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Contents

Foreword

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1 Scope

The present document specifies the media plane control and transmission control protocols and interactions with the media needed to support Mission Critical Video (MCVideo) service.

The MCVideo service and its associated media plane control protocols can be used for public safety applications and also for general commercial applications (e.g., utility companies and railways).

The present document is applicable to User Equipment (UE) supporting MCVideo client, and MCVideo server supporting media distribution function and transmission control server.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 24.281:"Mission Critical Video (MCVideo) call control; Protocol specification".

[3] IETF RFC 3550: "RTP: A Transport Protocol for Real-Time Applications".

[4] IETF RFC 3711: "The Secure Real-time Transport Protocol (SRTP)".

[5] 3GPP TS 24.481: "Mission Critical Services (MCS) group management Protocol specification".

[6] 3GPP TS 24.483: "Mission Critical Services (MCS) Management Object (MO)".

[7] 3GPP TS 24.484: "Mission Critical Services (MCS) configuration management protocol specification".

[8] 3GPP TS 33.180: "Security of the mission critical service".

[9] IETF RFC 3830: "MIKEY: Multimedia Internet KEYing".

[10] IETF RFC 6509: "MIKEY-SAKKE: Sakai-Kashar Key Encryption in Multimedia Internet KEYing (MIKEY)".

[11] 3GPP TS 23.281: "Functional architecture and information flows to support Mission Critical Video (MCVideo); Stage 2".

[12] 3GPP TS 23.280: "Common functional architecture to support mission critical services; Stage 2".

[13] 3GPP TS 26.346: " Multimedia Broadcast/Multicast Service (MBMS); Protocols and codecs".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

Transmission request queue: The transmission request queue used by the transmission control server to queue received Transmission Request messages.

Controlling MCVideo function: The MCVideo server performing a controlling role.

Effective priority: The priority decision determined by the transmission control server based on multiple input parameters like transmission priority, participant type, type of call etc. of the current transmission request and of the current participant to which transmission is granted if any and the local policy.

MBMS bearer: The service provided by the EPS to deliver the same IP datagrams to multiple receivers in a designated location.

MBMS subchannel: A logical channel which uses resources of an activated and announced MBMS bearer identified by the TMGI of the MBMS bearer and additional parameters, like UDP port, associated to a group or the MBMS subchannel used to e.g. inform when a transmission call is started or ended.

Media plane control protocols: Protocols in the media plane used for transmission control, pre-established session call control and MBMS subchannel control.

Participating MCVideo function: The MCVideo server performing a participating role.

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.281 [11] apply:

Transmission control
Transmission participant
Transmission control server
Group call
MCVideo call
MCVideo server performing a controlling role
MCVideo server performing a participating role
MCVideo user
Mission critical video
Private call
SIP core

For the purposes of the present document, the following terms and definitions given in 3GPP TS 33.179 [14] apply:

Client Server Key (CSK)
Client Server Key Identifier (CSK-ID)
Group Master Key (GMK)
Group Master Key Identifier (GMK-ID)
Multicast Key for Floor Control (MKFC)
Identifier of Multicast Key for Floor Control (MKFC-ID)
Multicast Signalling Key (MuSiK)
Multicast Signalling Key Identifier (MuSiK-ID)
Private Call Key (PCK)
Private Call Key Identifier (PCK-ID)
Signalling Protection Key (SPK)
Signalling Protection Key Identifier (SPK-ID)
MBMS SubChannel Control Key (MSCCK)
MBMS SubChannel Control Key Identifier (MSCCK-ID)

For the purposes of the present document, the following terms and definitions given in IETF RFC 3711 [16] apply:

SRTP master key (SRTP-MK)
SRTP master key identifier (SRTP-MKI)
SRTP master salt (SRTP-MS)

3.2 Symbols

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

AS	Application Server
D2D	Device to Device
DL	Downlink
GCS AS	Group Communication Service Application Server
GMK	Group Management Key
GMS	Group Management Server
GUK-ID	Group User Key Identifier
IP	Internet Protocol
MBMS	Multimedia Broadcast and Multicast Service
MCVideo	Mission Critical Video
MKI	Master Key Identifier
PCK	Private Call Key
PCK-ID	Private Call Identifier
RFC	Request For Comment
RTCP	RTP Control Protocol
RTP	Real-time Transport Protocol
SRTCP	Secure RTCP
SRTP	Secure RTP
SSRC	Synchronization SouRCe
TEK	Traffic-Encrypting Key
TMGI	Temporary Mobile Group Identity
UE	User Equipment

4 General

4.1 MCVideo media plane overview

4.1.1 Transmission Control

4.1.1.1 General

In a video group call after the call is setup, at a given time multiple group members (the allowed maximum simultaneous MCVideo transmitting group members is configured in the group configuration data) are allowed to transmit videos and all other affiliated group members are invited to accept the incoming videos. Each of the other affiliated group members has the option to accept or reject the incoming videos. After accepting the video, the affiliated group member can end the video being received at any time. . The control action for obtaining this mode of operation is known as transmission and reception control. The direct actors of transmission and reception control are the transmission participants and the transmission control server. A transmission participant does the transmission and reception control related actions in the MCVideo client. The transmission control server is the decision maker of the transmission and reception control. In on-network the transmission control server is in the MCVideo server with the controlling role. In off-network no specific transmission control server exists. The current video transmitter plays the role of transmission control server.

Transmission control actions in on-network are described in subclause 4.1.1.2. The differences for off-network transmission control are described in subclause 4.1.1.3.

NOTE: End-user actions as operation of the video transmit, video transmission end, video receive and video reception end button illustrates functionality but no end-user actions are mandated by the present document.

4.1.1.2 On-network transmission and reception control

At any point in time a group member can request permission to transmit.

When the allowed maximum simultaneous MCVideo transmitting group members is not reached, a group member can click the video transmission send button, meaning the request for permission to transmit. The transmission participant entity of this user reflects this request to the transmission control server by sending a Transmission Request message. If the transmission control server decides to permit, it informs this permission for this request by sending a Transmission Granted message to the requesting group member. The transmission control server informs the initiation of the transmission to the other group members by sending a Media Reception Notification message. Once the group member receives the permission, a permission indication (permission tone) is generated by the client to inform the user that the video starts being transmitted. The media packets (encoded audio stream and video stream) are sent to the controlling MCVideo server and from there they are distributed to all receivers of this group. The click on the video transmission end button indicates the user's intention to end transmitting. Once the video transmission end button is clicked, the transmission participant sends a Transmission End Request message to the transmission control server indicating that this user has finished transmitting. This cycle, starting from the Transmission Granted message and ending with Transmission End Request message, is known as 'video transmission'.

In the beginning of a call the initial transmit request can be implied by the SIP message which initiates the call as specified in 3GPP TS 24.281 [2] without any specific Transmission Request message.

A group member can also request permission to transmit media by sending a Transmission Request message when the allowed maximum simultaneous MCVideo transmitting group members is reached. The transmission control server can resolve this request in several ways.

1. If this request has higher priority than any one of the ongoing video transmissions, the transmission control server revokes the ongoing video transmission with lowest priority by sending a Transmission Revoke message to the video transmitter of the video transmission with lowest priority. The transmitter is interrupted and the current video transmission is ended by the current transmission participant by sending a Transmission End Request message. Then the transmission control server sends a Transmission Granted message to the revoking user and send Media Reception Notification message to other affiliated group members. Then a new video transmission starts.

2. If this request does not have higher priority and transmission request queueing is not used the transmission control server rejects this request by sending a Transmission Deny message to the requester. Then a reject indication (reject tone) is generated for the user. The ongoing video transmissions continue.

3. If request queueing is used the transmission control server sends Transmission Queue Position Info message indicating that there is no permission but the request is queued for potential permission when the current video transmissions end. Then a "queued" indication is generated for the user. The ongoing video transmissions continues.

When an affiliated group member receives the Media Reception Notification message, if the maximum number of simultaneous video streams that can be received is not reached, a warning indication (new video coming tone) is generated by the client to inform the user that a new video transmission is coming to be accepted. The click on the video receive button indicates the user accepts the video, the transmission participant entity of this user sends a Receive Media Request message to the transmission control server. If the transmission control server determines to accept the Receive Media Request, a Receive Media Response message is sent back to the requesting receiver. The click on the video reception end button indicates the receiver's intention to end the video reception. Once the video reception end button is clicked, the transmission participant sends a Media Reception End Request message to the transmission control server indicating that this user does not want to receive the video transmission any more. Once receiving the Media Reception End Request message, the transmission control server interacts with media distribution function to stop sending the requesting video to the requesting receiver. If no one receives the video any more, the transmission control server can send Transmission End Request to the video transmitting user to end the video transmitting.

If maximum number of simultaneous video streams that can be received towards the affiliated group member is reached, the transmission participant can resolve this Media Reception Notification in several ways.

1. If this notification has higher priority than any one of the ongoing video receptions, the transmission participant ends the ongoing video reception with lowest priority by sending a Media Reception End Request message to the transmission control server indicating that this user does not want to receive the video transmission any more.. Then the transmission participant sends a Transmission Granted message to the revoking user and send Media Reception Notification message to other affiliated group members. Then the transmission participant sends a

Receive Media Request to the transmission control server to receive the new video transmission. Then a new video reception starts.

2. If this notification does not have higher priority, a warning indication and a prompt (new video available but the maximum number of simultaneous video streams that can be received is reached) is generated by the client to inform the user that a new video transmission is available but the maximum number of simultaneous video streams that can be received is reached, and prompts the user to make a decision. If the user reject the new video transmission invitation, the ongoing video receptions continue and the video transmission is added to a recently invited group communications list locally for later reception. If the user end the other ongoing video reception to accept the new video transmission, then the transmission participant sends a Receive Media Request to the transmission control server to receive the new video transmission. Then a new video reception starts.

During the video transmissions, a queued user can ask its position in the queue by sending a Transmission Queue Position Request message. Then the transmission control server provides the information by sending Transmission Queue Position Info message. A queued user can also remove itself from the queue by sending a Transmission End Request message. This kind of message exchange during the video transmissions does not affect the ongoing video transmissions.

If request queueing is used, by the end of a video transmission, the transmission control server gives the transmit permission to the first pending request in the queue. For this, it sends the same messages as in the beginning of a video transmission; Transmission Granted message to the permitted user and Media Reception Notification message to other affiliated group members. The permitted user is expected to click the video transmission send button after the permission tone within a well-defined short period of time. If the permitted user does not click the video transmission send button, the MCVideo client loses the transmission permission.

If queueing is used the ordering in the queue is affected by the priority of the users in the queue.

A transmission request with pre-emptive priority can be granted with revoking the ongoing video transmitter with lowest priority.

During silence (when no video transmission is ongoing), the transmission control server can send Transmission Idle message to all transmission participants from time to time. The transmission control server sends Transmission Idle message in the beginning of silence.

Some of the transmission control messages can be repeated as specified in state machines specified in clause 6.

The call can be released after a long silence period.

4.1.1.3 Off-network transmission control

This subclause describes the special features for off-network transmission control with respect to the on-network transmission control.

In off-network no specific transmission control server exists. All transmission control messages are sent to all group members.

When a transmission control server gives transmission permission it sends a Transmission Granted message. The information element which expresses the group member, to which this transmission permission is given, implies to the other group members that the transmission is taken. No other Media Reception Notification message is sent.

After silence, a transmission participant asks for transmission permission by sending a Transmission Request message. After a well-defined waiting period, if no response is received, this transmission participant sends a Media Reception Notification message indicating itself in the information element which expresses the group member to which this transmission permission is given and continues the video transmission.

In off-network, the Transmission Idle message is not used.

Some of the transmission control messages can be repeated as specified in the state machines specified in clause 7.

4.1.1.4 Determine on-network effective priority

The transmission control server can determine how to handle a received Transmission Request message using a number of input parameters. Examples of input parameters that the transmission control server can use are:

1. the transmission priority, using the value of the Transmission Priority field in the Transmission Request message;
2. the <user-priority> element as specified in 3GPP TS 24.481 [5];
3. the <num-levels-priority-hierarchy> element as specified in 3GPP TS 24.484 [7];
4. the participant type, using the <participant-type> element specified in 3GPP TS 24.481 [5] or, in case a non-controlling MCVideo function is attached to a group call, the <Participant Type> value in the Track Info field in the Transmission Request message;
5. the type of call indicated in the Transmission Indicator field;
6. the effective priority of the transmission participant with the permission to send media, and the current type of the call (e.g. normal, imminent-peril, emergency, broadcast); and
7. any other information in the group document specified in 3GPP TS 24.481 [5] or information stored in the controlling MCVideo function outside the scope of the present document.

Using a local policy and the above input parameters the transmission control server can determine that a transmission request is:

1. pre-emptive such that the current transmission is overridden;
2. pre-emptive such that the current transmission is revoked;
3. not pre-emptive and put in the transmission request queue, if queueing was negotiated; or
4. not-pre-emptive and rejected, if queueing was not negotiated.

The transmission participant can determine how to handle a received Media Reception Notification message using a number of input parameters. Examples of input parameters that the transmission participant can use are:

1. the transmission priority, using the value of the Transmission Priority field in the Transmission Request message;
2. the <user-priority> element as specified in 3GPP TS 24.481 [5];
3. the <num-levels-priority-hierarchy> element as specified in 3GPP TS 24.484 [7];
4. the participant type, using the <participant-type> element specified in 3GPP TS 24.481 [5];
5. the type of call indicated in the Transmission Indicator field;
6. the effective priority of the transmission participant with the permission to send media, and the current type of the call (e.g. normal, imminent-peril, emergency, broadcast); and
7. any other information in the group document specified in 3GPP TS 24.481 [5] or information stored in the controlling MCVideo function outside the scope of the present document.

4.1.1.5 Determine off-network effective priority

The transmission control participant can determine how to handle a received Transmission Request message using the following input parameters:

1. the transmission priority, using the value of the Transmission Priority field in the Transmission Request message;
2. the value of the "/<x>/<x>/Common/MCVideoGroupMemberList/<x>/UserPriority" leaf node of the sender of the Transmission Request message, present in group configuration as specified in 3GPP TS 24.483 [6];
3. the value of the "/<x>/OffNetwork/NumLevelHierarchy" leaf node present in service configuration as specified in 3GPP TS 24.483 [6];
4. the type of call indicated in the Transmission Indicator field; and

5. the effective priority of the transmission participant with the permission to send media, and the current type of the call (e.g. normal, imminent-peril, emergency).

Using the policy as described in subclause 7.2.1.2, and the above input parameters the transmission control participant can determine that a transmission request is:

1. pre-emptive such that one of the on-going transmissions is revoked;

2. not pre-emptive and put in the transmission request queue, if the value of "/<x>/<x>/OffNetwork/QueueUsage" leaf node present in the group configuration as specified in 3GPP TS 24.483 [6] is set to "true"; or

3. not-pre-emptive and rejected, if the value of "/<x>/<x>/OffNetwork/QueueUsage" leaf node present in the group configuration as specified in 3GPP TS 24.483 [6] is set to "false".

4.1.2 MBMS subchannel control

4.1.2.1 General

The participating MCVideo function can use an MBMS bearer for the DL transmission of the media and the media control plane.

The participating MCVideo function decides to activate an MBMS bearer. After the activation of the MBMS bearer, as specified in 3GPP TS 29.468 [6], the TMGI of this MBMS bearer is announced to the MCVideo clients in the MBMS service area of this MBMS bearer. This announcement enables the MCPVideo client to listen (decode/demodulate) this MBMS bearer. The activation of an MBMS bearer and the announcement of the TMGI create a pool of MBMS subchannel resources without any association to a group or other purposes.

The criteria for a participating MCPVideo function to decide to activate and use an MBMS bearer is implementation dependent.

An MBMS bearer can be used for the DL transmission for more than one group. For this, additional parameters like destination UDP port are used for enabling the differentiation of messages and packets belonging to different groups over the same MBMS bearer by a receiving MCVideo client.

When a TMGI is announced a general purpose MBMS subchannel is created by defining an association between the identity of the general purpose MBMS subchannel (e.g. 'general purpose') and the TMGI (of the activated and announced MBMS bearer) together with the parameters (e.g. UDP port) differentiating this general purpose MBMS subchannel in this MBMS bearer. The parameters of this general purpose MBMS subchannel can be communicated to the MCVideo clients in the MBMS service area of this MBMS bearer using unicast over-the air transmission or can be pre-defined and stored in the MCVideo user profile that is downloaded to the MCVideo UE.

4.1.2.2 Start of a MCVideo transmission

When a MCVideo transmission starts, the participating MCVideo function can allocate an MBMS subchannel for this group by defining an association between this group (e.g. 'group id') and the TMGI (of the activated and announced MBMS bearer) with the parameters differentiating this MBMS subchannel in this MBMS bearer. The parameters of this MBMS subchannel are sent using the general purpose MBMS subchannel using the Map Group To Bearer message. The Map Group To Bearer message is repeated as long as the communication is ongoing for improving the reception probability and to allow MCVideo clients arriving late to listen to the MBMS subchannel.

The Map Group To Bearer provides the multicast IP destination address and the destination ports used to deliver the transmission control messages, the audio and video media packets, the FEC repair packets.

4.1.2.3 During a media transmission

If an MBMS subchannel exists, the participating MCVideo function forwards the media plane control messages, received from the controlling MCVideo function via MBMS subchannel for media plane control. Only transmission control messages which are transmitted to more than one affiliated group member are forwarded to the MBMS bearer (e.g. the Media transmission notification, Transmission Idle and Transmission end notify messages). Transmission control messages can be repeated as long as the transmission is on going for improving the reception probability. The participating MCVideo function forwards the media packets, received from the controlling MCVideo function, via the MBMS subchannel for media.

Amongst all affiliated group members under this participating MCVideo function, the participating MCVideo function is informed or is enabled to deduce the group members which do not or cannot receive the MBMS subchannels. The participating MCVideo function forwards the media packets and the media plane control messages, received from the controlling MCVideo function, to the group members which do not or cannot receive the MBMS subchannels, using unicast bearers allocated for media and media plane control respectively.

4.1.2.4 Ending the transmission

The participating MCVideo function can de-allocate an MBMS subchannel after a configurable period of silence in the transmission by removing the association to this group by sending the Unmap Group To Bearer message over this MBMS subchannel. The de-allocation of the MBMS subchannel frees the parameters used for differentiating this MBMS subchannel in this MBMS bearer. Therefore, the resources of a de-allocated MBMS subchannel can be reallocated for a transmission of another group.

NOTE: The participating MCVideo function will activate MBMS bearers with general QoS characteristics suitable for MCVideo service and will map MBMS subchannels for media or media plane control only to MBMS bearers that can provide the QoS required by media or media plane control.

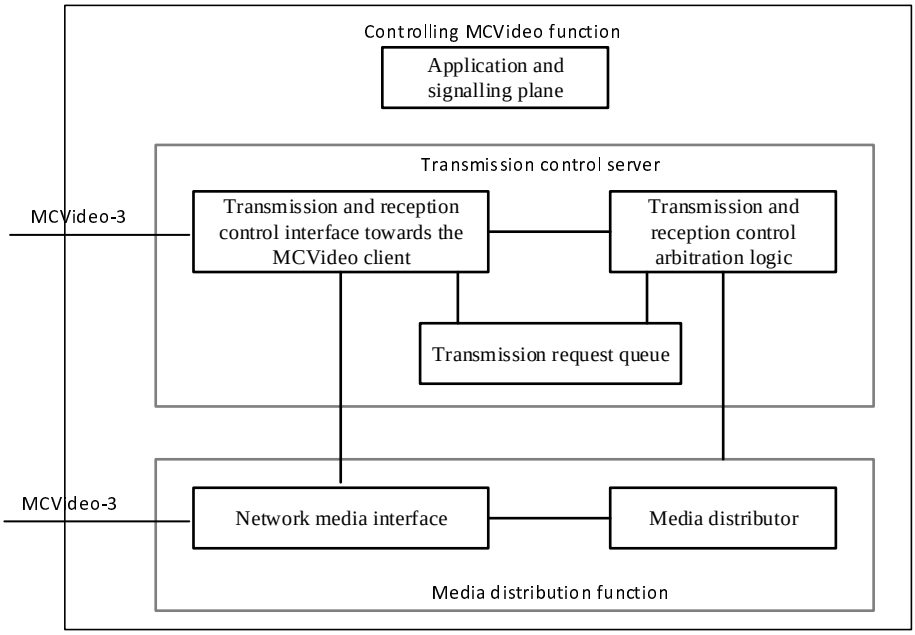
4.1.2.5 MBMS bearer announcement over an MBMS bearer

The participating MCVideo function can activate an MBMS bearer that previously has been announced over a unicast bearer by sending an MBMS bearer announcement over an MBMS bearer. The MCVideo client acknowledges that it can listen to the MBMS bearer by sending a listening status report.

4.2 Internal structure of media plane control entities

4.2.1 Controlling MCVideo function

According to 3GPP TS 23.281 [5] the controlling MCVideo function is divided into a transmission control server and a media distribution function. In the present document the internal structure of the MCVideo server is illustrated in figure 4.2-1.



NOTE: The real internal structure of the MCVideo server is implementation specific but a possible internal structure is shown to illustrate the procedures.

Figure 4.2.1-1: Internal structure of transmission control in the controlling MCVideo function

All entities in the controlling MCVideo function are assumed to have a direct communication interface to the application and signalling plane. The interface to the application and signaling plane carries information about SIP session initialisation and SIP session release, SDP content, etc.

The reference point MCVideo-3 is described in 3GPP TS 23.281 [5].

The transmission and reception control interface towards the MCVideo client receives and transmits the transmission control and reception control messages from and to the MCVideo client via the participating MCVideo function. The procedures are controlled by the state machines described in subclause 6.3.5 and subclause 6.3.7. One transmission control state machine and one reception control state machine are needed for each MCVideo client participating in an MCVideo call.

The transmission and reception control arbitration logic is performing the transmission and reception control. The transmission and reception control arbitration logic is controlled by the state machines described in subclause 6.3.4 and subclause 6.3.5. One transmission control state machine and one reception control ared needed per MCVideo call.

The transmission request queue is accessible both by the transmission and reception control interface towards the MCVideo client for all MCVideo clients in the call and the transmission and reception control arbitration logic.

The network media interface is receiving and sending media from and to the associated MCVideo client via the participating MCVideo function. The network media interface is out of scope of the present document. One network media interface is needed for each MCVideo client participating in an MCVideo call.

The media distributor is controlled by the transmission and reception control arbitration logic. The media distributor is out of scope of the present document. One media distributor is needed per MCVideo call.

The internal interfaces are assumed to transport the following types of information.

1. The interface between the network media interface and the transmission and reception control interface towards the MCVideo client:

    a. Indication that the network media interface has started to receive media packets from the associated MCVideo client or that media packets are no longer received from the associated MCVideo client.

NOTE: It is an implementation option whether an indication e.g. is sent for every received RTP media packet or only when the first packet is received and then when no more RTP packets are received.

