multiplexedMediaChannel** and **multiplexedMediaControlChannel** fields specifying destination transport address for the multiplexed Media and Media Control packets correspondingly.

If an OLC Request message contains **multiplexID** and **keepAliveChannel** fields, then the **keepAliveChannel** field shall contain the destination transport address for the multiplexed keep-alive packets.

If an OLC Request message contains **multiplexID** and **keepAliveChannel** fields, then the **multiplexedMediaChannel** field of the OLC Response message sent by the same entity for the same call and value of **sessionID** shall contain the same value as the **keepAliveChannel** field.

The values of the **multiplexedMediaControlChannel** field signalled by the same entity for all the LCs for the given call and value of **sessionID** shall be identical.

When the Fast Connect caller creates its **openLogicalChannel** proposal message, it does not yet know if the peer entity supports the procedures of this Recommendation. For this case, an ITU-T H.460.19 entity which desires to use the multiplexed media mode shall include both the

multiplexedMediaChannel and **multiplexedMediaControlChannel** fields (for the case where the peer supports multiplexing), and the **mediaChannel** and **mediaControlChannel** fields (for the case where the peer does not support multiplexing).

7.3 Media transport

7.3.1 NAT/FW traversal procedure

The NAT/FW traversal procedure shall be used in cases where an ITU-T H.460.19 server communicates with an ITU-T H.460.19 client.

The NAT/FW traversal procedure shall not be used in cases where an ITU-T H.460.19 server communicates with an ITU-T H.460.19 server, and in the cases where an ITU-T H.460.19 client communicates with an ITU-T H.460.19 client.

The Media Channel, Media Control Channel and keep-alive channel are considered established for the purpose of the keep-alive procedure when the ITU-T H.460.19 entity receives the OLC Request or OLC Response message containing the transport address for each channel.

NOTE – During establishment of the pair of LCs for a given call and value of **sessionID**, each entity receives the OLC Request and OLC Response messages with the same value of the Media Control Channel transport address. The Media Control Channel is considered established when the first of these two messages is received.

7.3.1.1 NAT/FW traversal procedure – Clients

All ITU-T H.460.19 clients shall implement the NAT/FW traversal procedure defined in this clause.

The keep-alive mechanism maintains pinholes in any NAT/FW devices located between the ITU-T H.460.19 client and ITU-T H.460.19 server.

Upon establishment of each keep-alive channel, the ITU-T H.460.19 client shall transmit one Media Channel keep-alive packet.

Upon establishment of each Media Control Channel, the ITU-T H.460.19 client shall transmit one Media Control Channel keep-alive packet.

For each established Media Control Channel and keep-alive channel, the ITU-T H.460.19 client shall transmit a Media Channel and Media Control Channel keep-alive packet at intervals of not less than the value specified by the ITU-T H.460.19 server in the **keepAliveInterval** field in the Traversal Parameters defined in clause 7.4.5, unless there is other traffic on the channel within the given interval.

A keep-alive interval in the range of 5 to 30 seconds should be used except in cases where it is known (for example, from the specifics of the network) that a longer interval will not result in the closure of pinholes.

NOTE – Keep-alive packets should not be sent in an unduly short interval compared to the **keepAliveInterval** value. This is to avoid waste of the network and processing resources.

7.3.1.1.1 RTP keep-alive packet

The RTP keep-alive packet is an RTP packet with an empty payload field. The payload type value shall be equal to the value specified by the client in **keepAlivePayloadType** field in the Traversal Parameters defined in clause 7.4.5. The sequence number header field shall start from any arbitrary value and increment by one for each keep-alive packet.

The SSRC and timestamp header fields may have arbitrary values.

7.3.1.1.2 RTCP keep-alive packet

The RTCP keep-alive packet is an RTCP packet containing only an SR (sender report) specified in [IETF RFC 3550].

7.3.1.1.3 SRTP keep-alive packet

The SRTP keep-alive packet is the same as the RTP keep-alive packet. In addition, the optional authentication tag (as defined by [IETF RFC 3711]) should be added to the packet.

7.3.1.1.4 SRTCP keep-alive packet

The SRTCP keep-alive packet is an SRTCP packet containing an SR (sender report) authenticated and optionally encrypted with the same parameters which are used for regular SRTCP packets in the same SRTP session.

7.3.1.2 NAT/FW Traversal procedure – Servers

All ITU-T H.460.19 servers shall implement the NAT/FW Traversal procedure defined in this clause.

ITU-T H.460.19 servers shall not forward any RTP or SRTP keep-alive packet as defined in the previous clause to any ITU-T H.323 endpoint which has not indicated support for the procedures of this Recommendation.

These packets should be identified by their payload type value.

The ITU-T H.460.19 server shall ignore the **mediaChannel**, **mediaControlChannel**, **multiplexedMediaChannel** and **multiplexedMediaControlChannel** transport addresses signalled in the **openLogicalChannel** or **openLogicalChannelAck** messages received from the ITU-T H.460.19 client.