2. The interface between the transmission and reception control interface towards the MCVideo client and the transmission and reception control arbitration logic:

    a. Transmission control and reception control messages to and from the associated MCVideo client, requests to create or delete the state machine instance for the associated MCVideo client. The transmission control and reception control messages to the transmission and reception control arbitration logic are limited to transmission control and reception control messages that will change the state of the transmission.

3. The interface between the network media interface and the media distributor:

    a. Media to and from associated MCVideo clients. This interface is out of scope of the present document.

4. The interface between the transmission and reception control arbitration logic and the media distributor:

    a. Requests to start or stop distributing media to participants in the MCVideo call. Indication that the media distributor has started to receive media packets from the network media interface associated with the MCVideo client with the permission to send media or that media packets are no longer received from the network media interface from the associated MCVideo client.

5. The interface between the transmission and reception control interface towards the MCVideo client and the transmission request queue:

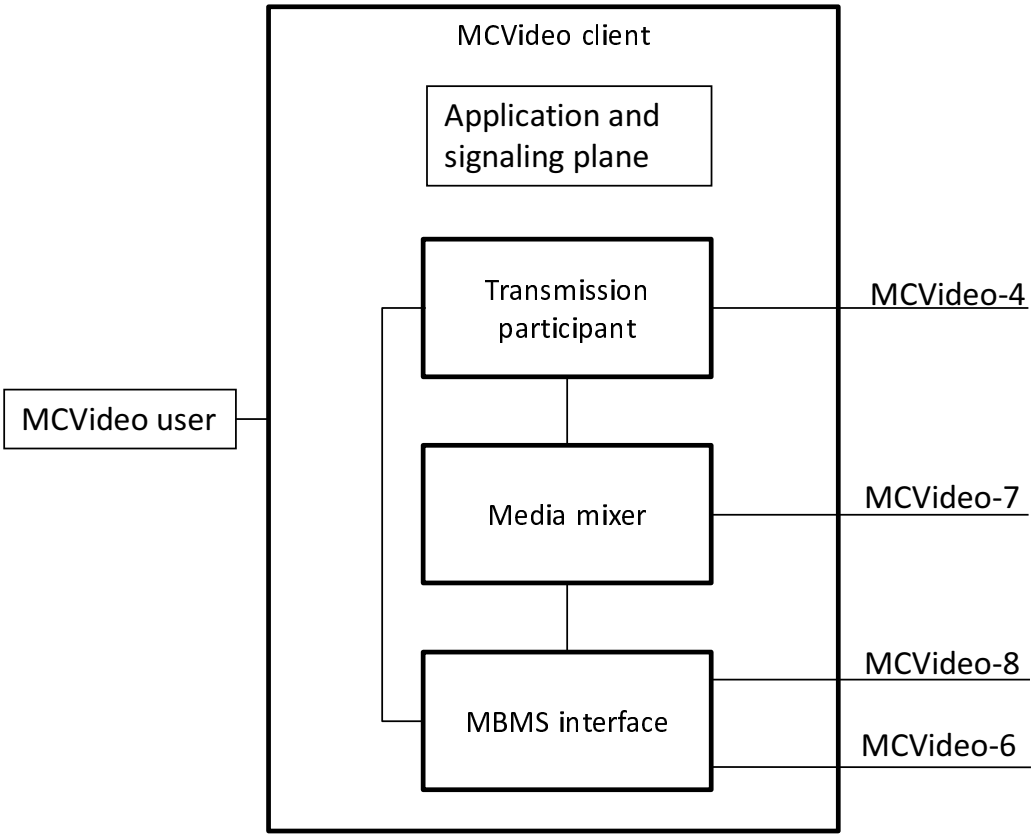
    a. Requests to store received Transmission Request messages in the queue or requests to remove Transmission Request messages from the queue and the queue content for building the Transmission Queue Position Info message.

6. The interface between the transmission and reception control arbitration logic and the transmission request queue:

a. Requests to store received Transmission Request messages in the queue or requests to remove Transmission Request messages from the queue. Indications that the queue is modified.

4.2.2 MCVideo client

According to 3GPP TS 23.380 [x1] the MCVideo client is divided into a transmission participant and a media mixer function. In the present document the internal structure of the MCVideo client is illustrated in figure 4.2.2-1.



NOTE: The real internal structure of the MCVideo client is implementation specific but a possible internal structure is shown to illustrate the logic and the procedures.

Figure 4.2.2-1: Internal structure of the MCVideo client

All entities in the MCVideo client have a direct communication interface to the application and signalling plane. The interface to the application and signaling plane carries information about SIP session initialisation and SIP session release, SDP content, etc.

The reference points MCVideo-4, MCVideo-6, MCVideo-7 and MCVideo-8 are described in 3GPP TS 23.281 [11].

The transmission participant receives and sends transmission and reception control message over the unicast bearer.

The media mixer receives and sends RTP media packets over the unicast bearer. The media mixer indicates to the transmission participant when RTP media packets are received and when RTP media packets are no longer received. The transmission participant instructs the media mixer on how to handle media received from the user or received from the network either over the unicast bearer or over the MBMS bearer.

The MBMS interface receives RTP media packets over the MBMS bearer. The RTP media packets are forwarded to the media mixer.

The MBMS interface receives transmission control messages and MBMS subchannel control messages over the MBMS bearer. The MBMS interface forward received transmission control messages to the transmission participants.

The transmission participant receives indication from the MCVideo client when the MCVideo user has click the video transmit, the video transmission end, and video receive or video reception end button. The MCVideo client can also provide notification towards the MCVideo user. Video received from the MCVideo user is, on instruction from the transmission participant, encoded by the media mixer and sent as RTP media packets over the unicast bearer.

4.2.3 Participating MCVideo function

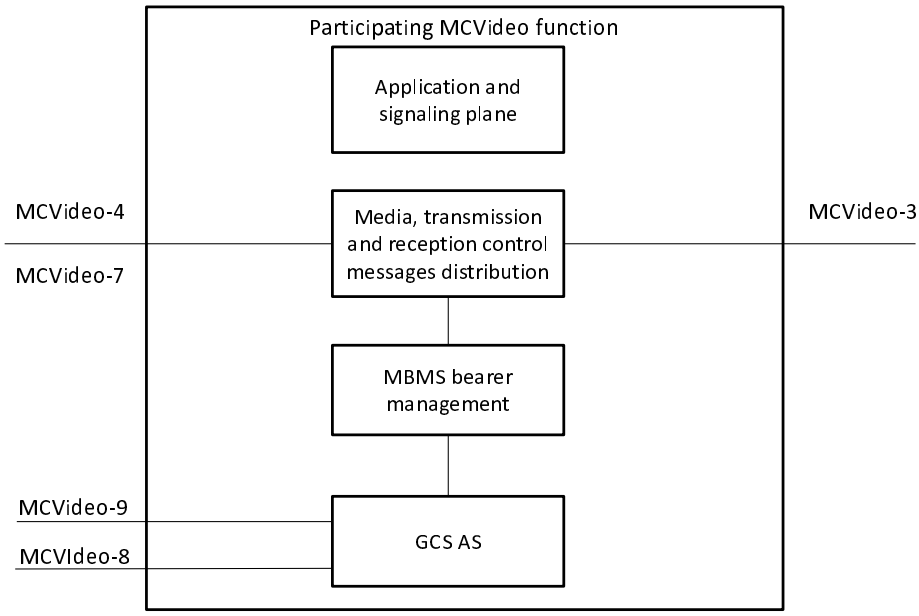
4.2.3.1 General

The participating MCVideo function performs the participating role of an MCVideo server as defined in 3GPP TS 23.281 [11]. The participating MCVideo function uses media plane control (non-SIP) messages when taking part in the transmission control and reception control procedures as specified in clause 6 and the use of MBMS Bearer procedures as specified in clause 10. In the sequel the term 'controlling MCVideo function' is used for the entity which performs the controlling role of an MCVideo server.

The following subclauses describe the assumed internal structure of a participating MCVideo function and the role of the participating function in the transmission control and reception control procedures and the use of MBMS Bearer procedures..

4.2.3.2 Internal structure of the participating MCVideo function

In the present document the internal structure of the participating MCVideo function is illustrated in figure 4.2.3.2-1.



NOTE: The real internal structure of the participating MCVideo function is implementation specific but a possible internal structure is shown to illustrate the logic and the procedures.

Figure 4.2.3.2-1: Internal structure of the participating MCVideo function

All entities in the participating MCVideo function have a direct communication interface to the application and signalling plane. The interface to the application and signalling plane carries information about SIP session initialisation and SIP session release, SDP content, etc.

The reference points MCVideo-3, MCVideo-4, MCVideo-7, MCVideo-8 and MCVideo-9 are described in 3GPP TS 23.281 [11].

The media and transmission control message distribution receives media control messages and RTP media packets to and from the MCVideo client and the controlling MCVideo function and the non-controlling MCVideo function. Media plane control messages and RTP packets are forwarded as received when unicast bearers are used. If MBMS bearers are used for transmission control messages, MBMS subchannel control messages and RTP media packets are sent to the MBMS bearer management.

The MBMS bearer management receives transmission control messages and RTP media packets from the media when transmission control messages and RTP media packets are sent over an MBMS bearer. MBMS bearer management also generates MBMS subchannel control message. Transmission control message, RTP media packets and MBMS subchannel control messages are sent to the GCS AS for distribution over an MBMS bearer. The GCS AS is outside the scope of the present specification.

4.2.3.3 The roles of the participating MCVideo function

4.2.3.3.1 For the transmission control procedures

When a transmission control or reception control message or a media packet is received from an MCVideo client, in the MCVideo-4 and MCVideo-7 reference points respectively, the participating MCVideo function forwards it to the controlling MCVideo function over MCVideo-3 reference point or to the application and signalling plane. When a transmission control message or a media packet is received from the controlling MCVideo function, over MCVideo-3 reference point or the application and signalling plane, for MCVideo clients which do not use an MBMS subchannel, the participating MCVideo function forwards the transmission control message to the MCVideo client over the MCVideo-4 and MCVideo-7 reference points respectively. For MCVidep clients which use an MBMS subchannel, for transmission control messages directed to all of these MCVideo clients and for media packets, the participating MCVideo function forwards a single transmission control message or a single media packet using the MBMS subchannel over MCVideo-9 and MCVideo-8 reference points respectively.When MCVideo clients are listening to the MBMS subchannel multiple copies of the same media packet destined to each individual MCVideo client are sent by the controlling MCVideo function while the participating MCVideo function only forwards one single media packet over the MBMS bearer. Any optimizations for not sending the media packet from the controlling MCVideo function to all MCVideo clients are out of scope of the present document.

The participating MCVideo function can decide to apply forward error correction to the media packets to protect them against loss, and reach the QoS target. The participating MCVideo function can apply forward error correction to the media packets before transmitting them over MBMS, or it can ask the BM-SC to apply forward error correction application as described in 3GPP TS 23.280 [12].

The participating MCVideo function specifications related to the transmission control and reception control are specified in subclause 6.4 for unicast media and media plane control.

4.2.3.3.2 For the use of MBMS bearer procedures

In the initiation of a transmission, if the MBMS bearer management in the participating MCVideo function decides to use MBMS subchannels for the media plane control messages and the media packets, the participating MCVideo function sends a Map Group To Bearer message over the MCVideo-9 reference point, for indicating the association information between the group identity of this call and the TMGI of the MBMS bearer and additional parameters necessary for the identification of this MBMS subchannels using the general purpose MBMS subchannel already associated for the transmission of this information. In the termination of a transmission the participating MCVideo function sends an Unmap Group To Bearer message for terminating the association between the MBMS subchannels in use for this transmission and the group identity.

The participating MCVideo function specifications related to the declaration of the association between an MBMS bearer and related parameters and the MBMS subchannels for media and media plane control are specified in subclause 10.3.2 and subclause 10.3.4.

4.3 The media plane control channel

4.3.1 General

The media plane control channel is used for transport of messages associated with the transmission control protocol, and the MBMS bearer management protocol, all specified in the present document.

4.3.2 Control channel realization

The media plane control channel is realized by sending RTCP APP packets on top of UDP/IP. RTCP APP packets are defined in IETF RFC 3550 [6]. The MCVideo specific coding of the RTCP APP packets is defined in clause 8 of the present document.

4.3.3 Establishing a media plane control channel

4.3.3.1 General

The MCVideo client and the MCVideo server use the SDP offer/answer mechanism in order to negotiate the establishment of the media plane control channel. The SDP offer/answer procedures for negotiating media plane control channel capabilities are specified in clause 14. The ABNF is defined in clause 12.

The media description ("m=" line) associated with the media plane control channel shall have the values as described in table 4.3.3.1-1.

Table 4.3.3.1-1: Media plane control channel media description

Media description element	Value
<media>	"application"
<port>	RTCP port
<proto>	"udp"
<fmt>	"MCVideo"

The port used for RTCP messages associated with the media plane control channel shall be different than ports used for RTCP messages associated with other "m=" lines (e.g. RTP) in the SDP.

NOTE 1: As RTCP is used to transport messages on the media plane control channel, the "m=" line port value indicates an RTCP port. This is different from cases where an "m=" line is associated with an RTP-based stream, and the "m=" line port value indicates an RTP port.

NOTE 2: In case the media plane control channel uses a different IP address than other media described in the SDP, a media plane control channel specific "c=" line also needs to be associated with the "m=" line associated with the media plane control channel.

The format of the optional SDP fmtp attribute, when associated with the media plane control channel, is described in clause 12.

The example below shows an SDP media description for a media plane control channel.

```
m=application 20032 udp MCVideo
a=fmtp:MCVideo mc_queueing;mc_priority=5;mc_reception_priority=5;mc_granted
```

5 Functional entities

5.1 General

This clause associates the functional entities with the MCVideo roles described in the stage 2 architecture document (see 3GPP TS 23.281 [11]).

5.2 MCVideo client

5.2.1 Introduction

To be compliant with the procedures in the present document, an MCVideo client shall:

1. support the role of an MCVideo client as specified 3GPP TS 23.281 [11];
2. support the on-network MCVideo client role as specified in 3GPP TS 24.281 [2];
3. support the off-network MCVideo client role as specified in 3GPP TS 24.281 [2]; and
4. support media plane security as specified in clause 13.

To be compliant with the on-network procedures in the present document, an MCVideo client shall:

1. provide the role of a transmission participant in on-network mode as specified in subclause 5.2.2;
2. provide the media mixer function as described in subclause 4.2.2 and support the related procedures in subclause 6.2;
3. provide video transmit, video transmission end, video receive and video reception end button events towards the on-network transmission participant as specified in subclause 6.2;
4. provide means (sound, display, etc.) for indications towards the MCVideo user as specified in subclause 6.2;
5. support negotiating media plane control channel media level attributes as specified in subclause 4.3; and
6. when operating in systems that support MBMS functionality, provide the MBMS interface as described in subclause 4.2.2 and support the related MBMS subchannel control procedure as specified in subclause 10.3;

To be compliant with the off-network procedures in the present document, an MCVideo client shall:

1. provide the role of a transmission participant in off-network mode as specified in subclause 5.2.3;
2. support the role of an off-network transmission participant as specified in 3GPP TS 23.281 [11] and in the present specification;
3. provide the media mixer function as described in subclause 4.2.2 and support the related procedures as specified in clause 7;
4. provide video transmit, video transmission end, video receive and video reception end button events towards the off-network transmission participant as specified in clause 7; and
5. provide means (sound, display, etc.) for indications towards the MCVideo user as specified in clause 7.

5.2.2 Transmission participant in on-network mode

To be compliant with the on-network procedures in the present document, a transmission participant in on-network mode shall:

1. support the on-network transmission control procedures as defined in 3GPP TS 23.281 [11];
2. support acting as an on-network transmission participant as specified in subclause 6.2; and
3. support the on-network mode transmission control protocol elements as specified in the clause 8.

A transmission participant in on-network mode may:

1. support queueing of transmission requests as specified in subclause 6.2 and subclause 4.1.1.2.

5.2.3 Transmission participant in off-network mode

To be compliant with the off-network procedures in the present document, a transmission participant in off-network mode shall:

1. support off-network transmission control procedures as specified in 3GPP TS 23.281 [11];
2. support acting as an off-network transmission participant as specified in clause 7;
3. support acting as an off-network transmission control server as specified in clause 7; and
4. support the off-network mode transmission control protocol elements in clause 8.

A transmission participant in off-network mode may:

1. support queueing of transmission requests as specified in clause 7 and subclause 4.1.1.3.

5.3 Controlling MCVideo function

An MCVideo server providing the controlling MCVideo function shall:

1. support the role of a controlling MCVideo function as specified in 3GPP TS 23.281 [11];

2. support negotiating media plane control channel media level attributes as specified in subclause 4.3;
3. provide transmission and reception control arbitration logic with an interface to MCVideo clients as described in subclause 4.2.1 and support the related procedures as specified in subclause 6.3;
4. provided a network media interface as described in subclause 4.2.1 and support associated procedures as specified in subclause 6.3;
5. provide a media distributor with a transmission control interface towards the MCVideo clients as described in subclause 4.2.1 and support associated procedures in subclause 6.3;
6. support the on-network mode transmission and reception control protocol elements as specified in clause 8: and
7. support media plane security as specified in clause 13.

An MCVideo server providing the controlling MCVideo function may:

1. provide a transmission request queue as described in subclause 4.2.1 and support the related procedures as specified in subclause 6.3 and subclause 4.3.

5.4 Participating MCVideo function

An MCVideo server providing the participating MCVideo function shall:

1. support the role of a participating MCVideo function as specified in 3GPP TS 23.281 [11];
2. distribute transmission control messages as described in subclause 6.3 and support associated procedures as specified in subclause 6.4;
3. support media plane security as specified in clause 13; and
4. when operating in systems that support and employ MBMS functionality, act as a GCS AS as specified in 3GPP TS 29.468 [6] and execute the related MBMS subchannel control procedures as specified in subclause 10.2.

6 On-network transmission control

6.1 General

This clause provides:

1. the transmission participant procedures in subclause 6.2;
2. the transmission control server procedures in subclause 6.3;
3. the participating MCVideo function transmission control procedures in subclause 6.4; and

If media plane security is required, the MCVideo client, the controlling MCVideo function, the participating MCVideo function and the non-controlling MCVideo function shall perform the additionally procedures in clause 13.

6.2 Transmission participant procedures

6.2.1 Transmission participant procedures at MCVideo session initialization

Based on the negotiations during the call establishment specified in 3GPP TS 24.281 [2], a new instance of the 'Transmission participant state transition diagram for basic transmission control operation', as specified in subclause 6.2.4 and a new instance of the 'Transmission participant state transition diagram for basic reception control operation' as specified in subclause 6.2.5, shall be created for this call.

The SIP INVITE request sent by the application and signalling plane:

1. shall be regarded an implicit Transmission request when an implicit Transmission request is negotiated; and

2. shall not be regarded as an implicit Transmission request in case of a rejoin to an already on-going group call.

NOTE: The transmission participant can negotiate the use of prioritization of the Transmission Media Request message. In that case, the transmission participant can request permission to send media at a priority level that is either the same as or lower than the highest priority that was permitted to the participant in the MCVideo call initialization. If a transmission participant is authorized for pre-emptive priority in the MCVideo call it is good practise to always request permission to send RTP media packets at a priority level that is lower than pre-emptive priority unless the user explicitly requests to pre-empt the current RTP media packets sender.

6.2.2 Transmission participant procedures at MCVideo call release

The MCVideo call release (whether it is initiated by the transmission participant or transmission control server) is a two-step procedure.

Step 1 The transmission participant stops sending transmission control and reception control messages and the MCVideo client stops sending and receiving RTP media packets.

Step 2 When the application and signalling plane has determined that the MCVideo call is released, the corresponding instance of the 'Transmission participant state transition diagram for basic transmission control operation' as specified in subclause 6.2.4 and the corresponding instance of the 'Transmission participant state transition diagram for basic reception control operation' as specified in subclause 6.2.5 are terminated and the transmission participant releases all the used resources.

The user plane can initiate the release step 1, but the application and signalling plane always initiates the release step 2.

6.2.3 Transmission participant procedures at MCVideo call modification

Editor's Note: It is FFS whether adding or removing media streams during an MCVideo call influences the transmission control procedures.

6.2.4 Transmission participant state transition diagram for basic transmission control operation

6.2.4.1 General

The transmission participant shall behave according to the state diagram and the state transitions specified in this subclause.

Figure 6.2.4.1-1 shows the state diagram for 'Transmission participant state transition diagram for basic transmission control operation'.

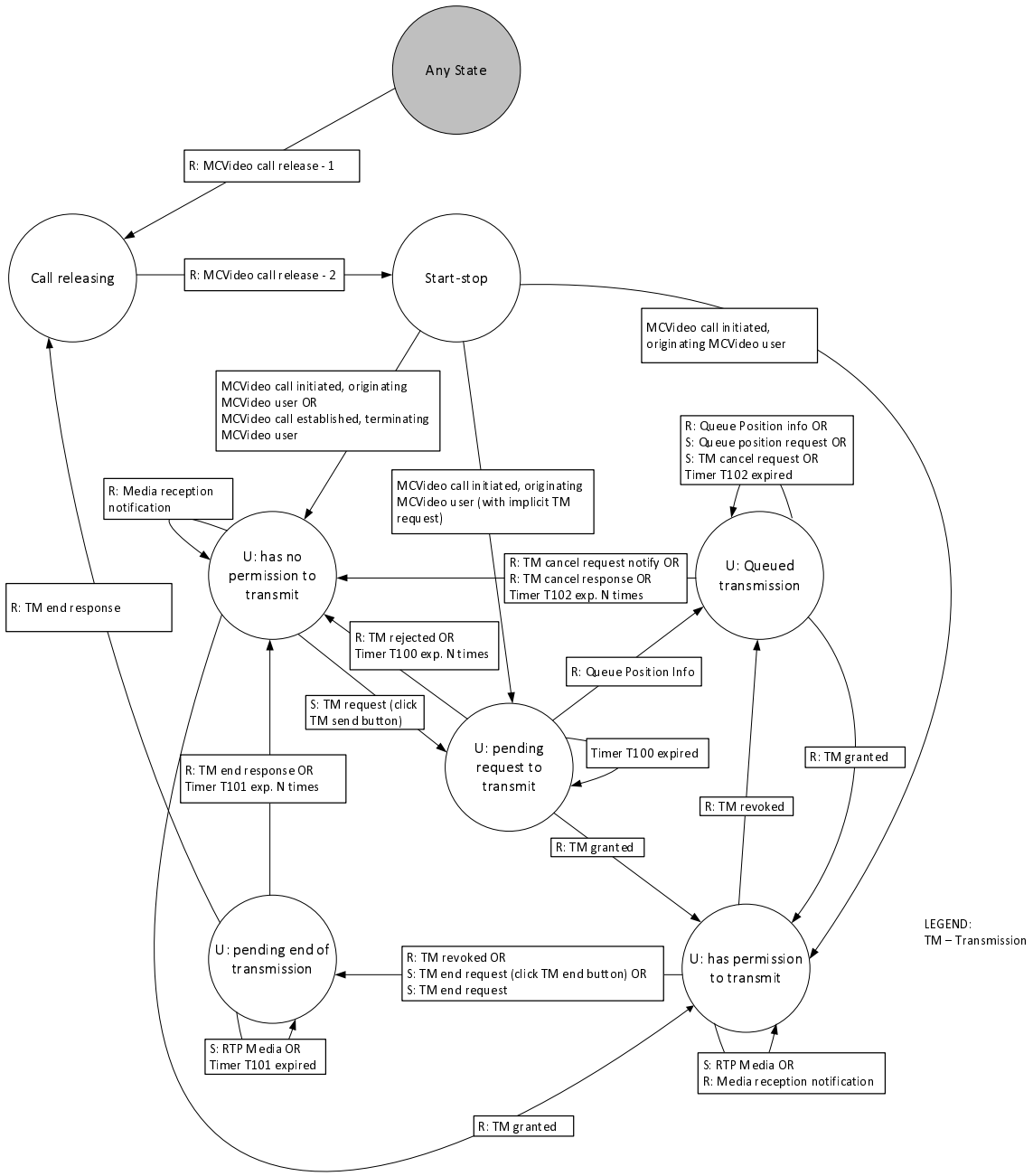


Figure 6.2.4.1-1: Transmission participant state transition diagram for basic transmission control operation.

State details are explained in the following subclauses.

If a transmission control message arrives in a state where there is no specific procedure specified for received transmission control message, the transmission participant shall discard the transmission control message and shall remain in the current state.

NOTE: A badly formatted transmission control message received in any state is ignored by the transmission participant and does not cause any change of the current state.

6.2.4.2 State: 'Start-stop'

6.2.4.2.1 General

When a new instance of the 'Transmission participant state transition diagram for basic transmission control operation' is initiated, before any transmission control related input is applied, the state machine is in 'Start-stop' state. Similarly when the call is released the state machine shall return to the 'Start-Stop state.

6.2.4.2.2 MCVideo call initiated, originating MCVideo user

When a call is initiated as described in 3GPP TS 24.281 [2], the transmission participant:

1. shall create an instance of the 'Transmission participant state transition diagram for basic transmission control operation';
2. if the originating transmission participant receives a transmission control message before it receives the SIP 200 (OK) response, shall store the transmission control message;

NOTE: The originating transmission participant might receive a transmission control message before the SIP 200 (OK) response when initiating, joining or rejoining a call because of processing delays of the SIP 200 (OK) response in the SIP core.

3. if the established MCVideo call is a chat group call and the SIP INVITE request is not an implicit Transmission request, shall enter the 'U: has no permission to transmit' state;
4. if for the established MCVideo call the SIP INVITE request is an implicit Transmission request:
   a. shall start timer T100 (Transmission Request) and initialise counter C100 (Transmission Request) to 1;
   b. shall enter the 'U: pending request to transmit' state; and
   c. if the transmission participant has received and stored a transmission control message before the reception of the SIP 200 (OK) response, shall act as if the transmission control message was received in the 'U: pending request to transmit' state after entering the 'U: pending request to transmit' state; and
5. if the established MCVideo call is a broadcast group call, shall enter the 'U: has permission to transmit' state.

When the transmission participant is rejoining an ongoing MCVideo call as described in 3GPP TS 24.281 [2] the transmission participant shall enter the 'U: has no permission to transmit' state.

6.2.4.2.3 MCVideo call established, terminating MCVideo user

When an MCVideo call is established, the terminating transmission participant:

1. shall create an instance of a 'Transmission participant state transition diagram for basic transmission control operation'; and
2. shall enter the 'U: has no permission to transmit' state.

NOTE: From a transmission participant perspective the MCVideo call is established when the application and signalling plane sends the SIP 200 (OK) response.

6.2.4.3 State: 'U: has no permission to transmit'

6.2.4.3.1 General

The transmission participant is in this state when the transmission participant is not sending RTP media packets or is not waiting for a transmission control message response.

In this state transmission control messages can be received.

6.2.4.3.2 Send Transmission Request message (Click Transmission send button)

Upon receiving an indication from the user to request permission to send media, the transmission participant:

1. if MCVideo client is sending RTP media to MCVideo server,

a. shall create an instance of the 'Transmission participant state transition diagram for basic transmission control operation'; and

b. shall enter the 'U: has no permission to transmit' state;

2. shall send the Transmission Request message toward the transmission control server; The Transmission Request message:

a. if a different priority than the normal priority is required, shall include the Transmission Priority field with the priority not higher than negotiated with the transmission control server as specified in subclause 14.3.3; and

b. if the Transmission request is a broadcast group call, system call, emergency call or an imminent peril call, shall include a Transmission Indicator field indicating the relevant call types;

3. shall start timer T100 (Transmission Request) and initialise counter C100 (Transmission Request) to 1; and

4. shall enter the 'U: pending request to transmit' state.

6.2.4.3.3 Receive Transmission Granted message (R: Transmission Granted)

Upon receiving a Transmission Granted message from the transmission control server due to remote Transmission request, the transmission participant:

1. if the first bit in the subtype of the Transmission Granted message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:

a. shall include the Message Type field set to '1' (Transmission Granted); and

b. shall include the Source field set to '0' (the transmission participant is the source);

2. shall store the SSRC of granted transmission participant received in the Transmission Granted message and use it in the RTP media packets until the transmission is relased;

3. shall provide Transmission granted notification to the user, if not already done; and

4. shall enter the 'U: has permission to transmit' state.

6.2.4.3.4 Void

6.2.4.4 State: 'U: pending request to transmit'

6.2.4.4.1 General

The transmission participant is in this state when the transmission participant is waiting for response to a Transmission Request message.

In this state transmission control messages can be received.

Timer T100 (Transmission Request) is running in this state.

6.2.4.4.2 Receive Transmission rejected message (R: Transmission rejected)

Upon receiving a Transmission rejected message, the transmission participant:

1. if the first bit in the subtype of the Transmission rejected message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:

a. shall include the Message Type field set to '3' (Transmission rejected); and

b. shall include the Source field set to '0' (the transmission participant is the source);

2. shall provide Transmission rejected notification to the user;

3. may display the Transmission rejected reason to the user using information in the Reject Cause field;
4. shall stop timer T100 (Transmission Request); and
5. shall enter the 'U: has no permission to transmit' state.

6.2.4.4.3 Timer T100 (Transmission request) expired

On expiry of timer T100 (Transmission Request) less than the upper limit of counter C100 (Transmission Request) times the timer is allowed to expire, the transmission participant:

1. shall send a Transmission Request message towards the transmission control server. The Transmission Request message:
   a. if a different priority than the normal priority is required, shall include the Transmission Priority field with the priority not higher than negotiated with the transmission control server as specified in subclause 14.3.3; and
   b. if the Transmission request is a broadcast group call, system call, emergency call or an imminent peril call, shall include a Transmission Indicator field indicating the relevant call types;
2. shall restart timer T100 (Transmission request) and increment counter C100 (Transmission Request) by 1; and
3. shall remain in the 'U: pending request to transmit' state.

6.2.4.4.4 Timer T100 (Transmission Request) expired N times

When timer T100 (Transmission Request) expires by the upper limit of counter C100 (Transmission Request), the transmission participant:

1. shall provide a Transmission request timeout notification to the user; and
2. shall enter the 'U: has no permission to transmit' state.

6.2.4.4.5 Receive Queue Position Info message (R: Queue Position Info)

Upon receiving a Queue Position Info message, the transmission participant:

1. if the first bit in the subtype of the Queue Position Info message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:
   a. shall include the Message Type field set to '9' (Queue Position Info); and
   b. shall include the Source field set to '0' (the transmission participant is the source);
2. shall provide Transmission request queued notification to the MCVideo user;
3. may provide the queue position and priority to the MCVideo user; and
4. shall enter the 'U: queued transmission' state.

6.2.4.4.6 Receive Transmission Granted message (R: Transmission Granted)

Upon receiving a Transmission Granted message from the transmission control server, the transmission participant:

1. if the first bit in the subtype of the Transmission Granted message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:
   a. shall include the Message Type field set to '1' (Transmission Granted); and
   b. shall include the Source field set to '0' (the transmission participant is the source);
2. shall store the SSRC of granted transmission participant received in the Transmission Granted message and use it in the RTP media packets until the transmission is relased;

3. shall provide Transmission granted notification to the user, if not already done;
4. shall stop timer T100 (Transmission Request); and
5. shall enter the 'U: has permission to transmit' state.

6.2.4.5 State: 'U: has permission to transmit'

6.2.4.5.1 General

The transmission participant is in this state when the MCVideo client is permitted to send RTP media.

In this state transmission control messages can be received.

In this state, the transmission participant can release permission to send RTP media at any time, even before sending any media.

The MCVideo client could have already buffered media when it enters this state.

NOTE: If the transmission participant was queued, the transmission participant requests a confirmation from the MCVideo user before start sending media. If confirmed, the media sending starts otherwise the permission to send media is released.

6.2.4.5.2 Send RTP media packets (S: RTP media)

Upon receiving indication from the MCVideo client that encoded video is received from the user or if encoded video is already buffered, the transmission participant:

1. shall request the MCVideo client to start to forward encoded video to the MCVideo server; and
2. shall remain in the 'U: has permission to transmit' state.

6.2.4.5.3 Send Transmission end request message (Click Transmission end button)

Upon receiving an indication from the user to end the permission to send RTP media, the transmission participant:

1. shall send a Transmission end request message towards the transmission control server. The Transmission end request message, if the session is a broadcast call and if the session was established as a normal call, shall include the Transmission Indicator with the A-bit set to '1' (Normal call);
2. shall start timer T101 (Transmission End Request) and initialize counter C101 (Transmission End Request) to 1; and
3. shall enter the 'U: pending end of transmission' state.

6.2.4.5.4 Void

6.2.4.5.5 Receive Transmission Revoked message (R: Transmission Revoked)

Upon receiving a Transmission Revoked message, the transmission participant:

1. shall inform the user that the permission to send RTP media is being revoked;
2. may give information to the user about the reason for revoking the permission to send media:
3. shall request the media in the MCVideo client discard any remaining buffered RTP media packets and to stop forwarding of encoded video to the MCVideo server; and
4. if the revoke reason is:
    a. terminate the RTP stream, shall enter the 'U: pending end of transmission' state:
        i. shall send a Transmission end request message towards the transmission control server; and
        ii. shall start timer T101 (Transmission End Request) and initialize counter C101 (Transmission End Request) to 1; or

b. queue the transmission, shall enter the 'U: queued transmission' state:

i. shall send a Queue Position Request message towards the transmission control server; and

ii. shall start timer T102 (Transmission Queue Position Request) and initialize counter C102 (Queue Position Request) to 1.

6.2.4.5.6 Receive Media reception notification message (R: Media Reception notification)

Upon receiving a Media Reception notification message, the transmission participant:

1. shall inform the user about the media reception by another user; and
2. shall remain in the 'U: has permission to transmit' state.

6.2.4.6 State: 'U: pending end of transmission'

6.2.4.6.1 General

The transmission participant is in this state when the transmission participant is waiting for response to a Transmission end request message.

Timer T101 (Transmission End Request) is running or can be running in this state.

6.2.4.6.2 Timer T101 (Transmission End Request) expired

On expiry of timer T101 (Transmission End Request) less than the configurable number of the upper limit of counter C101 (Transmission End Request) times, the transmission participant:

1. shall send a Transmission end request message towards the transmission control server;
2. shall restart timer T101 (Transmission End Request) and increment counter C101 (Transmission End Request) by 1; and
3. shall remain in state 'U: pending end of transmission'.

6.2.4.6.3 Timer T101 (Transmission End Request) expired N times

When timer T101 (Transmission End Request) expires by the upper limit of counter C101 (Transmission End Request) times, the transmission participant:

1. shall enter the 'U: has no permission to transmit' state.

6.2.4.6.4 Receive Transmission End Response message (R: Transmission end response)

Upon receiving a Transmission end response message, the transmission participant:

1. if the first bit in the subtype of the Transmission end response message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:

   a. shall include the Message Type field set to '5' (Transmission end response); and

   b. shall include the Source field set to '0' (the transmission participant is the source);

2. may provide a Transmission end notification to the MCVideo user;
3. if the Transmission Indicator field is included and the B-bit set to '1' (Broadcast group call), shall provide a notification to the user indicating the type of call;
4. shall stop timer T101 (Transmission End Request);
5. if the session is not a broadcast group call or if the A-bit in the Transmission Indicator field is set to '1' (Normal call), shall enter the 'U: has no permission to transmit' state; and
6. if the session was initiated as a broadcast group call:

a. shall indicate to the MCVideo client the media transmission is completed; and

b shall enter the 'Call releasing' state.

6.2.4.6.5 Void

6.2.4.7 In any state

6.2.4.7.1 General

This subclause describes the actions to be taken in all states defined for the basic state diagram with the exception of the 'Start-stop' state and the 'Call releasing' state.

In this state RTP media packets can be received due to previous reception control, RTP media packets can be sent due previous transmission control and transmission control and reception control messages can be received.

6.2.4.7.2 Receive MCVideo call release – step 1 (R: MCVideo call release - 1)

Upon receiving an MCVideo call release step 1 request from the application and signalling plane when the MCVideo call is going to be released or when the transmission participant is leaving the MCVideo call, the transmission participant:

1. shall stop sending transmission control messages;
2. shall request the MCVideo client to stop sending RTP media packets; and
3. shall enter the 'Call releasing' state.

6.2.4.8 State: 'Call releasing'

6.2.4.8.1 General

The transmission participant is in this state while waiting for the application and signalling plane to finalize the disconnection of an MCVideo call.

6.2.4.8.2 Receive MCVideo call release – step 2 (R: MCVideo call release - 2)

Upon receiving an MCVideo call release step 2 request from the application and signalling, the transmission participant:

1. shall release all resources including any running timers associated with the MCVideo call; and
2. shall enter the 'Start-stop' state and terminate the current instance of the 'Transmission control state machine – basic'.

6.2.4.9 State: 'U: queued transmission'

6.2.4.9.1 General

The transmission participant uses this state when a Transmission Media Request message has been queued by the transmission control server, and is awaiting the Transmission Granted message.

The timer T102 (Transmission Queue Position Request) can be running in this state.

6.2.4.9.2 Receive Queue Position Info message (R: Queue Position Info)

Upon receiving a Queue Position Info message, the transmission participant:

1. if the first bit in the subtype of the Queue Position Info message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:

   a. shall include the Message Type field set to '9' (Queue Position Info); and

   b. shall include the Source field set to '0' (the transmission participant is the source);

2. if the message indicates that the request has been queued or if a request for the queue position was sent, the transmission participant:

   a. may provide the queue position and priority (if available) to the MCVideo user;

3. shall stop the timer T102 (Transmission Queue Position Request), if running; and

4. shall remain in the 'U: queued transmission' state.

6.2.4.9.3 Send Queue Position Request message (S: Queue Position Request)

Upon receipt of an indication from the MCVideo client to request the queue position, the transmission participant:

1. shall send the Queue Position Request message;

2. shall start timer T102 (Transmission Queue Position Request) and initialize counter C102 (Queue Position Request) to 1; and

3. remain in the 'U: queued transmission" state.

6.2.4.9.4 Send Transmission cancel request message (S: Transmission Cancel Request)

Upon receipt of an indication from the MCVideo client to cancel the media transmit request from the queue, the transmission participant:

1. shall send the Transmission Cancel Request message to the transmission control server; and

2. remain in the 'U: queued transmission" state.

6.2.4.9.5 Recieve Transmission cancel response message (R: Transmission Cancel Response)

Upon receiving a Transmission cancel response message, the transmission participant:

1. if the first bit in the subtype of the Transmission cancel response message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:

   a. shall include the Message Type field set to 'X' (Transmission Cancel); and

   b. shall include the Source field set to '0' (the transmission participant is the source);

2. shall enter in the 'U: has no permission to transmit' state.

6.2.4.9.6 Receive Transmission cancel request notify message (R: Transmission Cancel Request Notify)

Upon receiving a Transmission cancel request notify message, the transmission participant:

1. if the first bit in the subtype of the Transmission cancel request notify message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:

   a. shall include the Message Type field set to 'X' (Transmission Cancel); and

   b. shall include the Source field set to '0' (the transmission participant is the source);

2. shall enter in the 'U: has no permission to transmit' state.

6.2.4.9.7 Timer T102 (Transmission Queue Position Request) expired

On expiry of timer T102 (Transmission Queue Position Request) less than the upper limit of C102 (Queue Position Request) times, the transmission participant:

1. shall send a Queue Position Request message towards the transmission control server;

2. shall restart timer T102 (Transmission Queue Position Request) and increment counter C102 (Queue Position Request) by 1; and

3. shall remain in the 'U: queued transmission'' state.

6.2.4.9.8 Timer T102 (Transmission Queue Position Request) expired N times

When timer T102 (Transmission Queue Position Request) expires by the upper limit of counter C102 (Queue Position Request) times, the transmission participant:

1. shall provide a queued timeout to the MCVideo client;

2. send the Transmission End Request message to the transmission control server;

3. shall start timer T101 (Transmission End Request) and increment counter C101 (Transmission End Request) by 1

4. shall enter the 'U: pending end of transmission' state.

6.2.4.9.9 Receive Transmission Granted message (R: Transmission Granted)

Upon receiving a Transmission Granted message from the transmission control server, the transmission participant:

1. if the first bit in the subtype of the Transmission Granted message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:

   a. shall include the Message Type field set to '1' (Transmission Granted); and

   b. shall include the Source field set to '0' (the transmission participant is the source);

2. shall store the SSRC of granted transmission participant received in the Transmission Granted message and use it in the RTP media packets until the transmission is relased;

3. shall provide Transmission granted notification to the user, if not already done;

4. shall stop timer T102 (Transmission Queue position request); and

5. shall enter the 'U: has permission to transmit' state.

6.2.5 Transmission participant state transition diagram for basic reception control operation

6.2.5.1 General

The transmission participant shall behave according to the state diagram and the state transitions specified in this subclause.

Figure 6.2.5.1-1 shows the state diagram for 'Transmission participant state transition diagram for basic reception control operation'.

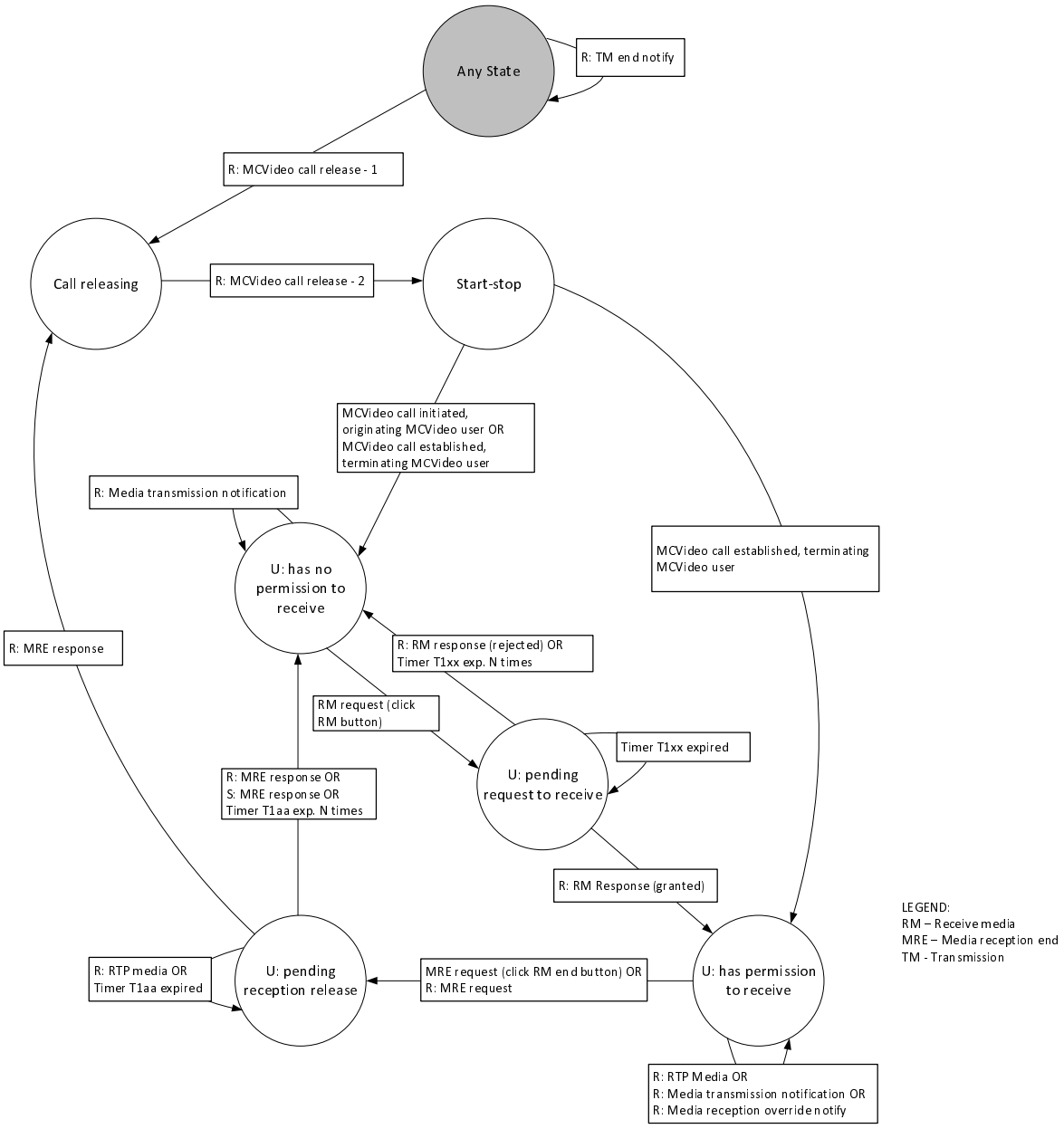


Figure 6.2.5.1-1: Transmission participant state transition diagram for basic reception control operation.

State details are explained in the following subclauses.

If an RTP media packet arrives in a state where there is no specific procedure specified for the RTP media packets or the received reception control message, the transmission participant shall discard the reception control message or the RTP media packet and shall remain in the current state.

NOTE: A badly formatted RTP packet or reception control message received in any state is ignored by the transmission participant and does not cause any change of the current state.

6.2.5.2 State: 'Start-stop'

6.2.5.2.1 General

When a new instance of the 'Transmission participant state transition diagram for basic reception control operation' is initiated, before any reception control related input is applied, the state machine is in 'Start-stop' state. Similarly when the call is released the state machine shall return to the 'Start-Stop state.

6.2.5.2.2 MCVideo call established, terminating MCVideo user

When an MCVideo call is established, the terminating transmission participant:

1. shall create an instance of a 'Transmission participant state transition diagram for basic reception control operation'; and
2. shall enter the 'U: has no permission to receive' state.

NOTE: From a transmission participant perspective the MCVideo call is established when the application and signalling plane sends the SIP 200 (OK) response.