For each established Media Channel, the ITU-T H.460.19 server entity shall wait for receipt of at least one keep-alive media packet from the ITU-T H.460.19 client and then send media packets destined for the ITU-T H.460.19 client to the source transport address of the keep-alive media packet received from the ITU-T H.460.19 client.

For each established Media Control Channel, the ITU-T H.460.19 server entity shall wait for receipt of at least one media control packet from the ITU-T H.460.19 client and then send media control packets destined for the ITU-T H.460.19 client to the source transport address of the media control packets received from the ITU-T H.460.19 client.

NOTE – Security may be increased through the use of authentication (either ITU-T H.235 anti-spamming or SRTP) in concert with the NAT/FW traversal procedure.

ITU-T H.460.19 entities which implement SRTP authentication shall also implement ITU-T H.235 anti-spamming.

7.3.2 Multiplexed media mode – RTP/RTCP

When operating in the multiplexed media mode, a multiplexing layer shall be added by ITU-T H.460.19 entities between the UDP and RTP/RTCP packet headers as shown in Figures 7 and 8.

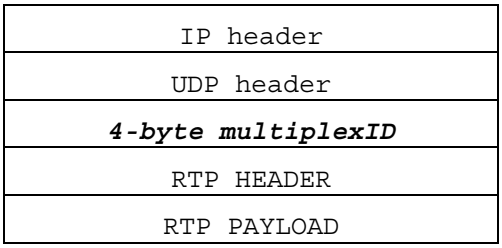

Figure 7 – The multiplexed RTP packet

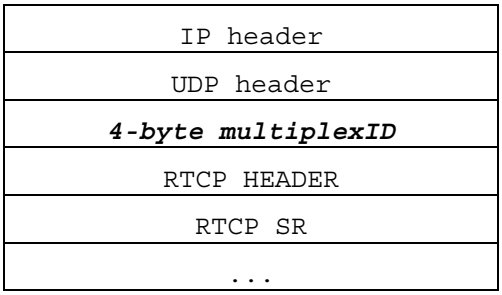

Figure 8 – The multiplexed RTCP packet

The sender of the multiplexed Media Channel/Media Control Channel packet shall create the Media Channel/Media Control Channel packet as specified by RTP/RTCP and then shall insert in the packet the value of **multiplexID** as specified by the peer during the OLC Request or OLC Response procedure as described in clause 7.2 above.

If the NAT/FW traversal procedure is in use, the packet shall be sent to the addresses discovered by that procedure. Otherwise the packet shall be sent to the addresses either specified by **multiplexedMediaChannel** (for RTP channels) or **multiplexedMediaControlChannel** (for RTCP channels) field.

NOTE – The receiver of the multiplexed packet is the same entity which specified the **multiplexID** to the peer.

When a multiplexed packet is received, the receiver shall verify that the **multiplexID** field has one of the values previously specified by the receiver of the packet.

If the value is valid, the receiver shall associate the packet with the corresponding RTP/RTCP session. It shall then remove the **multiplexID** field from the packet and further process the packet according to normal RTP/RTCP procedures.

Otherwise, the invalid packet shall be discarded.

7.3.3 Multiplexed media mode – SRTP/SRTCP

The multiplexed media mode for SRTP/SRTCP is identical to the RTP/RTCP procedure in the previous clause, with the 4-byte **multiplexID** inserted between the UDP header and the SRTP/SRTCP headers.

The information inside the SRTP/SRTCP portion of the packet shall remain intact.

NOTE – The **multiplexID** is not protected by the security mechanisms defined in SRTP/SRTCP.

7.4 Generic data usage

The ITU-T H.460.19 feature identifier defined in clause 7.4.1 shall be carried in the **id** subfield of the **supportedFeatures** field of the H323-UU-PDU in the ITU-T H.225.0 Call Signalling messages.

The **supportTransmitMultiplexedMedia** parameter defined in clause 7.4.2 and **mediaTraversalServer** parameter defined in clause 7.4.3 shall be carried in the **parameters** subfield of the **supportedFeatures** field containing the ITU-T H.460.19 feature identifier in its **id** subfield.

The ITU-T H.460.19 feature identifier defined in clause 7.4.4 shall be specified in the **standard** form of the **messageIdentifier** subfield in the **genericInformation** field of the **openLogicalChannel** or **openLogicalChannelAck** ITU-T H.245 messages. The **messageContent** subfield of the same **genericInformation** field shall include the "Traversal Parameters" parameter.