6.2.5.3 State: 'U: has no permission to receive'

6.2.5.3.1 General

The transmission participant is in this state when the transmission participant is not receiving RTP media packets or is not waiting for a reception control message response.

In this state RTP media packets can be received due to previous reception control, RTP media packets can be sent due previous transmission control and transmission control and reception control messages can be received.

6.2.5.3.2 Receive Media transmission notification message (R: Media Transmission Notification)

Upon receiving the media transmission notification from the transmission control server, the transmission participant:

1. if the first bit in the subtype of the media transmission notification message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:
   a. shall include the Message Type field set to 'X' (media transmission notification); and
   b. shall include the Source field set to '0' (the transmission participant is the source);
2. shall provide media transmission notification to the user;
3. shall store the User ID and the SSRC of the user transmitting the media;
4. may display the details of the incoming media to the user; and
5. shall remain in the 'U: has no permission to receive' state.

6.2.5.3.3 Send Receive Media Request message (Click video receive button)

Upon receiving an indication from the user to request permission to receive media, the transmission participant:

1. if MCVideo client is receiving RTP media from MCVideo server,
   a. shall create an instance of the 'Transmission participant state transition diagram for basic reception control operation'; and
   b. shall enter the 'U: has no permission to receive' state;
2. shall send the Receive Media Request message toward the transmission control server; The Receive Media Request message:
   a. if a different priority than the normal priority is required, shall include the Reception Priority field with the priority not higher than negotiated with the transmission control server as specified in subclause 14.3.3; and
   b. if the receive media request is a broadcast group call, system call, emergency call or an imminent peril call, shall include a Transmission Indicator field indicating the relevant call types;
3. shall start timer T103 (Receive Media Request) and initialise counter C103 (Receive Media Request) to 1; and
4. shall enter the 'U: pending request to receive state.

6.2.5.3.4 Void

6.2.5.4 State: 'U: pending request to receive'

6.2.5.4.1 General

The transmission participant is in this state when the transmission participant is waiting for response to a Receive Media Request message.

In this state RTP media packets can be received due to previous reception control, RTP media packets can be sent due previous transmission control and transmission control and reception control messages can be received.

Timer T103 (Receive Media Request) is running in this state.

6.2.5.4.2 Reception of Receive media response (rejected) message (R: RM response (rejected))

Upon receiving a rejected response for Receive media request message, the transmission participant:

1. if the first bit in the subtype of the Receive media response message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:

   a. shall include the Message Type field set to '3' (Receive media rejected); and

   b. shall include the Source field set to '0' (the transmission participant is the source);

2. shall provide receive media rejected notification to the user;

3. may display the receive media rejected reason to the user using information in the Reject Cause field;

4. shall stop timer T103 (Receive Media Request); and

5. shall enter the 'U: has no permission to receive' state.

6.2.5.4.3 Timer T103 (Receive media request) expired

On expiry of timer T103 (Receive Media Request) less than the upper limit of counter C103 (Receive Media Request) times the timer is allowed to expire, the transmission participant:

1. shall send a Receive Media Request message towards the transmission control server. The Receive Media Request message:

   a. if a different priority than the normal priority is required, shall include the Reception Priority field with the priority not higher than negotiated with the transmission control server as specified in subclause 14.3.3; and

   b. if the receive media request is a broadcast group call, system call, emergency call or an imminent peril call, shall include a Transmission Indicator field indicating the relevant call types;

2. shall restart timer T103 (Receive media request) and increment counter C103 (Receive Media Request) by 1; and

3. shall remain in the 'U: pending request to receive' state.

6.2.5.4.4 Timer T103 (Receive Media Request) expired N times

When timer T103 (Receive Media Request) expires by the upper limit of counter C103 (Receive Media Request), the transmission participant:

1. shall provide a receive media request timeout notification to the user; and

2. shall enter the 'U: has no permission to receive' state.

6.2.5.4.5 Reception of Receive media response (granted) message (R: RM response (granted))

Upon receiving a granted response for Receive media request message, the transmission participant:

1. if the first bit in the subtype of the Receive media response message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:

   a. shall include the Message Type field set to 'y' (Receive media granted); and

   b. shall include the Source field set to '0' (the transmission participant is the source);

2. shall provide receive media success notification to the user;

3. if the Receive Media Indicator field is included and the B-bit is set to '1' (Broadcast group call), shall provide a notification to the user indicating the type of call;

4. shall stop timer T103 (Receive Media Request); and

5. shall enter the 'U: has permission to receive' state.

6.2.5.5 State: 'U: has permission to receive'

6.2.5.5.1 General

The transmission participant is in this state when the MCVideo client is permitted to receive RTP media.

In this state, the transmission participant can end the reception of RTP media at any time, even before actually receiving any media.

6.2.5.5.2 Receive RTP media packets (R: RTP media)

Upon receiving indication from the transmission control server that encoded video is received from the source, the transmission participant:

NOTE: RTP media packets can be received from multiple sources by the transmission control server. The MCVideo client can differentiate between the different sources using the SSRC in the received RTP media packets. How the media mixer in the MCVideo client mixes the different RTP media stream sources is out of scope of the present document.

1. shall receive the encoded video from the MCVideo server; and

2. shall remain in the 'U: has permission to receive' state.

6.2.5.5.3 Media reception end request message (Click video reception end button)

Upon receiving an indication from the user to end the RTP media reception, the transmission participant:

1. shall send a Media reception end request message towards the transmission control server The Media reception end request message:

   a. if the session is a broadcast call and if the session was established as a normal call, shall include the Transmission Indicator with the A-bit set to '1' (Normal call); and

   b. shall include the SSRC of user transmitting the media in the Media reception end request message;

2. shall remove the indication that the participant is overriding without revoke if this indication is stored;

3. shall remove the indication that the participant is overridden without revoke if this indication is stored;

4. shall start timer T104 (Receive Media Release) and initialize counter C104 (Receive Media Release) to 1; and

6. shall enter the 'U: pending reception release' state.

6.2.5.5.4 Receive Media reception override notify message (R: Media Rx override notify)

Upon receiving a Media reception override notify message, the transmission participant:

1. shall inform the user that the permission to receive a RTP media is being overriden;

2. may give information to the user about the reason for overriding the received RTP media;

3. shall send a Media reception end request message towards the transmission control server;
4. shall start timer T104 (Receive Media Release) and initialize counter C104 (Receive Media Release) to 1; and
5. shall enter the 'U: pending reception release' state.

6.2.5.5.5 Receive Media reception end request message (R: MRE request)

Upon receiving a Media reception end request message, the transmission participant:

1. if the first bit in the subtype of the Media reception end request message set to "1" (Acknowledgment is required) as described in subclause 8.3.2, shall send a Reception control Ack message. The Reception control Ack message:
   a. shall include the Message Type field set to '2' (Media reception end request);
   b. shall include the Source field set to '0' (the transmission participant is the source); and
   c. shall include the Message Name field set to MCV2.
2. shall inform the user that the receiving RTP media is being ended;
3. may give information to the user about the reason for ending the received RTP media;
4. shall request the MCVideo client to discard any remaining buffered RTP media packets and stop displaying to user;
5. shall send a Media reception end response message towards the transmission control server;
6. may provide a Media reception end notification to the MCVideo user;
7. if the Receive Media Indicator field is included and the B-bit set to '1' (Broadcast group call), shall provide a notification to the user indicating the type of call;
8. if the session is not a broadcast group call or if the A-bit in the Receive Media Indicator field is set to '1' (Normal call), shall enter the 'U: has no permission to receive' state; and
9. if the session was initiated as a broadcast group call:
   a. shall indicate to the MCVideo client the media reception is completed; and
   b. shall enter the 'Call releasing' state.

6.2.5.5.6 Void

6.2.5.6 State: 'U: pending reception release'

6.2.5.6.1 General

The transmission participant is in this state when the transmission participant is waiting for response to a MRE request message.

Timer T104 (Receive Media Release) is running or can be running in this state.

6.2.5.6.2 Timer T104 (Receive Media Release) expired

On expiry of timer T104 (Receive Media Release) less than the configurable number of the upper limit of counter C104 (Receive Media Release) times, the transmission participant:

1. shall send a MRE request message towards the transmission control server;
2. shall restart timer T104 (Receive Media Release) and increment counter C104 (Receive Media Release) by 1; and
3. shall remain in state 'U: pending reception release'.

6.2.5.6.3 Timer T104 (Receive media release) expired N times

When timer T104 (Receive media Release) expires by the upper limit of counter C104 (Receive Media Release) times, the transmission participant:

1. shall enter the 'U: has no permission to receive' state.

6.2.5.6.4 Receive Media Reception End Response message (R: MRE response)

Upon receiving a MRE response message, the transmission participant:

1. if the first bit in the subtype of the MRE response message set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:
   a. shall include the Message Type field set to '5' (Media reception end response); and
   b. shall include the Source field set to '0' (the transmission participant is the source);
2. may provide a Media reception end notification to the MCVideo user;
3. if the Receive Media Indicator field is included and the B-bit set to '1' (Broadcast group call), shall provide a notification to the user indicating the type of call;
4. shall stop timer T104 (Receive Media Release);
5. if the session is not a broadcast group call or if the A-bit in the Receive Media Indicator field is set to '1' (Normal call), shall enter the 'U: has no permission to receive state'; and
6. if the session was initiated as a broadcast group call:
   a. shall indicate to the MCVideo client the media reception is completed; and
   b shall enter the 'Call releasing' state.

6.2.5.6.5 Void

6.2.5.7 In any state

6.2.5.7.1 General

This subclause describes the actions to be taken in all states defined for the basic state diagram with the exception of the 'Start-stop' state and the 'Call releasing' state.

6.2.5.7.2 Receive MCVideo call release – step 1 (R: MCVideo call release - 1)

Upon receiving an MCVideo call release step 1 request from the application and signalling plane when the MCVideo call is going to be released or when the transmission participant is leaving the MCVideo call, the transmission participant:

1. shall stop receiving reception control messages;
2. shall request the MCVideo client to stop receiving RTP media packets; and
3. shall enter the 'Call releasing' state.

6.2.5.7.3 Receive Transmission end notify message (R: Transmission end notify)

Upon receiving a Transmission end notify message, the transmission participant:

1. shall inform the user about the media transmission ended by another user;
2. shall remain in the same state.

6.2.5.7.4 Receive Media transmission notification message (R: Media transmission notification)

Upon receiving a Media transmission notification message, the transmission participant:

1. shall inform the user about the media transmission by another user; and
2. shall remain in the same state.

6.3 Transmission control server procedures

6.3.1 General

The transmission control server arbitration logic in the transmission control server shall support the procedures in subclauses 6.3.2 and 6.3.3 and shall behave according to the transmission control server state transition diagram for 'general transmission control operation' in subclause 6.3.4.

The transmission control interface towards the MCVideo client in the transmission control server shall behave according to the transmission control server state transition diagram for 'basic transmission control operation towards the transmission participant' as specified in subclause 6.3.5.

The reception control arbitration logic in the transmission control server shall support the procedures in subclauses 6.3.2 and 6.3.3 and shall behave according to the reception control server state transition diagram for 'general reception control operation' in subclause 6.3.6.

The transmission control interface towards the MCVideo client in the transmission control server shall behave according to the transmission control server state transition diagram for 'basic reception control operation towards the transmission participant' as specified in subclause 6.3.7.

6.3.2 Controlling MCVideo function procedures at MCVideo call initialization

6.3.2.1 General

The subclause 6.3.2.2 describes the initial procedures when a new SIP session is establishing a group session or a private session with transmission control.

6.3.2.2 Initial procedures

When an MCVideo call is established a new instance of the transmission control server state machine for 'general transmission control operation' is created.

For each MCVideo client added to the MCVideo call, a new instance of the transmission control server state machine for 'basic transmission control operation towards the transmission participant' is added.

If the optional "mc_queueing" feature is supported and has been negotiated as specified in clause 14, the transmission control server could queue the implicit transmission control request for the media-transmission control entity.

The original initial SIP INVITE request or SIP REFER request to establish an MCVideo chat group call or to rejoin an ongoing MCVideo call is not handled as an implicit transmission control request message by the transmission control server unless explicitly stated in the SIP INVITE request or in the SIP REFER request.

The permission to send media to the inviting MCVideo client due to implicit transmission control request is applicable to both confirmed indication and unconfirmed indication.

When the first unconfirmed indication is received from the invited participating MCVideo function (see 3GPP TS 24.281 [2]) the transmission control server optionally can give an early indication to send RTP media packets, to the inviting MCVideo client.

If an early indication to send RTP media packets is given to the inviting MCVideo client, the transmission participant is granted the permission to send media and the MCVideo server buffers RTP media packets received from the MCVideo client at least until the first invited MCVideo client accepts the invitation or until the RTP media packet buffer exceeds it maximum limit to store RTP media packets.

If the MCVideo server does not support or does not allow media buffering then when an early indication to send RTP media packets is not given to the inviting MCVideo client, the transmission participant is granted the permission to send media when the first invited MCVideo client accepts the media.

Before the transmission control server sends the first transmission control message in the MCVideo call, the transmission control server has to assign itself a SSRC identifier to be included in media transmission control messages and quality feedback messages if the MCVideo server is supporting that option. A suitable algorithm to generate the SSRC identifier is described in IETF RFC 3550 [3].

The transmission participant and the transmission control server can negotiate the maximum priority level that the transmission participant is permitted to request. The transmission control server can pre-empt the current sender based on the negotiated maximum priority level that the transmission participant is permitted to request and the priority level included in the Transmission Media Request message.

NOTE: The maximum priority level that a transmission participant can use is negotiated as specified in subclause 14.3.3 and is based on group configuration data retrieved by the controlling MCVideo function from the group management server as described in 3GPP TS 24.481 [12] and service configuration data retrieved by the controlling MCVideo function from the configuration management server as described in 3GPP TS 24.484 [13].

The transmission participant and the transmission control server can negotiate queueing of Transmission requests using the "mc_queueing" fmtp attribute as described in clause 14. If queueing is supported and negotiated, the transmission control server queues the transmission control request if a Transmission Media Request message is received when another transmission participant has the transmission and the priority of the current speaker is the same or higher.

6.3.3 MCVideo transmission control procedures at MCVideo call release

When an MCVideo client leaves an MCVideo call and the MCVideo call remains ongoing with the other MCVideo clients, the transmission control server follows a two-step procedure.

Step 1 The MCVideo server stops sending transmission control messages and RTP media packets to the MCVideo client leaving the MCVideo call and .the MCVideo server discards transmission control messages and RTP media packets received from the MCVideo client leaving the MCVideo call.

Step 2 When the application and signalling plane has determined that the MCVideo call with this transmission participant has been released, the corresponding instance of the transmission control server state machine for 'basic transmission control operation towards the transmission participant' is released.

When an MCVideo call is released, the transmission control server follows a two-step procedure.

Step 1 The MCVideo server stops sending transmission control messages and RTP media packets to all transmission participants in the MCVideo call.

Step 2 When the application and signalling plane has determined that the MCVideo call has been released, the corresponding instance of the transmission control server state machine for 'general transmission control operation' are also terminated, along with any 'basic transmission control operation towards the transmission participant' state machines for the transmission participants of this call.

The transmission control server state machine for general transmission control operation initiates the MCVideo call release depending on the release policy specified in 3GPP TS 24.281 [2].

6.3.4 Transmission control server state transition diagram for general transmission control operation

6.3.4.1 General

The transmission control server arbitration logic in the transmission control server shall behave according to the state diagram and state transitions specified in this subclause.

Figure 6.3.4.1-1 shows the general transmission control operation states (G states) and the state transition diagram.

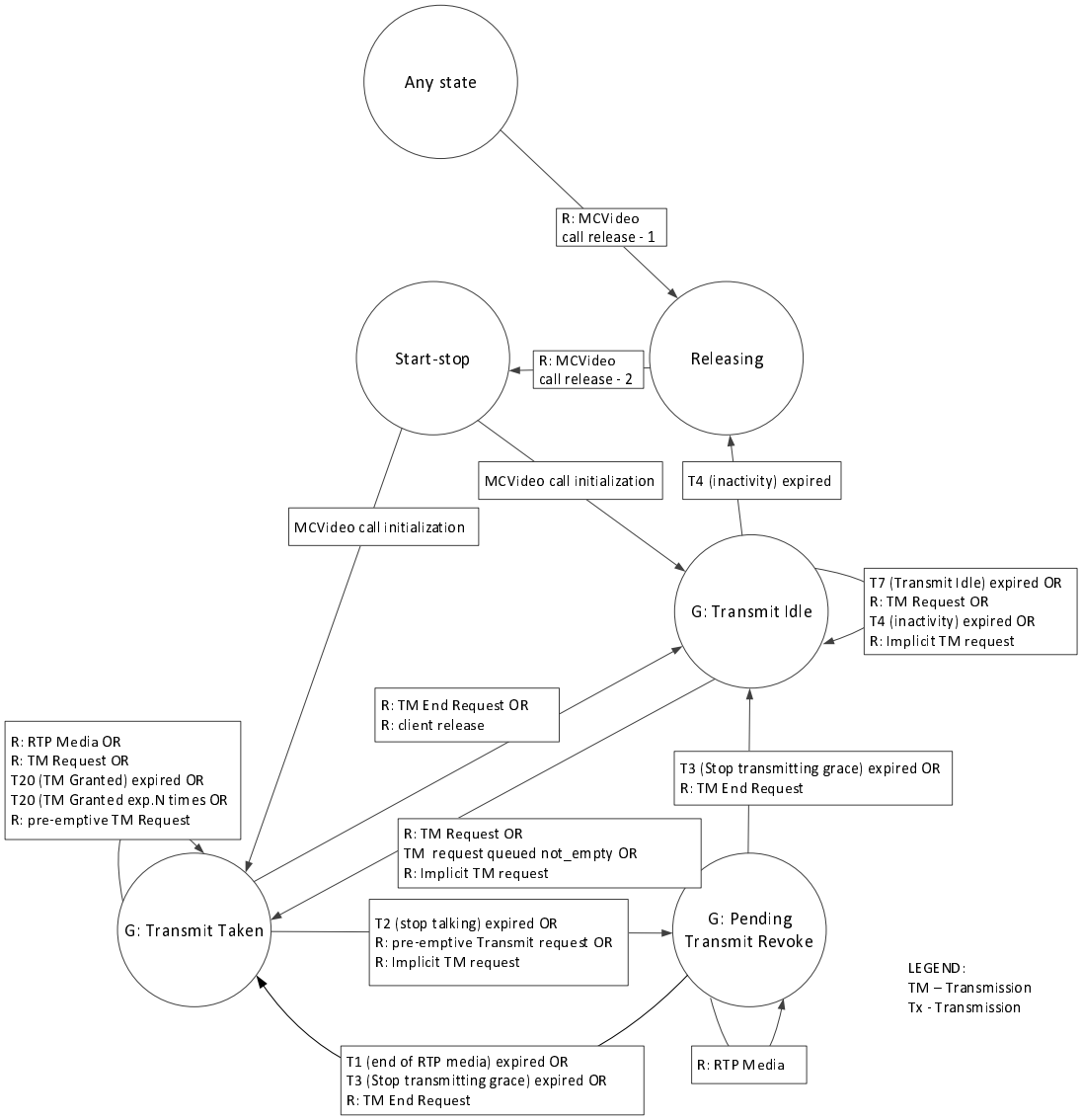


Figure 6.3.4.1-1: Transmission control server state transition diagram for 'general transmission control operation'

The transmission control arbitration logic in the transmission control server shall keep one instance of the 'general transmission control operation' state machine per MCVideo call.

If transmission control messages or RTP media packets arrives in a state where there is no procedure specified in the following subclauses the transmission control arbitration logic in the transmission control server:

1. shall discard the transmission control message;
2. shall request the media distributor in the MCVideo server to discard any received RTP media packet; and
3. shall remain in the current state.

State details are explained in the following subclauses.

6.3.4.2 State: 'Start-stop'

6.3.4.2.1 General

When a new instance of the 'general transmission control operation' state machine is initiated, before any transmission control related input is applied, the state machine is in 'Start-stop' state. Similarly when the call is released the state machine shall return to the 'Start-stop' state or the related MCVideo call is released.

6.3.4.2.2 MCVideo call initialization

When an MCVideo call is initiated as specified in 3GPP TS 24.281 [2] and

1. if a confirmed indication is required and at least one invited MCVideo client has accepted the invitation;
2. if a confirmed indication is not required; or

then the transmission control arbitration logic in the transmission control server:

1. shall create an instance of the 'general transmission control operation' state machine;
2. shall wait for the 'basic transmission control operation towards the transmission participant' to be initialized before continuing the following steps;
3. when the 'basic transmission control operation towards the transmission participant' state machine is initialized and the initialised session is not a temporary group session:
   a. if the "mc_granted" fmtp attribute is not negotiated as specified in clause 14:
      i. if the transmission control server is granting an implicit Transmission request at MCVideo call establishment, shall act as if a Transmission Media Request message was received and perform the actions specified in subclause 6.3.4.3.3; or
      ii. if the transmission control server is not granting an implicit Transmission request at MCVideo call establishment, shall enter the 'G: Transmit Idle' state as specified in subclause 6.3.4.3.2; or
   b. if the "mc_granted" fmtp attribute is negotiated as specified in clause 14, shall enter the 'G: Transmit Taken' state as specified in subclause 6.3.4.4.2.

6.3.4.3 State: 'G: Transmit Idle'

6.3.4.3.1 General

The transmission control arbitration logic in the transmission control server is in this state when no MCVideo user currently has permission to send media.

Timer T1 (Inactivity) and timer T2 (Transmit Idle) can be running when the transmission control arbitration logic in the transmission control server is in this state.

6.3.4.3.2 Enter the 'G: Transmit Idle' state

When entering this state from any state except the 'Start-stop' state and if no MCVideo client negotiated support of queueing Transmission requests as described in clause 14, the transmission control arbitration logic in the transmission control server:

1. if the active Transmission request queue is empty the transmission control server:
   a. shall send Transmission Idle message to all transmission participants. The Transmission Idle message:
      i. shall include a Message Sequence Number field with a Message Sequence Number value increased with 1; and
      ii. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications;
   b. shall start timer T2 (Transmit Idle) and initialise counter C2 (Transmit Idle) to 1;

c. shall start timer T1 (Inactivity);

d. shall set the general state to the 'G: Transmit Idle' state; and

e. shall initialise counter Cx (Simultaneous transmission video) to 0.

2. if the active Transmission request queue is not empty the transmission control server:

a. shall select a queued Transmission request from the top of the active Transmission request queue;

b. shall remove that queued Transmission request from the active Transmission request queue; and

c. shall enter the 'G: Transmit Taken' state as specified in the subclause 6.3.4.4.2 with respect to that transmission participant.

6.3.4.3.3 Receive Transmission Media Request message (R: Transmission Media Request)

Upon receiving a Transmission request message (from a transmission participant that is permitted to make a Transmission request) the transmission control arbitration logic in the transmission control server:

1. shall reject the request if one of the following conditions is fulfilled:

a. if there is only one MCVideo client in the MCVideo call; and

b. <on-network-recvonly> element is present in the <entry> element as specified 3GPP TS 24.481 [12] for the associated transmission participant;

2. if the Transmission request is rejected the transmission control server:

a. shall send the Transmission Reject message. The Transmission Reject message:

i. shall include in the Reject Cause field the <Reject Cause> value:

A. cause #3 (Only one participant), if there is only one MCVideo client in the MCVideo call; or

B. cause #5 (Receive only), if the <on-network-recvonly> element is present in the <entry> element as specified in 3GPP TS 24.481 [12] for the associated transmission participant;

ii. may include an additional text string explaining the reason for rejecting the Transmission request in the <Reject Phrase> value of the Reject Cause field; and

b. shall remain in the 'G: Transmit Idle' state; and

3. if the Transmission request is granted the transmission control server:

a. shall stop timer T1 (Inactivity);

b. shall stop timer T2 (Transmit Idle);

c. shall store the SSRC of transmission participant granted the permission to send media until the transmission is released associated to that Transmission request;

d. shall enter the 'G: Transmit Taken' state as specified in the subclause 6.3.4.4.2.

6.3.4.3.4 Timer T2 (Transmit Idle) expired

On expiry of timer T2 (Transmit Idle) the transmission control arbitration logic in the transmission control server:

1. shall restart timer T2 (Transmit Idle) and increment counter C2 (Transmit Idle) by 1 if counter C2 (Transmit Idle) has not reached its upper limit;

2. shall send a Transmission Idle message to all transmission participants in the MCVideo call if counter C2 (Transmit Idle) has not reached its upper limit. The Transmission Idle message:

a. shall include a Message Sequence Number field with a <Message Sequence Number> value increased with 1; and

3. shall remain in the 'G: Transmit Idle' state.

6.3.4.3.5 Timer T1 (Inactivity) expired

On expiry of timer T1 (Inactivity) the transmission control arbitration logic in the transmission control server based on a configurable service provider policy either:

1. shall indicate to the application and signalling plane that timer T1 (Inactivity) has expired;
2. if the application and signalling planes initiates MCVideo call release, shall enter the 'Releasing' state; and
3. if the application and signalling planes do not initiate MCVideo call release:
   a. should restart the T1 (Inactivity) timer; and
   b. shall remain in the 'G: Transmit Idle' state.

6.3.4.3.6 Receive an implicit Transmission request (R: Implicit Transmission request)

Upon receiving an implicit Transmission request due to an upgrade to an emergency group call or due to an upgrade to imminent peril call, the transmission control arbitration logic in the transmission control server:

1. shall reject the request if there is only one MCVideo client in the MCVideo call;
2. if the Transmission request is rejected the transmission control server:
   a. shall send the Transmission Reject message. The Transmission Reject message:
      i. shall include in the Reject Cause field the <Reject Cause> value cause #3 (Only one participant); and
      ii. may include in the Reject Cause field an additional text string explaining the reason for rejecting the Transmission request in the <Reject Phrase> value; and
   b. shall remain in the 'G: Transmit Idle' state; and
3. if the Transmission request is granted the transmission control server:
   a. shall stop the timer T1 (Inactivity);
   b. shall stop the timer T2 (Transmit Idle);
   c. shall store the SSRC of transmission participant granted the permission to send media until the transmission is released associated to that Transmission request; and
   d. shall enter the 'G: Transmit Taken' state as specified in the subclause 6.3.4.4.2.

6.3.4.4 State: 'G: Transmit Taken'

6.3.4.4.1 General

The transmission control arbitration logic in the transmission control server uses this state when it has permitted at least one of the MCVideo clients in the MCVideo call to send media.

Timer T4 (Transmission Grant) is running to guarantee reliable delivery of the Transmission Grant message, if the granted Transmission request was queued.

6.3.4.4.2 Enter the 'G: Transmit Taken' state

When entering this state the transmission control arbitration logic in the transmission control server:

1. shall send a Transmission Grant message to the requesting transmission participant. The Transmission Grant message:
   a. shall include the granted priority in the Transmission priority field;
   b. shall increment counter Cx (Simultaneous transmission video) by 1 if counter Cx (Simultaneous transmission video) has not reached its upper limit;

c. if a group call is a broadcast group call, system call, emergency call, an imminent peril call or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

d. shall include the SSRC of the granted transmission participant to be used by the MCVideo user transmitting the media;

2. shall start timer T4 (Transmission Granted) if the Transmission request was queued and initialise the counter C4 (Transmission Grant) to 1;

3. shall send Media Transmission notify message to the reception control arbitration logic. The Media Transmission notification message:

a. shall include the granted MCVideo user's MCVideo ID in the User ID field, if privacy is not requested;

b. shall include the granted MCVideo user's SSRC in the SSRC of transmitter field;

c. shall include a Message Sequence Number field with a Message Sequence Number value increased with 1;

d. if the session is a broadcast group call, shall include the Permission to Request the Transmission field set to '0';

e. if the session is not a broadcast group call, may include the Permission to Request the Transmission field set to '1';

f. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

g. shall initiate the 'general reception control operation' state machine;and

4. shall enter the 'G: Transmit Taken' state.

6.3.4.4.5 Receive RTP media packets (R: RTP media)

Upon receiving an indication from the media distributor in the MCVideo server that RTP media packets are received from the permitted MCVideo client, the transmission control arbitration logic in the transmission control server:

1. shall stop timer T4 (Transmission Grant), if running;

2. shall instruct the media distributor to forward the RTP media packets to MCVideo clients according to local policy and reception control machine state; and

3. shall remain in the 'G: Transmit Taken' state.

6.3.4.4.6 Receive Transmission End Request message (R: Transmission End Request)

Upon receiving a Transmission End Request message the transmission control arbitration logic in the transmission control server:

1. shall decrement counter Cx (Simultaneous transmission video) by 1 if counter Cx (Simultaneous transmission video) has not reached its lower limit;

2. shall request the media distributor in the MCVideo server to stop forwarding RTP media packets for the requesting participant;

3. shall stop timer T4 (Transmission grant), if running;

4. shall send a Transmission End Response message; and

5. if Cx (Simultaneous transmission video) has reached it lower limit, shall enter the 'G: Transmit Idle' state as specified in the subclause 6.3.4.3.2.

6.3.4.4.7A Receive Transmission Media Request message without pre-emptive priority (R: Transmission Media Request)

Upon receiving a Transmission Media Request message the transmission control arbitration logic in the transmission control server:

1. shall reject the request if one of the following conditions is fulfilled:

   a. if the counter Cx (Simultaneous transmission video) has reached its upper limit and did not negotiate queueing; and

   b. <on-network-recvonly> element is present in the <entry> element as specified 3GPP TS 24.481 [12] for the associated transmission participant;

2. if the request is rejected the transmission control server:

   a. shall send the Transmission Media Deny message. The Transmission Media Deny message:

      i. shall include in the Reject Cause field the <Reject Cause> value - cause #5 (Receive only), if the <on-network-recvonly> element is present in the <entry> element as specified in 3GPP TS 24.481 [12] for the associated transmission participant;

      ii. may include an additional text string explaining the reason for rejecting the transmission request in the <Reject Phrase> value of the Reject Cause field; and

   b. shall remain in the 'G: Transmission Taken' state.

3. if counter Cx (Simultaneous transmission video) has not reached its upper limit:

   a. if the Transmission Media request is granted the transmission control server:

      i. shall perform the actions specified in the subclause 6.3.4.4.2;

6.3.4.4.7 Receive Transmission Media Request message with pre-emptive priority (R: pre-emptive Transmission Media Request)

On receipt of a Transmission request message with effective priority indicating pre-emptive priority, the transmission control arbitration logic in the transmission control server:

1. if counter Cx (Simultaneous transmission video) has not reached its upper limit:

   i. shall perform the actions specified in the subclause 6.3.4.4.2;

2. if the counter Cx (Simultaneous transmission video) has not reached its upper limit, and if the effective priority of the transmission participants with permission to send media is not the pre-emptive priority, based on local policy:

   a. select one of the transmission participants with permission to send media without the pre-emptive priority revoke the current speaker;

   b. shall stop timer T4 (Transmission Grant), if running;

   c. shall include a Reject Cause field with the <Reject Cause> value set to #4 (Media Transmission pre-empted) in the Transmission Revoke message sent in subclause 6.3.4.5.2;

   d. shall enter the 'G: pending Transmission Revoke' state as specified in the subclause 6.3.4.5.2;

   e. shall insert the transmission participant into the active Transmission request queue to the position in front of all queued requests, if not inserted yet or update the position of the transmission participant in the active Transmission request queue to the position in front of all other queued requests, if already inserted; and

   f. shall send a Queue Position Info message to the requesting transmission participant, if negotiated support of queueing of Transmission requests as specified in clause 14. The Queue Position Info message:

      i. include the queue position and transmission priority in the Queue Info field.

6.3.4.4.8 Receive Transmission request message from permitted transmission participant (R: Transmission Media Request)

Upon receiving a Transmission request message from the transmission participant that has been granted permission to send media, the transmission control arbitration logic in the transmission control server:

1. shall send a Transmission Grant message to the previously granted transmission participant. The Transmission Grant message:

   a. shall include the granted priority in the Transmission priority field; and

2. shall remain in the 'G: Transmit Taken' state.

6.3.4.4.9 Timer T4 (Transmission Grant) expired

On expiry of timer T4 (Transmission Grant), the transmission control arbitration logic in the transmission control server:

1. shall send a Transmission Grant message to the granted transmission participant if counter C4 (Transmission Grant) has not reached its upper limit: The Transmission Grant message:

   a. shall include the granted priority in the Transmission priority field; and

   b. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications;

2. shall start timer T4 (Transmission Grant) and increment counter C4 (Transmission Grant) by 1 if counter C4 (Transmission Grant) has not reached its upper limit; and

3. shall remain in the 'G: Transmit Taken' state.

6.3.4.4.10 Timer T4 (Transmission Grant) expired N times

When timer T4 (Transmission Grant) expires and counter C4 (Transmission Grant) reaches its upper limit, the transmission control arbitration logic in the transmission control server:

1. shall remain in the 'G: Transmit Taken' state.

6.3.4.4.11 Permitted MCVideo client release (R: client release)

If the transmission control server receives an indication from the transmission control interface towards the MCVideo client that the MCVideo client has started to disconnect from the MCVideo call, the transmission control arbitration logic in the transmission control server:

1. if the counter Cx (Simultaneous transmission video) equals 1, shall enter the 'G: Transmit Idle' state as specified in the subclause 6.3.4.3.2.

6.3.4.4.12 Receive an implicit Transmission request (R: Implicit Transmission request)

Upon receiving an implicit Transmission request due to an upgrade to an emergency group call or due to an upgrade to imminent peril call, the transmission control arbitration logic in the transmission control server:

1. if counter Cx (Simultaneous transmission video) has not reached its upper limit:

   a. shall perform the actions specified in the subclause 6.3.4.4.2;

2. if counter Cx (Simultaneous transmission video) has reached its upper limit:

   a. select one of the transmission participants with permission to send media without the pre-emptive priority or low effective priority;

   b. shall stop timer T4 (Transmission Grant), if running;

   c. shall set the Reject Cause field in the Transmission Revoke message to #4 (Media Transmission pre-empted);

   d. shall enter the 'G: pending Transmission Revoke' state as specified in the subclause 6.3.4.5.2;

   e. shall insert the transmission participant into the active Transmission request queue to the position in front of all queued requests, if not inserted yet or update the position of the transmission participant in the active Transmission request queue to the position in front of all other queued requests, if already inserted; and

f. shall send a Transmission Queue Position Info message to the requesting transmission participant, if negotiated support of queueing Transmission requests as specified in clause 14. The Queue Position Request message:

   i. shall include the queue position and transmission priority in the Queue Info field; and

   ii. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications.

6.3.4.5 State: 'G: pending Transmission Revoke'

6.3.4.5.1 General

The transmission control arbitration logic in the transmission control server uses this state after having sent a Transmission Revoke message to the permitted transmission participant.

In this state the MCVideo server forwards RTP media packets to the other transmission participants in the MCVideo call.

6.3.4.5.2 Enter the 'G: pending Transmission Revoke' state

When entering this state the transmission control arbitration logic in the transmission control server:

1. shall send the Transmission Revoke message to the permitted transmission participant. The Transmission Revoke message:

   a. shall include the reason for sending the Transmission Revoke message in the <Reject Cause> value in the Reject Cause field; and

   b. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

2. shall set the general state to 'G: pending Transmission Revoke'.

6.3.4.5.3 Receive RTP media packets (R: RTP media)

Upon receiving an indication from the media distributor in the MCVideo server that RTP media packets are received from the permitted transmission participant the transmission control server:

1. shall instruct the media distributor to forward the RTP media packets to MCVideo clients according to local policy; and

2. shall remain in the 'G: pending Transmission Revoke' state.

6.3.4.5.4 Receive Transmission End Request message (R: Transmission End Request)

Upon receiving a Transmission End Request message the transmission control arbitration logic in the transmission control server:

1. shall request the media distributor in the MCVideo server to stop forwarding RTP media packets for the requesting transmission participant; and

2. shall decrease Cx (Simultaneous transmission video) by 1 if Cx (Simultaneous transmission video) has not reached it lower limit;

3. shall send a Transmission End Response message;

4. if Cx (Simultaneous transmission video) has reached lower limit, enter the 'G: Transmit Idle' state as specified in the subclause 6.3.4.3.2.

5. if Cx (Simultaneous transmission video) has not reached lower limit and if the active Transmission request queue is not empty the transmission control server:

   a. shall select a queued Transmission request from the top of the active Transmission request queue;

   b. shall remove that queued Transmission request from the active Transmission request queue; and

c. shall enter the 'G: Transmit Taken' state as specified in the subclause 6.3.4.4.2 with respect to that transmission participant.

6.3.4.5.5 Void

6.3.4.5.6 Void

6.3.4.6 In any state

6.3.4.6.1 General

This subclause describes the actions to be taken in all states defined for the general state diagram with the exception of the 'Start-stop' state.

6.3.4.6.2 Receive MCVideo call release - 1

This subclause is used by the transmission control arbitration logic in the transmission control server when an MCVideo call is released.

Upon receiving an MCVideo call release step 1 request from the application and signalling plane the transmission control arbitration logic in the transmission control server:

1. shall request the media distributor in the MCVideo server to stop sending RTP media packets MCVideo clients; and
2. shall enter the 'Releasing' state.

6.3.4.7 State: 'Releasing'

6.3.4.7.1 General

The transmission control arbitration logic in the transmission control server uses this state while waiting for the application and signalling plane to finalize the disconnection of an MCVideo call.

6.3.4.7.2 Receive MCVideo call release - 2

Upon receiving an MCVideo call release step 2 request from the application and signalling plane, the transmission control arbitration logic in the transmission control server:

1. shall release all resources reserved in the media plane including the instances used for the 'Transmission control server state transition diagram for general transmission control operation', and 'Transmission control server state transition diagram for basic transmission control operation towards the transmission participant' state machines and any running timers associated with the state machines; and
2. shall enter the 'Start-stop' state.

6.3.5 Transmission control server state transition diagram for basic transmission control operation towards the transmission participant

6.3.5.1 General

The transmission control interface towards the MCVideo client in the transmission control server shall behave according to the state diagram and state transitions specified in this subclause.

Figure 6.3.5.1-1 shows the states and state transitions for an associated transmission participant in the transmission control server.

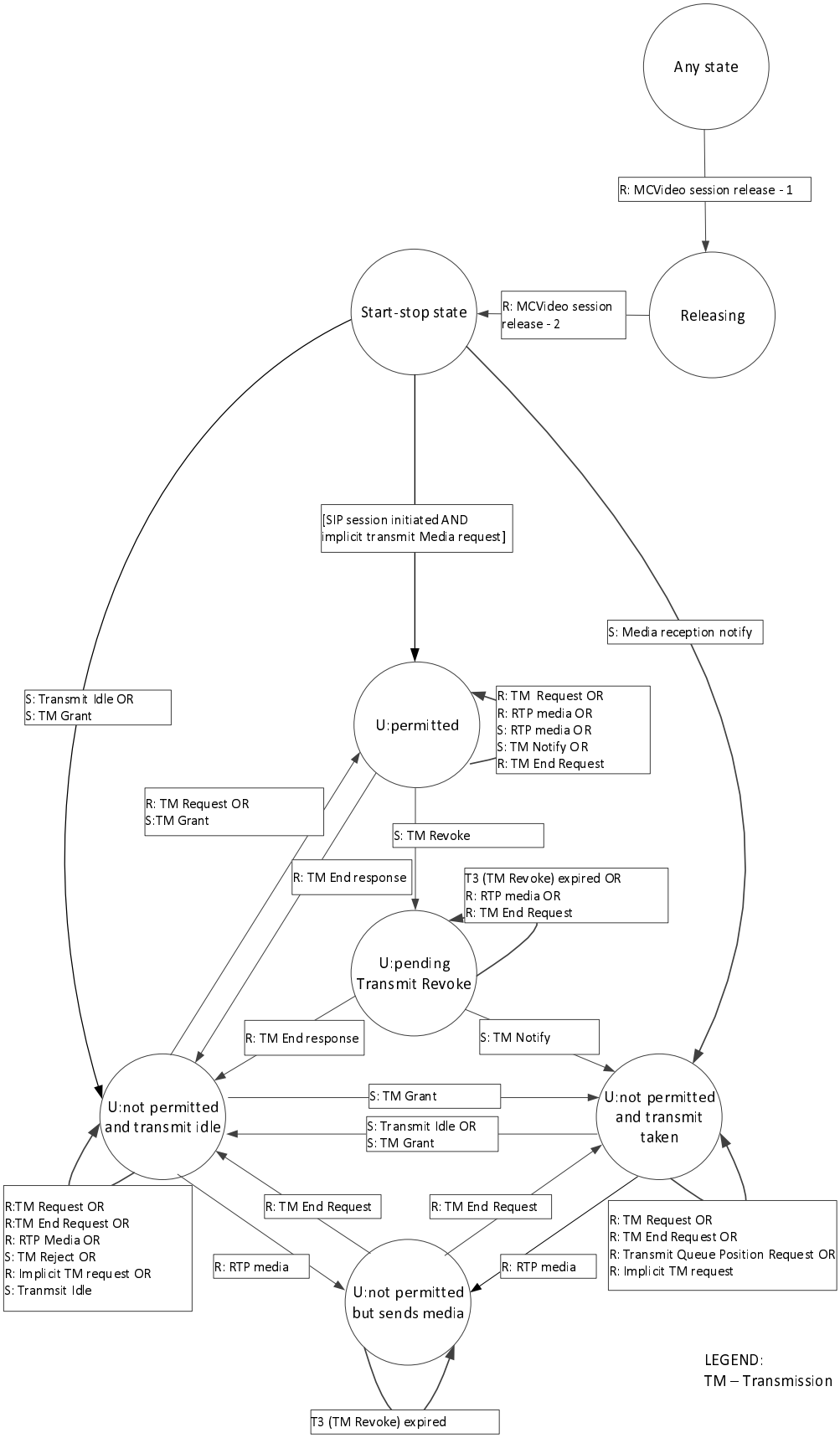


Figure 6.3.5.1-1: Transmission control server state transition diagram for basic transmission control operation towards the transmission participant

The transmission control interface towards the MCVideo client in the transmission control server shall create one instance of the 'basic transmission control operations' state machine towards the MCVideo client for every transmission participant served by the transmission control server as follows:

1. For pre-arranged group call in case of an originating MCVideo call, the 'basic transmission control operation towards the transmission participant' state machine shall be created when the MCVideo server sends the SIP 200 (OK) response towards the originating MCVideo client.

2. For pre-arranged group call in case of a terminating MCVideo call, the 'basic transmission control operation towards the transmission participant' state machine shall be created when the transmission control server receives the SIP 200 (OK) response.

3. For chat group call the 'basic transmission control operation state machine towards the transmission participant' shall be created when the MCVideo server sends the SIP 200 (OK) response to the received initial SIP INVITE request.

The transmission participant associated to the 'basic transmission control operation towards the transmission participant' state machine is here referred to as the "associated transmission participant".

The external inputs to the state machine are:

1. directives coming from the transmission control arbitration logic;

2. transmission messages sent by the transmission participants;

3. media; and

4. in certain cases, SIP messages used for call handling.

If transmission control messages or RTP media packets arrives in a state where there is no procedure specified in the following subclauses, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall discard the transmission control message;

2. shall request the network media interface in the MCVideo server to discard any received RTP media packet; and

3. shall remain in the current state.

State details are explained in the following subclauses.

6.3.5.2 State: 'Start-stop'

6.3.5.2.1 General

When a new instance of the 'basic transmission control operations towards the transmission participant' state machine is created, before any transmission control related input is applied, the state machine is in the 'Start-stop' state. Similarly when the call is released the state machine shall return to the Start-Stop state.

An association between the transmission control server and a transmission participant in the MCVideo client is created, when the state machine is created; and

1. in case of an originating MCVideo call, when the MCVideo server sends the SIP 200 (OK) response to the originating MCVideo client; and

2. in case of a terminating MCVideo call, when the transmission control server receives the SIP 200 (OK) response sent from the terminating MCVideo client.

6.3.5.2.2 SIP Session initiated

When a SIP Session is established and if the session is a normal group call session:

NOTE 1: Temporary group call is not supported in this release. Normal group call contains pre-arranged group call, chat group call, broadcast group call.

1. if an MCVideo client initiates an MCVideo call with an implicit Transmission request, and the MCVideo call does not exist yet, the transmission control interface towards the MCVideo client in the transmission control server:

   a. shall initialize a general state machine as specified in subclause 6.3.4.2.2; and

NOTE 2: In the subclause 6.3.4.2.2 the 'general transmission control operation' state machine will continue with the initialization of the 'general transmission control operation' state machine.

   b. shall enter the state 'U: permitted' as specified in the subclause 6.3.5.5.2;

2. if the associated MCVideo client rejoins an ongoing MCVideo call without an implicit Transmission request or initiates or joins a chat group call without an implicit Transmission request or attempts to initiate an already existing MCVideo call without an implicit Transmission request, and

   a. if an MCVideo call already exists but no MCVideo client has the permission to send a media, the transmission control interface towards the MCVideo client in the transmission control server:

      i. should send a Transmission Idle message to the MCVideo client. The Transmission Idle message:

         A. shall include a Message Sequence Number field with a Message Sequence Number value increased with 1; and

         B. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

      ii. shall enter the state 'U: not permitted and Transmit Idle' as specified in the subclause 6.3.5.5.2;

   b. if an MCVideo call is initiated, the transmission control interface towards the MCVideo client in the transmission control server:

      i. shall enter the state 'U: not permitted and Transmit Idle' as specified in the subclause 6.3.5.5.2; and

      ii. shall initialize a general state machine as specified in subclause 6.3.4.2.2; and

NOTE 3: In the subclause 6.3.4.2.2 the general state machine will continue with the initialization of the general state machine.

   c. if other MCVideo clients have the permission to send a media, the transmission control interface towards the MCVideo client in the transmission control server:

      i. should send a Media Transmission Notify message to the reception control arbitration logic. The Media Transmission Notify message:

         A. shall include the granted MCVideo users MCVideo ID in the Granted Party's Identity field, if privacy is not requested;

         B. shall include a Message Sequence Number field with a <Message Sequence Number> value increased with 1;

         C. if the session is a broadcast group call, shall include the Permission to Request the transmission field set to '0';

         D. if the session is not a broadcast group call, may include the Permission to Request the transmission field set to '1'; and

         E. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications

         F. initiates a instance of 'basic reception control operations towards the transmission participant' state machine.

      ii. shall enter the 'U: not permitted and Transmit Taken' state as specified in the subclause 6.3.5.4.2;

NOTE 3: For multiple MCVideo clients have the permission to send a media, the following Media Transmission notify messages will be handle as in 'U: not permitted and Media Transmission Notify' state as specified in the subclause 6.3.5.4.2.