7.4.1 Feature identifier definition for ITU-T H.225.0

Table 3 – mediaNATFWTraversal parameter

Feature name:	**mediaNATFWTraversal**
Feature description:	Declares support of ITU-T H.460.19 feature.
Feature identifier type:	Standard
Feature identifier value:	19

7.4.2 supportTransmitMultiplexedMedia parameter definition

Table 4 – supportTransmitMultiplexedMedia parameter

Parameter name:	**supportTransmitMultiplexedMedia**
Parameter description:	This is sent together with **mediaNATFWTraversal** feature identifier to signal support for transmission of the multiplexed media mode. NOTE – Support for reception of the multiplexed media mode is signalled inside OLC Request and OLC Response messages.
Parameter identifier type:	Standard
Parameter identifier value:	1
Parameter type:	Empty (Content field shall be omitted)
Parameter cardinality:	One and only one

7.4.3 mediaTraversalServer parameter definition

Table 5 – mediaTraversalServer parameter

Parameter name:	**mediaTraversalServer**
Parameter description:	This is sent together with **mediaNATFWTraversal** feature identifier to signal that the ITU-T H.460.19 entity is an ITU-T H.460.19 server
Parameter identifier type:	Standard
Parameter identifier value:	2
Parameter type:	Empty (Content field shall be omitted)
Parameter cardinality:	One and only one

7.4.4 Feature identifier definition for ITU-T H.245

{ itu-t (0) recommendation (0) h (8) 460 19 version (0) 1}

7.4.5 Traversal Parameters definition

Table 6 – Traversal Parameters parameter

Parameter name:	**Traversal Parameters**
Parameter description:	This parameter shall be sent to provide media parameters necessary for NAT/FW traversal and media multiplexing. The content is a raw field consisting of the ASN.1 aligned variant PER encoded TraversalParameters type as specified in the ASN.1 notation in Annex A.
Parameter identifier value:	1
Parameter status:	Mandatory
Parameter type:	octetString
Supersedes:	This field is not used

7.4.5.1 Traversal Parameters semantics

multiplexedMediaChannel

Media Channel packets shall be sent to the transport address received in this field in the event that the multiplexed media mode is used. If the multiplexed media mode is not used, then the packets shall be sent to the transport address received in the **mediaChannel** field.

Servers performing the NAT/FW traversal procedure should ignore **multiplexedMediaChannel** and **mediaChannel** fields.

multiplexedMediaControlChannel

Media Control Channel packets shall be sent to the transport address received in this field in the event that the multiplexed media mode is used. If the multiplexed media mode is not used, then the packets shall be sent to the transport address received in the **mediaControlChannel** field.

Servers performing the NAT/FW traversal procedure should ignore **multiplexedMediaControlChannel** and **mediaControlChannel** fields.

multiplexID

The presence of this field indicates the intention to use the multiplexed media mode for the logical channel. The value received in this field shall be transmitted in the **multiplexID** field in the multiplexed media mode packets for that logical channel.

keepAliveChannel

Keep-alive channel packets shall be sent to the transport address received in this field. This field is used only to specify the address for the keep-alive packets which need to be sent in the opposite direction to that of the Media Channel. This field shall be specified only by ITU-T H.460.19 servers in OLC Request messages.

keepAlivePayloadType

The keep-alive channel packets shall have the payload type value equal to the value specified in this field by the sender of the keep-alive packets. This field shall be specified in the OLC Response messages by the ITU-T H.460.19 client communicating with ITU-T H.460.19 server or with an entity whose ITU-T H.460.19 type is still unknown.

keepAliveInterval

This value is signalled by an ITU-T H.460.19 server and represents the maximum interval, in seconds, of the absence of the Media Channel or Media Control Channel packet traffic, within which the corresponding keep-alive packets shall be sent.

Annex A

Media traversal ASN.1 definitions for use inside generic data

(This annex forms an integral part of this Recommendation.)

A.1 Introduction

This annex contains the ASN.1 definitions used by this Recommendation.

```
MEDIA-TRAVERSAL {itu-t(0) recommendation(0) h(8) 460 19 version (0) 1}
DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
                TimeToLive

FROM H323-MESSAGES
                TransportAddress

FROM MULTIMEDIA-SYSTEM-CONTROL;

TraversalParameters ::= SEQUENCE
{
      multiplexedMediaChannel             TransportAddress  OPTIONAL,
      multiplexedMediaControlChannel      TransportAddress  OPTIONAL,
      multiplexID                         INTEGER(0..4294967295) OPTIONAL,

      keepAliveChannel                    TransportAddress  OPTIONAL,
      keepAlivePayloadType                INTEGER (0..127)  OPTIONAL,
      keepAliveInterval                   TimeToLive        OPTIONAL,
      ...

}

END -- of ASN.1
```

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	**Audiovisual and multimedia systems**
Series I	Integrated services digital network
Series J	Cable networks and transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
Series M	Telecommunication management, including TMN and network maintenance
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Terminals and subjective and objective assessment methods
Series Q	Switching and signalling
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks, open system communications and security
Series Y	Global information infrastructure, Internet protocol aspects and next-generation networks
Series Z	Languages and general software aspects for telecommunication systems

Printed in Switzerland
Geneva, 2013