3. if the associated transmission participant attempts to initiate an already existing MCVideo call with an implicit Transmission request, and

   a. if no MCVideo client has the permission to send media, the transmission control interface towards the MCVideo client in the transmission control server:

      i. shall processes the implicit Transmission request as if a Transmission Media Request message was receive as specified in subclause 6.3.4.3.3; and

   ii. shall enter the state 'U: permitted' as specified in the subclause 6.3.5.5.2;b.if the MCVideo client negotiated support of queueing Transmission requests as specified in clause 14 and if other MCVideo clients have the permission to send media and if Cx (Simultaneous Transmission video) has not reached it upper limit, the transmission control interface towards the MCVideo client in the transmission control server:

      i. shall processes the implicit Transmission request as if a Transmission Media Request message was receive as specified in subclause 6.3.4.4.12; and

      ii. shall enter the state 'U: permitted' as specified in the subclause 6.3.5.5.2;

   c. if the MCVideo client negotiated support of queueing Transmission requests as specified in clause 14 and if other MCVideo clients have the permission to send media and if Cx (Simultaneous Transmission video) has reached it upper limit, the transmission control interface towards the MCVideo client in the transmission control server:

      i. shall set the priority level to the negotiated maximum priority level that the MCVideo client is permitted to request, except for pre-emptive priority, when high priority is used;

NOTE 4: The maximum transmission priority the transmission participant is permitted to request is negotiated in the "mc_priority" fmtp attribute as specified in clause 14.

NOTE 5: The initial implicit Transmission request will not result in pre-emption when an MCVideo client is joining an ongoing MCVideo call. If the MCVideo client wants to pre-empt the current MCVideo client that are sending media, an explicit Transmission request with pre-emptive transmission priority is required.

      ii. shall insert the MCVideo client into the active Transmission request queue to the position immediately following all queued Transmission requests with the same transmission priority;

      iii. shall send a Transmission Queue Position Info message to the MCVideo client. The Transmission Queue Position Info message:

         A shall include the queue position and transmission priority in the Queue Info field; and

         B. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications;

      iv. should send a Transmission Queue Position Info message with the updated status to the MCVideo clients in the active Transmission request queue which negotiated queueing of Transmission requests as specified in clause 14, which have requested the queue status, whose queue position has been changed since the previous Transmission Queue Position Info message and which is not the joining MCVideo client. The Transmission Queue Position Info message:

         A shall include the queue position and transmission priority in the Queue Info field; and

         B. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

      v. shall enter the 'U: not permitted and Transmit Taken' state as specified in the subclause 6.3.5.4.2; and

d. if the MCVideo client did not negotiate queueing of Transmission requests and if other MCVideo clients have the permission to send a media and if Cx (Simultaneous Transmission video) has reached it upper limit, the transmission control interface towards the MCVideo client in the transmission control server:

i. shall send a Media Transmission Notify message to the reception control arbitration logic. The Media Transmission Notify message:

A. shall include the granted MCVideo users MCVideo ID in the Granted Party's Identity field, if privacy is not requested;

B. shall include a Message Sequence Number field with a Message Sequence Number value increased with 1;

C. if the session is a broadcast group call, shall include the Permission to Request the transmission field set to '0';

D. if the session is not a broadcast group call, may include the Permission to Request the transmission field set to '1'; and

E. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

F. shall initiate the general reception control state machine.

ii. shall enter the 'U: not permitted and Transmit Taken' state as specified in the subclause 6.3.5.4.2; and

4. if the MCVideo client is invited to the MCVideo call and

a. if other MCVideo clients have permission to send a media, the transmission control interface towards the MCVideo client in the transmission control server:

i. should send a Media Transmission Notify message to the the reception control arbitration logic. The Media Transmission Notify message:

A. shall include the granted MCVideo users MCVideo ID in the Granted Party's Identity field, if privacy is not requested;

B. shall include a Message Sequence Number field with a Message Sequence Number value increased with 1;

C. if the session is a broadcast group call, shall include the Permission to Request the transmission field set to '0';

D. if the session is not a broadcast group call, may include the Permission to Request the transmission field set to '1'; and

E. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

F. shall initiate the general reception control state machine.

ii. shall enter the 'U: not permitted and Transmit Taken' state as specified in the subclause 6.3.5.4.2; and

b. if no other MCVideo client has the permission to send a media; the transmission control interface towards the MCVideo client in the transmission control server:

i. should send a Transmission Idle message to the MCVideo client. The Transmission Idle message:

A. shall include a Message Sequence Number field with a <Message Sequence Number> value increased with 1; and

B. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

ii. shall enter the 'U: not permitted and Transmit Idle' state as specified in the subclause 6.3.5.3.2.

6.3.5.3 State: 'U: not permitted and Transmit Idle'

6.3.5.3.1 General

The transmission control interface towards the MCVideo client in the transmission control server uses this state when the associated transmission participant is not permitted to send media.

6.3.5.3.2 Enter state 'U: not permitted and Transmit Idle'

When entering this state the transmission control interface towards the MCVideo client in the transmission control server:

1. shall set the state for the associated transmission participant to 'U: not permitted and Transmit Idle'.

6.3.5.3.3 Send Media Transmission Notify message (S: Media Transmission Notify)

When a Media Transmission Notify message is received from the transmission control server arbitration logic, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall forward the Media Transmission Notify message to the the reception control arbitration logic;

2. may set the first bit in the subtype of the Media Transmission Notify message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, and

NOTE: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

3. initiates a instance of 'basic reception control operations towards the transmission participant' state machine.

4. shall enter the 'U: not permitted and Transmit Taken' state as specified in the subclause 6.3.5.4.2.

6.3.5.3.4 Receive Transmission Media Request message (R: Transmission Media Request)

Upon receiving a Transmission Media Request message from the associated transmission participant, the transmission control interface towards the MCVideo client in the transmission control server:

1. if the session is not a broadcast group call or if the session is a broadcast group call and the associated transmission participant is the initiator of the broadcast group call, shall forward the Transmission Media Request message to the transmission control server arbitration logic;

NOTE 1: The Transmission Media Request message can contain a Transmission Indicator field indicating that the Transmission request is an attempt to upgrade a group call to a broadcast group call. If the transmission control arbitration logic accepts the Transmission request, the ongoing group call will be upgraded accordingly by the Transmission Grant message and, for other participants, by the Media Transmission Notify message.

NOTE 2: Initiating a broadcast group call is done in the application and signalling plane using SIP. Initiating or upgrading a call to an emergency call or an imminent peril call is done in the application and signalling plane using SIP.

2. if the session is a broadcast group call and the associated transmission participant is not the initiator of the broadcast group call, shall send a Transmission Reject message to the associated transmission participant. The Transmission Reject message:

   a. shall include in the Reject Cause field the <Reject Cause> value cause #5 (Receive only);

   b. may include in the Reject Cause field an additional text string explaining the reason for rejecting the Transmission request in the <Reject Phrase> value;

   c. may set the first bit in the subtype of the Transmission Reject message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1; and

NOTE 3: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

d. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

3. shall remain in the 'U: not permitted and Transmit Idle' state.

6.3.5.3.5 Send Transmission Grant message (S: Transmission Grant)

When a Transmission Grant message is received from the transmission control arbitration logic in the MCVideo server, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall forward the Transmission Grant messages to the associated transmission participant;

2. may set the first bit in the subtype of the Transmission Grant message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1; and

NOTE: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

3. shall enter the state 'U: permitted' as specified in subclause 6.3.5.5.2.

6.3.5.3.6 Send Transmission Reject message (S: Transmission Reject)

When a Transmission Reject message is received from the transmission control arbitration logic in the MCVideo server, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall forward the Transmission Reject messages to the associated transmission participant;

2. may set the first bit in the subtype of the Transmission Reject message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1; and

NOTE: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

3. shall remain in the 'U: not permitted and Transmit Idle' state.

6.3.5.3.7 Receive Transmission End Request message (R: Transmission End Request)

Upon receiving a Transmission End Request message from the associated transmission participant, the transmission control interface towards the MCVideo client in the transmission control server:

1. if the first bit in the subtype of the Transmission End Request message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:

   a. shall include the Message Type field set to '4' (Transmission End Request); and

   b. shall include the Source field set to '2' (the controlling MCVideo function is the source);

2. shall send a Transmission Idle message to the associated transmission participant. The Transmission Idle message:

   a. shall include a Message Sequence Number field with a <Message Sequence Number> value increased with 1;

   b. may set the first bit in the subtype of the Transmission Idle message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1; and

NOTE: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

   c. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications;

3. shall use the SSRC in the received Transmission End Request message to check if the transmission participant has a queued Transmission request;

4 if the transmission participant has a Transmission request in the queue, shall remove the queued Transmission request from the queue; and

5. shall remain in the state 'U: not permitted and Transmit Idle' state.

6.3.5.3.8 Receive RTP media packets (R: media)

Upon receiving an indication from the network media interface that RTP media packets are received with payload from the associated transmission participant and if Transmission End Request message was received in the previous 'U: permitted' state, the transmission control interface towards the MCVideo client in the transmission control server:

NOTE: Reception of unauthorized RTP media packets can only happen if the associated transmission participant is in an MCVideo client. If the associated transmission participant is a transmission control server interface in a non-controlling MCVideo function of an MCVideo group, the unauthorized RTP media packets are handled in the non-controlling MCVideo function.

1. shall request the network media interface in the MCVideo server to not forward the received RTP media packets to the media distributor in the MCVideo server;

2. shall send a Transmission Revoke message to the associated transmission participant. The Transmission Revoke message:

   a. shall include the Reject Cause field with the <Reject Cause> value set to #3 (No permission to send a Media Transmission); and

   b. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

3. shall enter the 'U: not permitted but sends media' state as specified in the subclause 6.3.5.7.2.

6.3.5.3.9 Receive an implicit Transmission request (R: Implicit Transmission request)

When an ongoing session is upgraded to an emergency group call and when the application and signalling plane indicates that a subsequent SDP offer included the "mc_implicit_request" fmtp attribute as described in clause 14, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall indicate to the transmission control server arbitration logic that an implicit Transmission request is received due to an upgrade to an emergency group call; and

2. shall remain in the 'U: not permitted and Transmit Idle' state.

6.3.5.3.10 Send Transmission Idle message (S: Transmit Idle)

When receiving a Transmission Idle message from the transmission control server arbitration logic in the MCVideo server, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall forward the Transmission Idle message to the associated transmission participant;

2. may set the first bit in the subtype of the Transmission Idle message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1; and

NOTE: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

3. shall remain in the 'U: not permitted and Transmit Idle' state.

6.3.5.4 State 'U: not permitted and transmit taken'

6.3.5.4.1 General

The transmission control interface towards the MCVideo client in the transmission control server uses this state when another MCVideo client (i.e. not the associated transmission participant) has been given permission to send media.

In this state RTP media packets received from the media distributor in the MCVideo server are forwarded to the associated transmission participant by the network media interface in the MCVideo server.

6.3.5.4.2 Enter state 'U: not permitted and Transmit Taken'

When entering this state the transmission control server:

1. shall set the state to 'U: not permitted and Transmit Taken'.
2. shall create the 'basic reception control operations towards the transmission participant' state machine as specified in subclause 6.3.7.

6.3.5.4.3 Send Transmission Idle message (S: Transmit Idle)

When receiving a Transmission Idle message from the transmission control server arbitration logic in the MCVideo server, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall forward the Transmission Idle message to the associated transmission participant;
2. may set the first bit in the subtype of the Transmission Idle message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1;

NOTE: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

3. shall enter the 'U: not permitted and Transmit Idle' state as specified in the subclause 6.3.5.3.2.

6.3.5.4.4 Receive Transmission Media Request message (R: Transmission Media Request)

Upon receiving a Transmission Media Request message, without a Transmission Indicator field or with the Transmission Indicator field included where the D-bit (Emergency call) and the E-bit (Imminent peril call) are set to '0', from the associated transmission participant, and if the MCVideo client did not negotiate queueing of Transmission requests or did not include a priority in the "mc_priority" fmtp attribute as specified in clause 14, the transmission control interface towards the MCVideo client in the transmission control server:

1. if the Cx (Simultaneous transmission video) has reached it upper limit:
   a. shall send a Transmission Reject message to the associated transmission participant. The Transmission Reject message:
      i. shall include in the Reject Cause field the <Reject Cause> value cause #1 (Another MCVideo client has permission);
      ii. may include in the Reject Cause field an additional text string explaining the reason for rejecting the Transmission request in the <Reject Phrase> value;
      iii. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications;
   b. may set the first bit in the subtype of the Transmission Reject message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1; and

NOTE 1: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

2. if the Cx (Simultaneous transmission video) has not reached it upper limit:
   a. shall perform the actions specified in the subclause 6.3.4.4.7A;
3. shall remain in the 'U: not permitted and Transmit Taken' state.

Upon receiving a Transmission Media Request message from the associated transmission participant and the session is a broadcast group call, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall send a Transmission Reject message to the associated transmission participant. The Transmission Reject message:
   a. shall include in the Reject Cause field the <Reject Cause> value cause #5 (Receive only);

b. may include in the Reject Cause field an additional text string explaining the reason for rejecting the Transmission request in the <Reject Phrase> value; and

c. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications;

2. may set the first bit in the subtype of the Transmission Reject message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1; and

NOTE 2: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

3. shall remain in the 'U: not permitted and Transmit Taken' state.

Upon receiving a Transmission Media Request message from the associated transmission participant and if the MCVideo client negotiated support of queueing of Transmission requests or included a transmission priority in the "mc_priority" or both as described in specified in clause 14 and according to local policy, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall determine the effective priority level as described in subclause 4.1.1.4 by using the following parameters:

   a. the transmission priority shall be:

      i. the lower of the transmission priority included in Transmission Media Request message and the negotiated maximum transmission priority that the MCVideo client is permitted to request, if the MCVideo client negotiated transmission priority "mc_priority" and transmission priority is included in the Transmission Media Request message;

      ii. the receive only transmission priority, if the MCVideo client negotiated transmission priority in the "mc_priority" fmtp attribute and if the negotiated maximum transmission priority that the MCVideo client is permitted to request is "receive only";

      iii. the default priority, if the MCVideo client negotiated transmission priority in the "mc_priority" fmtp attribute, if the negotiated maximum transmission priority that the MCVideo client is permitted to request is not receive only and if the transmission priority is not included in the Transmission Media Request message; and

      iv. the default priority, if the MCVideo client did not negotiate transmission priority in the "mc_priority" fmtp attribute; and

   b. the type of the call shall be

      i. if the Transmission Indicator field is included in the message and the D-bit (Emergency call bit) is set to '1', determined to be an emergency call;

      ii. if the Transmission Indicator field is included in the message and the E-bit (Imminent peril call) is set to '1', determined to be an imminent peril call; and

      iii. if the Transmission Indicator field is not included in the message or the Transmission Indicator field is included and neither the D-bit (Emergency call bit) nor the E-bit (Imminent peril call) is set to '1', determined to be a normal call;

2. if the effective priority is "receive only", the transmission control interface towards the MCVideo client in the transmission control server:

   a. shall send a Transmission Reject message to the transmission participant. The Transmission Reject message:

      i. shall include in the Reject Cause field the <Reject Cause> value cause #5 (Receive only) ;

      ii. may include in the Reject Cause field an additional text string explaining the reason for rejecting the Transmission request in the <Reject Phrase> value;

      iii. if the Transmission Media Request included a Track Info field, shall include the received Track Info field; and

iv. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

b. shall remain in the 'U: not permitted and Transmit Taken' state;

3. shall use the SSRC in the received Transmission Media Request message to check if the transmission participant has a queued Transmission request;

4. if the transmission participant already has a queued Transmission request with the same effective priority level, the transmission control interface towards the MCVideo client in the transmission control server:

   a. shall send a Transmission Queue Position Info message to the requesting MCVideo client, if the MCVideo client negotiated support of queueing of Transmission requests as specified in clause 14. The Transmission Queue Position Info message:

      i. shall include the queue position and transmission priority in the Queue Info field;

      ii. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

   b. shall remain in the 'U: not permitted and Transmit Taken' state

5. if the effective priority level is pre-emptive and there are no other pre-emptive requests in the active Transmission request queue and the effective priority level of the current MCVideo client with permission to send a media is not the pre-emptive priority, the transmission control interface towards the MCVideo client in the transmission control server:

   a. shall forward the Transmission Media Request message to the transmission control server arbitration logic indicating that a Transmission Media Request message with pre-emptive priority is received; and

   b. shall remain in the 'U: not permitted and Transmit Taken' state

NOTE 3: The Transmission control server arbitration logic initiates revoking the permission to send media towards the current MCVideo client with the permission to send media as specified in the subclause 6.3.4.4.7;

Upon receiving a Transmission Media Request message from the associated transmission participant and if the MCVideo client did not negotiate support of queueing of Transmission requests as specified in clause 14, the effective priority level is pre-emptive and either other pre-emptive request is queued or the effective priority level of the current MCVideo client with permission to send a media is the pre-emptive priority, the transmission control interface towards the MCVideo client in the transmission control server:

1. if the Cx (Simultaneous transmission video) has reached it upper limit:

   a. shall send a Transmission Reject message to the associated transmission participant. The Transmission Reject message:

      i. shall include in the Reject Cause field the <Reject Cause> value cause #1 (Another MCVideo client has permission);

      ii. may include in the Reject Cause field an additional text string explaining the reason for rejecting the Transmission request in the <Reject Phrase> value;

      iii. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

2. if the Cx (Simultaneous transmission video) has not reached it upper limit:

   a. shall perform the actions specified in the subclause 6.3.4.4.7A;

3. shall remain in the 'U: not permitted and Transmit Taken' state.

Upon receiving a Transmission Media Request message from the associated transmission participant and if the MCVideo client did not negotiate "queueing" and the effective priority level is not pre-emptive, the transmission control interface towards the MCVideo client in the transmission control server:

1. if the Cx (Simultaneous transmission video) has reached it upper limit:

a. shall send a Transmission Reject message to the associated transmission participant. The Transmission Reject message:

i. shall include in the Reject Cause field the <Reject Cause> value cause #1 (Another MCVideo client has permission);

ii. may include in the Reject Cause field an additional text string explaining the reason for rejecting the Transmission request in the <Reject Phrase> value;

iii. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

2. if the Cx (Simultaneous transmission video) has not reached it upper limit:

a. shall perform the actions specified in the subclause 6.3.4.4.7A;

3. shall remain in the 'U: not permitted and Transmit Taken' state.

Upon receiving a Transmission Media Request message from the associated transmission participant and if the MCVideo client negotiated support of queueing of Transmission requests as specified in clause 14 and the effective priority level is not pre-emptive, the transmission control interface towards the MCVideo client in the transmission control server:

1. if the Cx (Simultaneous transmission video) has reached it upper limit:

a. shall insert the MCVideo client into the active Transmission request queue, if not inserted yet, or update the position of the MCVideo client in the active Transmission request queue, if already inserted, to the position immediately following all queued requests at the same effective priority level;

b. the transmission control server shall send a Transmission Queue Position Info message to the transmission participant. The Transmission Queue Position Info message:

i. shall include the queue position and transmission priority in the Queue Info field;

ii. if the Transmission Media Request included a Track Info field, shall include the received Track Info field; and

iii. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications;

c. shall remain in the 'U: not permitted and Transmit Taken' state; and

d. may set the first bit in the subtype of the Transmission Queue Position message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1.

NOTE 4: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

2. if the Cx (Simultaneous transmission video) has not reached it upper limit:

a. shall perform the actions specified in the subclause 6.3.4.4.7A;

6.3.5.4.5 Receive Transmission End Request message (R: Transmission End Request)

Upon receiving a Transmission End Request message from the associated transmission participant and if the MCVideo client did not negotiate support of queueing of Transmission requests or included a transmission priority in the "mc_priority" fmtp attribute as specified in clause 14, the transmission control interface towards the MCVideo client in the transmission control server:

1. if the first bit in the subtype of the Transmission End Request message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:

a. shall include the Message Type field set to '4' (Transmission End Request); and

b. shall include the Source field set to '2' (the controlling MCVideo function is the source);

2. shall send a Media Transmission Notify message to the reception control arbitration logic. The Media Transmission Notify message:

   a. shall include the granted MCVideo users MCVideo ID in the Granted Party's Identity field, if privacy is not requested;

   b. shall include a Message Sequence Number field with a <Message Sequence Number> value increased with 1;

   c. shall include the Permission to Request the transmission field set to '0', if the transmission participants are not allowed to request the transmission;

   d. may set the first bit in the subtype of the Media Transmission Notify message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1; and

NOTE 1: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

   e. initiates a instance of 'basic reception control operations towards the transmission participant' state machine.

   f. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

3. shall remain in the 'U: not permitted and Transmit Taken' state.

Upon receiving a Transmission End Request message from the associated transmission participant and if the MCVideo client negotiated support of queueing of Transmission requests as specified in clause 14, the transmission control interface towards the MCVideo client in the transmission control server:

1. if the first bit in the subtype of the Transmission End Request message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:

   a. shall include the Message Type field set to '4' (Transmission End Request); and

   b. shall include the Source field set to '2' (the controlling MCVideo function is the source);

2. if

   a. a Track Info field is included in the Transmission End Request message, shall use the topmost <Participant Reference> value and the SSRC in the received Transmission End Request message to check if the transmission participant has a queued Transmission request; or

   b. if a Track Info field is not included in the Transmission End Request message, shall use the SSRC in the received Transmission End Request message to check if the transmission participant has a queued Transmission request;

3. shall remove the MCVideo client from the active Transmission request queue, if the MCVideo client was in the active Transmission request queue;

4. shall send a Media Transmission Notify message to the the reception control arbitration logic. The Media Transmission Notify message:

   a. shall include the granted MCVideo users MCVideo ID in the Granted Party's Identity field, if privacy is not requested;

   b. if the session is a broadcast group call, shall include the Permission to Request the transmission field set to '0';

   c. if the session is not a broadcast group call, may include the Permission to Request the transmission field set to '1';

   d. shall include a Message Sequence Number field with a <Message Sequence Number> value increased with 1; and

   e. initiates a instance of 'basic reception control operations towards the transmission participant' state machine.

f. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications;

5. may set the first bit in the subtype of the Media Transmission Notify message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1; and

NOTE 2: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

6. shall remain in the 'U: not permitted and Transmit Taken' state.

6.3.5.4.6 Receive RTP media packets (R: media)

Upon receiving an indication from the network media interface in the MCVideo server that RTP media packets with payload are received from the associated transmission participant, the transmission control interface towards the MCVideo client in the transmission control server:

NOTE: Reception of unauthorized RTP media packets can only happen if the associated transmission participant is in an MCVideo client. If the associated transmission participant is a transmission control server interface in a non-controlling MCVideo function of an MCVideo group, the unauthorized RTP media packets are handled in the non-controlling MCVideo function.

1. shall request the network media interface to not forward the RTP media packets to the media distributor in the MCVideo server;

2. shall send a Transmission Revoke message to the associated transmission participant. The Transmission Revoke message:

   a. shall include the Reject Cause field with the Reject Cause value set to #3 (No permission to send a Media Transmission); and

   b. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

3. shall enter the 'U: not permitted but sends media' state as specified in the subclause 6.3.5.7.2.

6.3.5.4.7 Send Transmission Queue Position Info message (R: Transmission Queue Position Request)

Upon receiving a Transmission Queue Position Request message from the associated transmission participant, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall send the Transmission Queue Position Info message. The Transmission Queue Position Info message:

   a. shall include the queue position and transmission priority in the Queue Info field;

   b. may include the first bit in the subtype of the Transmission Queue Position Info message set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1; and

NOTE: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

   c. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

3. shall remain in the 'U: not permitted and Transmit Taken' state.

6.3.5.4.8 Receive an implicit Transmission request (R: Implicit Transmission request)

When an ongoing session is upgraded to an emergency group call and when the application and signalling plane indicates that a subsequent SDP offer included the "mc_implicit_request" fmtp attribute as specified in clause 14, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall indicate to the transmission control server arbitration logic that an implicit Transmission request is received due to an upgrade to an emergency group call; and

2. shall remain in the 'U: not permitted and Transmit Taken' state.

6.3.5.4.9 Send Transmission Grant message (S: Transmission Grant)

When a Transmission Grant message is received from the transmission control arbitration logic in the MCVideo server, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall forward the Transmission Grant messages to the associated transmission participant;

2. may set the first bit in the subtype of the Transmission Grant message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1;

NOTE: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

3. shall enter the state 'U: permitted' as specified in subclause 6.3.5.5.2.

6.3.5.4.10 Send Media Transmission Notify message (S: Media Transmission Notify)

When a Media Transmission Notify message is received from the transmission control arbitration logic in the MCVideo server, if the G-bit in the Transmission Indicator is set to '1' the transmission control interface towards the MCVideo client in the transmission control server:

1. shall forward the Media Transmission Notify message to the the reception control arbitration logic;

2. may set the first bit in the subtype of the Media Transmission Notify message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1;

NOTE: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

3. shall store an indication that the participant is listening to media from two sources; and

4. initiates a instance of 'basic reception control operations towards the transmission participant' state machine.

5. shall remain in the 'U: not permitted and Transmit Taken' state.

6.3.5.5 State: 'U: permitted'

6.3.5.5.1 General

The transmission control interface towards the MCVideo client in the transmission control server uses this state when the associated transmission participant has been given permission to send media.

6.3.5.5.2 Enter state 'U: permitted'

When entering this state the transmission control interface towards the MCVideo client in the transmission control server:

1. shall set the state for the associated transmission participant to 'U: permitted'.

6.3.5.5.3 Receive Transmission End Request message (R: Transmission End Request)

Upon receiving a Transmission End Request message from the associated transmission participant, the transmission control interface towards the MCVideo client in the transmission control server:

1. if the first bit in the subtype of the Transmission End Request message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:

   a. shall include the Message Type field set to '4' (Transmission End Request); and

   b. shall include the Source field set to '2' (the controlling MCVideo function is the source);

2. shall forward the Transmission End Request message to the general transmission control operation state machine of the transmission control arbitration logic in the MCVideo server with the first bit in the subtype of the Transmission End Request message set to '0' (Acknowledgment is not required), if not already set; and

3. shall remain in the 'U: permitted' state.

6.3.5.5.3a Receive Transmission End Response message (R: Transmission End Response)

Upon receiving a Transmission End Response message from the transmission control server, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall forward the Transmission End Response message to the associated transmission participant; and
2. shall enter the state 'U: not permitted and Transmit Idle'.

6.3.5.5.4 Send Transmission Idle message (S: Transmit Idle)

Upon receiving the Transmission Idle message from the transmission control server arbitration logic in the MCVideo server, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall enter the 'U: not permitted and Transmit Idle' state as specified in the subclause 6.3.5.3.2.

6.3.5.5.5 Send Transmission Revoke message (S: Transmission Revoke)

When receiving the Transmission Revoke message from the transmission control server arbitration logic in the MCVideo server, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall forward the Transmission Revoke message to the transmission participant;
2. shall enter the state 'U pending Transmit Revoke' as specified in the subclause 6.3.5.6.2.

6.3.5.5.6 Receive RTP media packets (R: media)

Upon receiving an indication from the network media interface in the MCVideo server that RTP media packets with payload are received from the associated transmission participant, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall request the network media interface in the MCVideo server to forward RTP media packets to the media distributor in the MCVideo server.

6.3.5.5.7 Receive Transmission Media Request message (R: Transmission Media Request)

Upon receiving a Transmission Media Request message from the associated transmission participant, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall forward the Transmission Media Request message to the transmission control server arbitration logic in the MCVideo server; and

   b. shall instruct the media distributor to act as in subclause 6.3.4.4.5.

2. shall remain in the 'U: permitted' state.

6.3.5.5.8 Send RTP Media (S: media)

When RTP packets are received from the media distributor, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall forward the RTP packet to the associated transmission participant; and
2. shall remain in the 'U: permitted' state.

6.3.5.5.9 Send Media Transmission Notify message (S: Media Transmission Notify)

When receiving the Media Transmission Notify message from the transmission control server arbitration logic in the MCVideo server with the G-bit in the Transmission Indicator set to '1', the transmission control interface towards the MCVideo client in the transmission control server:

1. shall send the Media Transmission Notify message to the the reception control arbitration logic;
2. shall remain in the 'U: permitted' state.

3. initiates a instance of 'basic reception control operations towards the transmission participant' state machine.

6.3.5.6 State: 'U: pending Transmit Revoke'

6.3.5.6.1 General

The transmission control interface towards the MCVideo client in the transmission control server uses this state during the grace period after sending the Transmission Revoke message.

In this state timer T3 (Transmission Revoke) is running.

6.3.5.6.2 Enter state 'U pending Transmit Revoke'

When entering this state the transmission control interface towards the MCVideo client in the transmission control server:

1. shall start timer T3 (Transmission Revoke); and
2. shall enter the state 'U: pending Transmit Revoke'.

6.3.5.6.3 Timer T3 (Transmission Revoke) expired

On expiry of timer T3 (Transmission Revoke) the transmission control interface towards the MCVideo client in the transmission control server:

1. shall retransmit the Transmission Revoke message to the associated transmission participant. The Transmission Revoke message:
   a. shall include the same Rejection Cause field and the same Transmission Indicator field as in the previous sent Transmission Revoke message;
2. shall start timer T3 (Transmission Revoke); and
3. shall remain in the 'U: pending Transmit Revoke' state.

NOTE: The number of times the transmission control server retransmits the Transmission Revoke message and the action to take when the transmission control server gives up is an implementation option. However, it is recommended that the MCVideo client is disconnected from the MCVideo call when the transmission control server gives up.

6.3.5.6.4 Receive RTP media packets (R: media)

Upon receiving an RTP media packet with payload from the associated transmission participant, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall forward RTP media packets to the media distributor; and
2. shall remain in the 'U: pending Transmit Revoke' state.

6.3.5.6.5 Receive Transmission End Request message (R: Transmission End Request)

Upon receiving a Transmission End Request message from the associated transmission participant, the transmission control interface towards the MCVideo client in the transmission control server:

1. if the first bit in the subtype of the Transmission End Request message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:
   a. shall include the Message Type field set to '4' (Transmission End Request); and
   b. shall include the Source field set to '2' (the controlling MCVideo function is the source);
2. shall forward the Transmission End Request message to the transmission control server arbitration logic; and
   b. shall remain in the state 'U: pending Transmit Revoke'.

6.3.5.6.5a Receive Transmission End Response message (R: Transmission End Response)

Upon receiving a Transmission End Response message from the transmission control server, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall forward the Transmission End Response message to the associated transmission participant; and
2. shall enter the state 'U: not permitted and Transmit Idle'.

6.3.5.6.6 Send Transmission Idle message (S: Transmit Idle)

Upon receiving a Transmission Idle message from the transmission control server arbitration logic in the MCVideo server, the transmission control interface towards the MCVideo client in the transmission control server:

NOTE 1: The Transmission Idle message is sent when there are no queued Transmission requests.

1. shall send the Transmission Idle message to the associated transmission participant;
2. may set the first bit in the subtype of the Transmission Idle message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1; and

NOTE 2: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

3. shall enter the 'U: not permitted and Transmit Idle' state as specified in the subclause 6.3.5.3.2.

6.3.5.6.7 Send Media Transmission Notify message (S: Media Transmission Notify)

Upon receiving a Media Transmission Notify message from the transmission control server arbitration logic in the MCVideo server, the transmission control interface towards the MCVideo client in the transmission control server:

NOTE 1: The Media Transmission Notify message is sent when there are queued Transmission requests.

1. shall send the Media Transmission Notify message to the associated transmission participant the reception control arbitration logic;
2. may set the first bit in the subtype of the Media Transmission Notify message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1; and

NOTE 2: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

3. shall enter the 'U: not permitted and Transmit Taken' state as specified in the subclause 6.3.5.3.2.

6.3.5.7 State 'U: not permitted but sends media'

6.3.5.7.1 General

The transmission control interface towards the MCVideo client in the transmission control server uses this state when it receives RTP media packets from the MCVideo client and the MCVideo client is not permitted to send media.

Timer T3 (Transmission Revoke) is running in this state.

6.3.5.7.2 Enter state 'U: not permitted but sends media'

When entering this state the transmission control interface towards the MCVideo client in the transmission control server:

1. shall start timer T3 (Transmission Revoke); and
2. shall enter the state 'U: not permitted but sends media'.

In this state the transmission control interface towards the MCVideo client in the transmission control server:

1. shall not request the network media interface in the MCVideo server to forward RTP media packets from the MCVideo client to the media distributor in the MCVideo server.

6.3.5.7.3 Timer T3 (Transmission Revoke) expired

On expiry of timer T3 (Transmission Revoke), the transmission control interface towards the MCVideo client in the transmission control server:

1. shall send a Transmission Revoke message to the associated transmission participant. The Transmission Revoke message:

   a. shall include in the Rejection Cause field the <Rejection Cause> value set to #3 (No permission to send a Media Transmission); and

   b. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications;

2. shall restart timer T3 (Transmission Revoke); and

3. shall remain in the 'U: not permitted but sends media' state.

NOTE: The number of times the transmission control server retransmits the Transmission Revoke message and the action to take when the transmission control server gives up is an implementation option. However, the recommended action is that the MCVideo client is disconnected from the MCVideo call.

6.3.5.7.4 Receive Transmission End Request message (R: Transmission End Request)

Upon receiving a Transmission End Request message, the transmission control interface towards the MCVideo client in the transmission control server:

1. if the first bit in the subtype of the Transmission End Request message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message. The Transmission control Ack message:

   a. shall include the Message Type field set to '4' (Transmission End Request); and

   b. shall include the Source field set to '2' (the controlling MCVideo function is the source);

2. if the general state is 'G: Transmit Idle', the transmission control interface towards the MCVideo client in the transmission control server:

   a. shall send the Transmission Idle message. The Transmission Idle message:

      i. shall include a Message Sequence Number field with a Message Sequence Number value increased with 1; and

      ii. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

   b. shall enter the 'U: not permitted and Transmit Idle' state as specified in the subclause 6.3.5.3.2; and

3. if the general state is 'G: Transmit Taken', the transmission control interface towards the MCVideo client in the transmission control server:

   a. shall send a Media Transmission Notify message to the reception control arbitration logic. The Media Transmission Notify message:

      i. shall include the granted MCVideo users MCVideo ID in the Granted Party's Identity field, if privacy is not requested;

      ii. if the session is a broadcast group call, shall include the Permission to Request the transmission field set to '0';

      iii. if the session is not a broadcast group call, may include the Permission to Request the transmission field set to '1';

      iv. may include the first bit in the subtype of the Media Transmission Notify message set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1; and

NOTE: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

v. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

c. shall enter the 'U: not permitted and Transmit Taken' state as specified in the subclause 6.3.5.4.2.

d. initiates a instance of 'basic reception control operations towards the transmission participant' state machine.

6.3.5.8 In any state

6.3.5.8.1 General

This subclause describes the actions to be taken in all states defined for the basic state diagram with the exception of the 'Start-stop' and 'Releasing' states.

6.3.5.8.2 Receive MCVideo call release – 1

Upon receiving an MCVideo call release step 1 request from the application and signalling plane e.g. when the MCVideo call is going to be released or when the MCVideo client leaves the MCVideo call, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall stop sending transmission control messages to the associated transmission participant;
2. shall request the network media interface to stop sending RTP media packets towards to the associated MCVideo client;
3. shall ignore any transmission control messages received from the associated transmission participant;
4. shall request the network media interface to stop forwarding RTP media packets from the associated MCVideo client to the media distributor in the MCVideo server;
5. shall indicate to the transmission control server arbitration logic in the MCVideo server that the MCVideo client has started to disconnect from the MCVideo call; and
6. shall enter the 'Releasing' state.

6.3.5.9 State: 'Releasing'

6.3.5.9.1 General

The transmission control interface towards the MCVideo client in the transmission control server uses this state while waiting for the application and signalling plane to finalize the release of the MCVideo call or finalizing the removal of the MCVideo client from the MCVideo call.

6.3.5.9.2 Receive MCVideo call release - 2

Upon receiving an MCVideo call release step 2 request from the application and signalling plane, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall request the network media interface to release all resources associated with this MCVideo client for this MCVideo call; and
2. shall enter the 'Start-stop' state and terminate the 'basic transmission control operation towards the transmission participant" state machine associated with this transmission participant and this MCVideo call.

6.3.6 Transmission control server state transition for general reception control

6.3.6.1 General

The reception control arbitration logic in the transmission control server shall behave according to the state diagram and state transitions specified in this subclause.

Figure 6.3.6.1-1 shows the general reception operation states (Gr states) and the state transition diagram.

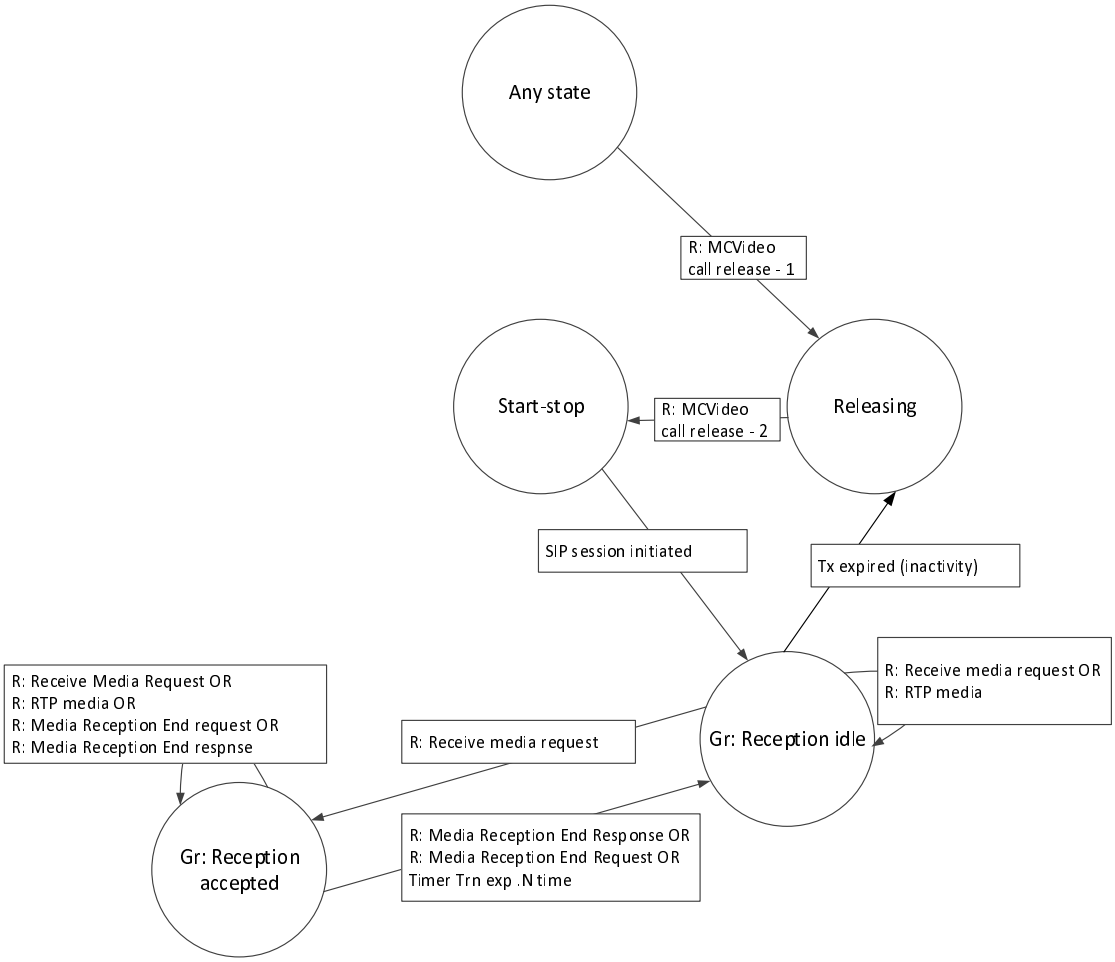


Figure 6.3.6.1-1: Transmission control server state transition diagram for 'general reception control operation'

The reception control arbitration logic in the transmission control server shall keep one instance of the 'general transmission control operation' state machine per MCVideo call.

If transmission control messages or RTP media packets arrives in a state where there is no procedure specified in the following subclauses the transmission control arbitration logic in the transmission control server:

1. shall discard the transmission control message;
2. shall request the media distributor in the MCVideo server to discard any received RTP media packet; and
3. shall remain in the current state.

State details are explained in the following subclauses.

6.3.6.2 State: 'Start-stop'

6.3.6.2.1 General

When a new instance of the 'general reception control operation' state machine is initiated, before any reception control related input is applied, the state machine is in 'Start-stop' state. Similarly when the call is released the state machine shall return to the 'Start-stop' state or the related MCVideo call is released.

6.3.6.2.2 MCVideo call initialization

When an MCVideo call is initiated as specified in 3GPP TS 24.281 [2] and

1. if a confirmed indication is required and at least one invited MCVideo client has accepted the invitation;

2. if a confirmed indication is not required; or

then the reception control arbitration logic in the transmission control server:

1. shall create an instance of the 'general reception control operation' state machine;
2. shall wait for the 'basic reception control operation towards the transmission participant' to be initialized before continuing the following steps;
3. when the 'basic reception control operation towards the transmission participant' state machine is initialized and the initialised session is not a temporary group session:
   a. shall enter the 'G: Reception Idle' state as specified in subclause 6.3.6.3.2; or

6.3.6.3 State: 'Gr: Reception Idle'

6.3.6.3.1 General

The reception control arbitration logic in the transmission control server is in this state when no MCVideo user currently accept the media invitation to receive media.

Timer T5 (Inactivity) can be running when the reception control arbitration logic in the transmission control server is in this state.

6.3.6.3.2 Enter the 'Gr: Reception Idle' state

When entering this state from any state except the 'Start-stop' state, the reception control arbitration logic in the transmission control server:

1. shall start timer T5 (Reception Inactivity);
2. shall initialise counter C7 (Reception Accepted) to 0;
3. shall set the general state to the 'Gr: Reception Idle' state;

6.3.6.3.3 Receive Media Transmission Notify message (R: Media Transmission Notify)

Upon receiving a media transmission request notify message the transmission control arbitration logic in the transmission control server, the reception control arbitration logic in the transmission control server:

1. shall send the Media Transmission Notify message to all other transmission participants. The Media Transmission Notify message:
   a. if a group call is a broadcast group call, system call, emergency call, an imminent peril call, shall include the Reception Mode the Reception Mode field set to '0' indicateing automatial reception mode;
   b. If a group call is not a broadcast group call, system call, emergency call or an imminent peril call, shall include the Reception Mode the Reception Mode field set to '1' indicateing manual reception mode.2. shall remain the 'Gr: Reception Idle' state.

6.3.6.3.4 Void

6.3.6.3.5 Timer T5 (Reception Inactivity) expired

On expiry of timer T5 (Reception Inactivity) the reception control arbitration logic in the transmission control server based on a configurable service provider policy either:

1. shall indicate to the application and signalling plane that timer T5 (Reception Inactivity) has expired;
2. if the application and signalling planes initiates MCVideo call release, shall enter the 'Releasing' state; and
3. if the application and signalling planes do not initiate MCVideo call release:
   a. should restart the T5 (Reception Inactivity) timer; and
   b. shall remain in the 'G: Reception Idle' state.

6.3.6.3.6 Reception of Receive Media Request message (R: Receive Media Request)

Upon receiving a Receive Media Request message, the reception control arbitration logic in the transmission control server:

1. if the Receive Media Request is rejected:
   a. shall send the Receive Media Response (Rejected) message. The Receive Media Response message:
      i. the first bit in the subtype of the Receive media response message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message; and
      ii. shall include the Result field set to 0 (Receive media rejected); and
   b. shall remain the 'Gr: Reception accepted' state; or
2. if the Receive Media Request is granted:
   a. shall stop timer T5 (Reception Inactivity);
   b. shall store the SSRC of transmission participant requesting to receive media until the reception is finished associated with that Transmission request;
   c. shall send the Receive Media Response message. The Receive Media Response message:
      i. the first bit in the subtype of the Receive media response message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message; and
      ii. shall include the Result field set to 1 (Receive media granted);
   d. shall increase C7 (Reception Accepted) by 1 if it has not reach its upper limit; and
   e. shall enter the 'Gr: Reception accepted' state.

6.3.6.3.7 Receive RTP media (R: RTP media)

Upon receiving RTP media, the reception control arbitration logic in the transmission control server:

1. shall instruct the media distributor to forward the RTP media packets to MCVideo clients according to local policy:
   a. If discard is specified in the local policy for transmission without receiving MCVideo clients, shall discard the RTP packet;
   b. If buffer is specified in the local policy for transmission without receiving MCVideo clients, shall buffer the RTP packet;
2. shall remain 'Gr: Reception Idle' state.

6.3.6.4 State: 'Gr: Reception accepted'

6.3.6.4.1 General

The reception control arbitration logic in the transmission control server is in this state when other MCVideo users currently accept the media invitation to receive media.

6.3.6.4.2 Enter the 'Gr: Reception Accepted' state

When entering this state from any state except the 'Start-stop' state, the reception control arbitration logic in the transmission control server:

1. shall stop timer T5 (Inactivity);
2. shall set the general state to the 'Gr: Reception Accepted' state;

6.3.6.4.3 Reception of Receive Media Request message (R: Receive Media Request)

Upon receiving a Receive Media Request message, the reception control arbitration logic in the transmission control server:

1. if the Receive Media Request is rejected:
   a. shall send the Receive Media Response (Rejected) message. The Receive Media Response message:
      i. the first bit in the subtype of the Receive media response message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message; and
      ii. shall include the Result field set to 0 (Receive media rejected); and
   b. shall remain the 'Gr: Reception accepted' state; or
2. if the Receive Media Request is granted:
   a. shall stop timer T5 (Inactivity);
   b. shall store the SSRC of transmission participant requesting to receive media until the reception is finished associated with that Transmission request;
   c. shall send the Receive Media Response (Granted) message. The Receive Media Response message:
      i. the first bit in the subtype of the Receive media response message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message; and
      ii. shall include the Result field set to 1 (Receive media granted);
   d. shall start timer T6 (Reception Granted);
   e. shall increase C7 (Reception Accepted) by 1 if it has not reach its upper limit; and
   f. shall remain the 'Gr: Reception accepted' state.

6.3.6.4.4 Reception of Receive Media End Request message (R: Receive Media End Request)

Upon receiving a Receive Media End Request message, the reception control arbitration logic in the transmission control server:

1. if the Receive Media End Request is rejected:
   a. shall send the Receive Media End Response (Rejected) message. The Receive Media End Response message:
      i. the first bit in the subtype of the Receive media end response message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message.
      ii. shall include the Message Type field set to 'y' (Receive media end granted);
   f. shall remain the 'Gr: Reception accepted' state.
2. if the Receive Media End Request is granted:
   a. shall send the Receive Media End Response (Granted) message. The Receive Media End Response message:
      i. the first bit in the subtype of the Receive media end response message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message.
      ii. shall include the Message Type field set to 'y' (Receive media end granted);
   b. shall stop timer T6 (Reception Granted);
   c. shall decrease C7 (Reception Accepted) by 1 if it has not reach its lower limit;
   d. if C7 has not reached it lower limit, shall remain the 'Gr: Reception accepted' state.

e. if C7 has reached it lower limit, shall enter the 'Gr: Reception Idle' state.

6.3.6.4.5 Reception of Receive Media End Response (Granted) message (R: Receive Media End Response)

Upon receiving a Receive Media End Response (Granted) message, the reception control arbitration logic in the transmission control server:

1. if the the first bit in the subtype of the Receive media end response message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message.
2. shall stop timer T6 (Reception Granted);
3. shall decrease C7 (Reception Accepted) by 1 if it has not reach its lower limit;
4. if C7 has not reached it lower limit, shall remain the 'Gr: Reception accepted' state.
5. if C7 has reached it lower limit, shall enter the 'Gr: Reception Idle' state.

6.3.6.4.6 Reception of Receive Media End Response (Rejected) message (R: Receive Media End Response)

Upon receiving a Receive Media End Response (Rejected) message, the reception control arbitration logic in the transmission control server:

1. if the the first bit in the subtype of the Receive media end response message is set to '1' (Acknowledgment is required) as described in subclause 9.2.2.1, shall send a Transmission control Ack message.
2. shall remain the 'Gr: Reception accepted' state.

6.3.6.4.7 Receive RTP media (R: RTP media)

Upon receiving a RTP media, the reception control arbitration logic in the transmission control server:

1. shall instruct the media distributor to forward the RTP media packets to MCVideo clients according to local policy; and
2. shall remain the 'Gr: Reception accepted' state.

6.3.6.4.8 Timer T6 (Reception Granted) expires

On expiry of timer T6 (Reception Granted) the reception control arbitration logic in the transmission control server:

1. shall send a Receive Media Response (Granted) message to the granted transmission participant if counter C6 (Reception Granted) has not reached its upper limit.
2. shall start timer T6 (Reception Granted) and increment counter C6 (Reception Granted) by 1 if counter C6 (Reception Granted) has not reached its upper limit; and
3. shall remain in the 'G: Reception accepted' state.

6.3.6.4.9 Timer T6 (Reception Granted) expired N times

When timer T6 (Reception Granted) expires and counter C6 (Reception Granted) reaches its upper limit, the reception control arbitration logic in the transmission control server:

1. shall remain in the 'G: Reception Accepted' state.

6.3.6.5 State: 'Gr: Any state'

6.3.6.5.1 General

This subclause describes the actions to be taken in all states defined for the general state diagram with the exception of the 'Start-stop' state.

6.3.6.5.2 Receive MCVideo call release - 1

This subclause is used by the reception control arbitration logic in the transmission control server when an MCVideo call is released.

Upon receiving an MCVideo call release step 1 request from the application and signalling plane the transmission control arbitration logic in the transmission control server:

1. shall request the media distributor in the MCVideo server to stop sending RTP media packets MCVideo clients; and
2. shall enter the 'Releasing' state.

6.3.6.6 State: 'Gr: Releasing'

6.3.6.6.1 General

The reception control arbitration logic in the transmission control server uses this state while waiting for the application and signalling plane to finalize the disconnection of an MCVideo call.

6.3.4.6.2 Receive MCVideo call release - 2

Upon receiving an MCVideo call release step 2 request from the application and signalling plane, the reception control arbitration logic in the transmission control server:

1. shall release all resources reserved in the media plane including the instances used for the 'transmission control server state transition diagram for general reception control operation', and 'Transmission control server state transition diagram for basic reception control operation towards the transmission participant' state machines and any running timers associated with the state machines; and
2. shall enter the 'Start-stop' state.

6.3.7 Transmission control server state transition for basic reception control operations towards the transmission participant

6.3.7.1 General

The reception control interface towards the MCVideo client in the transmission control server shall behave according to the state diagram and state transitions specified in this subclause.

Figure 6.3.7.1-1 shows the states and state transitions for an associated transmission participant in the transmission control server.

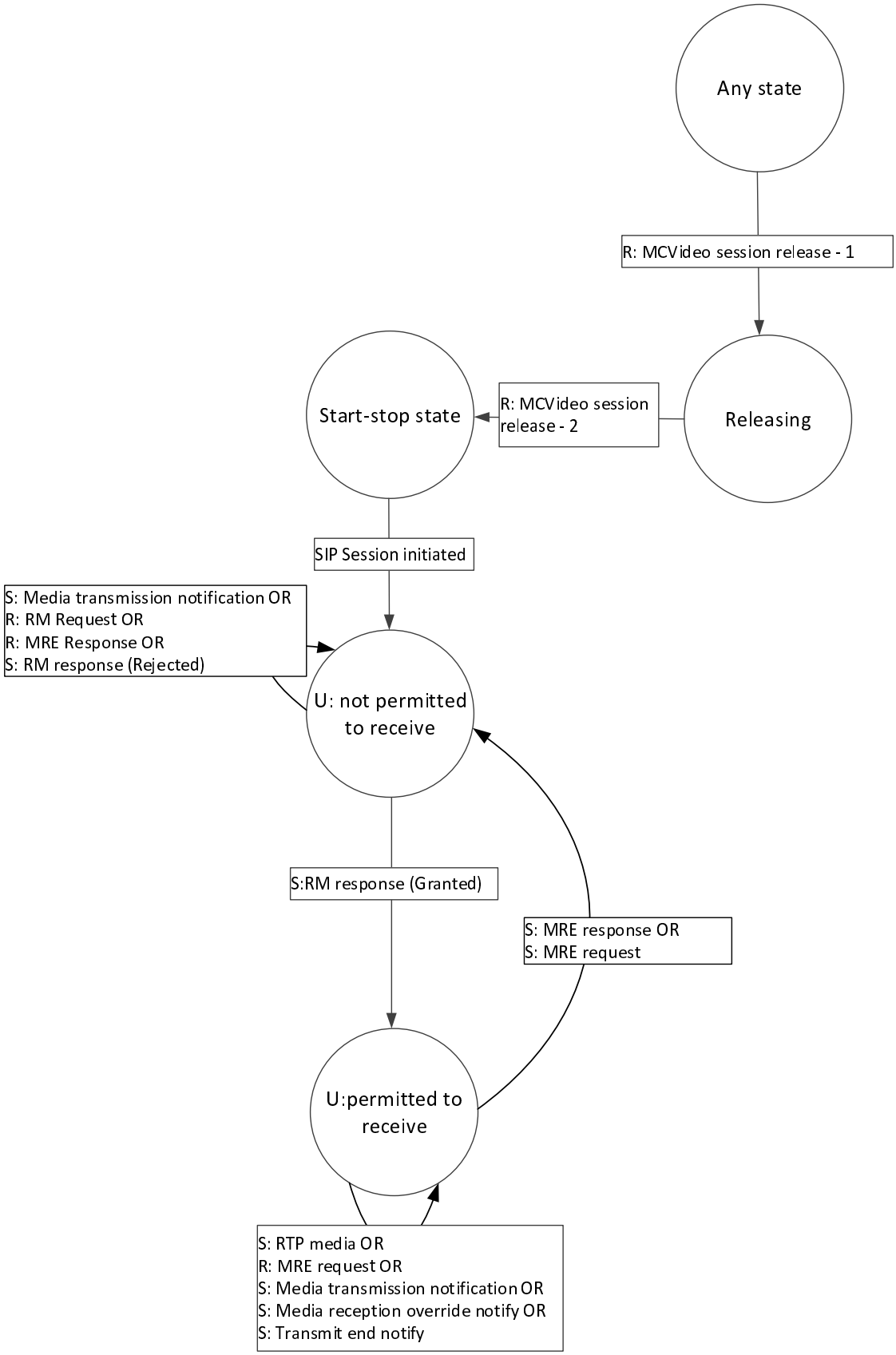


Figure 6.3.7.1-1: Transmission control server state transition diagram for basic reception control operation towards the transmission participant

The reception control interface towards the MCVideo client in the transmission control server shall create one instance of the 'basic reception control operations' state machine towards the MCVideo client for every transmission participant served by the transmission control server as follows:

1. For pre-arranged group call in case of an originating MCVideo call, the 'basic transmission control operation towards the transmission participant' state machine shall be created when the MCVideo server sends the SIP 200 (OK) response towards the originating MCVideo client.

2. For pre-arranged group call in case of a terminating MCVideo call, the 'basic transmission control operation towards the transmission participant' state machine shall be created when the transmission control server receives the SIP 200 (OK) response.

3. For chat group call the 'basic transmission control operation state machine towards the transmission participant' shall be created when the MCVideo server sends the SIP 200 (OK) response to the received initial SIP INVITE request.

The transmission participant associated to the 'basic reception control operation towards the transmission participant' state machine is here referred to as the "associated transmission participant".

The external inputs to the state machine are:

1. directives coming from the reception control arbitration logic;

2. transmission control messages sent by the transmission participants;

3. media; and

4. in certain cases, SIP messages used for call handling.

If transmission control messages or RTP media packets arrives in a state where there is no procedure specified in the following subclauses, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall discard the transmission control message;

2. shall request the network media interface in the MCVideo server to discard any received RTP media packet; and

3. shall remain in the current state.

State details are explained in the following subclauses.

6.3.7.2 State: 'Start-stop'

6.3.7.2.1 General

When a new instance of the 'basic reception control operations towards the transmission participant' state machine is created, before any reception control related input is applied, the state machine is in the 'Start-stop' state. Similarly when the call is released the state machine shall return to the Start-Stop state.

An association between the transmission control server and a transmission participant in the MCVideo client is created, when the state machine is created; and

1. in case of an originating MCVideo call, when the MCVideo server sends the SIP 200 (OK) response to the originating MCVideo client; and

2. in case of a terminating MCVideo call, when the transmission control server receives the SIP 200 (OK) response sent from the terminating MCVideo client.

6.3.7.2.2 SIP Session initiated

When a SIP Session is established and if the session is a normal group call session:

NOTE 1: Temporary group call is not supported in this release. Normal group call contains pre-arranged group call, chat group call, broadcast group call.

1. shall initialize a general state machine as specified in subclause 6.3.6.2.2; and

NOTE 2: In the subclause 6.3.6.2.2 the 'general reception control operation' state machine will continue with the initialization of the 'general reception control operation' state machine.

2. shall enter the state 'U: not permitted to receive' as specified in the subclause 6.3.7.3.2;

The maximum reception priority of the transmission participant is permitted to request is negotiated in the "mc_reception_priority" fmtp attribute as specified in clause 14.

6.3.7.3 State: 'U: not permitted to receive'

6.3.7.3.1 General

The transmission control interface towards the MCVideo client in the transmission control server uses this state when the associated transmission participant is not permitted to receive media.

6.3.7.3.2 Enter state 'U: not permitted to receive'

When entering this state, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall set the state for the associated transmission participant to 'U: not permitted to receive'.

6.3.7.3.3 Send Media Transmission Notification message (S: Media Transmission Notification)

When the transmission control server has received RTP media packets from another transmission participant, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall send the Media Transmission Notification message to the transmission participant;
2. shall include the User ID and the SSRC of user transmitting the media in the Media Transmission Notification message;
3. may set the first bit in the subtype of the Media Transmission Notification message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1,

NOTE: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

4. initiates a instance of 'basic reception control operations towards the transmission participant' state machine.
5. shall remain in the 'U: not permitted to receive' state as specified in the subclause 6.3.7.3.2.

6.3.7.3.4 Reception of Receive Media Request message (R: Receive Media Request)

Upon receiving a Receive Media Request message from the associated transmission participant, the transmission control interface towards the MCVideo client in the transmission control server:

1. if the session is not a broadcast group call, shall forward the Receive Media Request message to the transmission control server arbitration logic;
2. if the transmission control server arbitration logic decides that the transmission participant cannot receive media, shall send a Receive Media Response (Rejected) message to the associated transmission participant. The Receive Media Response (Rejected) message:
   a. shall include in the Result field the <Result indicator> value result#0 (Rejected)
   b. shall include in the Reject Cause field the <Reject Cause> value:
      i. cause#0 (Insufficient downlink bandwidth); or
      ii. cause#1 (No permission to receive)
   c. may include in the Reject Cause field an additional text string explaining the reason for rejecting the Transmission request in the <Reject Phrase> value;
   d. may set the first bit in the subtype of the Transmission Response (Rejected) message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1; and

NOTE 3: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

e. if a group call is a broadcast group call, a system call, an emergency call, an imminent peril call, or a temporary group session, shall include the Transmission Indicator field with appropriate indications; and

3. shall remain in the 'U: not permitted to receive' state.

Upon receiving a Receive Media Request messagae from the associated transmission participant including a Reception Priority field, the reception priority shall be the lower of the reception priority included in Receive Media Request message and the negotiated maximum reception priority that the MCVideo client is permitted to request.

6.3.7.3.5 Receive Media Reception End Response message (R: Media Reception End Resonse)

Upon receiving the Media Reception End Response message from the transmission participant, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall release any downlink resources associated with the transmission participant; and

2. shall remain in the 'U: not permitted to receive' state.

6.3.7.3.6 Send Receive Media Response (Granted) message (S: Receive Media Response (Granted))

When the transmission control server arbitration logic in the MCVideo server decides to grant permission to the transmission participant to receive the media, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall send the Receive Media Response (Granted) message to the associated transmission participant;

2. may set the first bit in the subtype of the Receive Media Response (Granted) message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1; and

NOTE: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

3. shall enter the state 'U: permitted to receive' as specified in subclause 6.3.7.4.2.

6.3.7.4 State: 'U: permitted to receive'

6.3.7.4.1 General

The transmission control interface towards the MCVideo client in the transmission control server uses this state when the associated transmission participant has been given permission to receive media.

6.3.7.4.2 Enter state 'U: permitted to receive'

When entering this state the transmission control interface towards the MCVideo client in the transmission control server:

1. shall set the state for the associated transmission participant to 'U: permitted to receive'.

6.3.7.4.3 Send RTP media packets (S: RTP media)

Upon the decision of the transmission control server arbitration logic to permit the transmission participant to receive a media in transmission, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall request the network media interface in the MCVideo server to forward RTP media packets to the media distributor in the MCVideo server; and

2. shall remain in the 'U: permitted to receive' state.

6.3.7.4.4 Receive Media Reception End Request message (R: Media Reception End Request)

Upon receiving a Media Reception End Request message from the associated transmission participant, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall forward the Media Reception End Request message to the general transmission control operation state machine of the transmission control arbitration logic in the MCVideo server; and
2. shall remain in the 'U: permitted to receive' state.

6.3.7.4.5 Send Media Transmission Notification message (S: Media Transmission Notification)

When transmission control server has received RTP media packets from another transmission participant on uplink, the transmission control interface towards the MCVideo client in the transmission control server:

1. initiates a instance of 'basic reception control operations towards the transmission participant' state machine;
2. shall send the Media Transmission Notification message to the transmission participant;
3. shall include the User ID and the SSRC of user transmitting the media in the Media Transmission Notification; and
4. shall remain in the 'U: permitted to receive' state.

6.3.7.4.6 Send Media Reception Override Notify message (S: Media Reception Override Notify)

When transmission control server has received RTP media packets from another transmission participant on uplink and the transmission control server decides that it cannot send the RTP media packet on downstream even if the user if permitted to receive, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall send the Media Reception Override Notify message to the transmission participant; and
2. shall remain in the 'U: permitted to receive' state.

6.3.7.4.7 Send Transmission End Notify message (S: Transmission End Notify)

When transmission control server has stopped receiving RTP media packets from another transmission participant on uplink, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall send the Transmission End Notify message to the transmission participant; and
2. shall remain in the 'U: permitted to receive' state.

6.3.7.4.8 Send Media Reception End Request message (S: Media Reception End Request)

When the transmission control server determines to end sending the RTP media packets on downlink to the transmission participant, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall stop sending the RTP media packets to the transmission participant;
2. shall send the Media Reception End Request message to the transmission participant;
3. shall include the SSRC of the user transmitting the media in the Media Reception End Request message; and
4. shall enter the 'U: not permitted to receive' state.

6.3.7.4.9 Send Media Reception End Response message (S: Media Reception End Response)

When the transmission control server determines to end sending the RTP media packets on downlink to the transmission participant, the transmission control interface towards the MCVideo client in the transmission control server:

1. shall stop sending the RTP media packets to the transmission participant;

2. shall send the Media Reception End Response message to the transmission participant, may set the first bit in the subtype of the Media Reception End Response message to '1' (Acknowledgment is required) as described in subclause 9.2.2.1; and

NOTE 3: It is an implementation option to handle the receipt of the Transmission control Ack message and what action to take if the Transmission control Ack message is not received.

3. shall enter the 'U: not permitted to receive' state.

6.4 Participating MCVideo function transmission control procedures

6.4.1 General

Once an on-demand MCVideo session is established or a pre-established session is in use when the participating MCVideo function receives transmission control messages from the transmission participant in the MCVideo client or from the transmission control server in the controlling MCVideo function, the behaviour of the participating MCVideo function is described in the following subclauses.

6.4.2 Receive transmission control messages

Upon receiving a transmission control message the participating MCVideo function:

1. shall immediately forward the transmission control message to the transmission control server if the message is received from the transmission participant;

2. if an MBMS subchannel is not used for a transmission in the session the transmission control message is associated with, shall immediately forward the transmission control message to the transmission participant if the message is received from the transmission control server; and

3. if an MBMS subchannel is used for a transmission in the session the transmission control message is associated with:

   a. if

      i. the transmission control message is not a Transmission Idle message or a Media Transmission Notify message;

      ii. the MCVideo client has not reported "listening" status as specified in 3GPP TS 24.281 [2] subclause 14.2.3; or

      iii. the MCVideo client has reported "not-listening" status as specified in 3GPP TS 24.281 [2] subclause 14.2.3 in the latest received MBMS bearer listening status report;

      shall immediately forward the transmission control message to the transmission participant; and

   b. if

      i. the MCVideo client has reported "listening" status as specified in 3GPP TS 24.281 [2] subclause 14.2.3 in the latest received MBMS bearer listening status report; and

      ii if the transmission control message is the Transmission Idle message or the Media Transmission Notify message,

   shall perform actions as specified in subclause 10.2.

NOTE: When the Transmit Idle or Media Transmission Notify messages are discarded the messages are sent to the MCVideo clients over the MBMS subchannel allocated for the transmission as specified in subclause 10.2.

6.4.3 Receive RTP media packets (R: RTP Media)

Upon receiving RTP media packets the participating MCVideo function:

1. shall immediately forward the RTP media packet to the controlling MCVideo function if the RTP packet is from an MCVideo client; and

2. if an MBMS subchannel is not used for a transmission in the session the RTP media packets are associated with, shall immediately forward the RTP media packets to the MCVideo client if the RTP packet is from the controlling MCVideo function or the non-controlling MCVideo function.

3. if an MBMS subchannel is used for a transmission in the session the RTP media packets are associated with and if RTP media packets are received from the controlling MCVideo function or the non-controlling MCVideo function:

   a. if

      i. the MCVideo client has not reported "listening" status as specified in 3GPP TS 24.281 [2] subclause 14.2.3; or

      ii. the MCVideo client has reported "not-listening" status as specified in 3GPP TS 24.281 [2] subclause 14.2.3 in the latest received MBMS bearer listening status report,

      shall immediately forward the RTP media packets to the MCVideo client; and

   b. if the MCVideo client has reported "listening" status as specified in 3GPP TS 24.281 [2] subclause 14.2.3 in the latest received MBMS bearer listening status report, shall perform actions as specified in subclause 10.2.

6.4.4 Release of session

When the participating function receives an indication from the application and signalling plane that session release is initiated, the participating MCVideo function:

1. shall stop sending transmission control messages towards the transmission participant and the transmission control server; and

2. shall stop sending RTP media packets towards the MCVideo client and towards the controlling MCVideo function.

When the participating MCVideo function receives an indication from the application and signalling plane that the session is released, the participating MCVideo function:

1. in case of a pre-established session, shall perform the actions in subclause 9.3.2; and

2. in case of an on-demand session, shall release the media resources associated with the session.

7 Off-network MCVideo service media plane procedures

7.1 General

Transmission control in off-network can be performed in two ways:

- Single arbitrator: transmission participants rely on a single participant designated as transmission arbitrator for the arbitration of transmission requests.

- Self arbitration: each transmission participant arbitrates its own transmission based on its view of the topology.

Both of the approaches, as appropriate for the deployment model, can be adopted for a MCVideo group using the "/<x>/<x>/OffNetwork/MCVideo/ArbitrationApproach" configuration parameter.

If the value of "/<x>/<x>/OffNetwork/MCVideo/ArbitrationApproach" leaf node present in group configuration as specified in 3GPP TS 24.483 [4] is set to:

- "single", then single arbitrator approach applies; or

- "self", then self arbitration approach applies.

In the single arbitrator approach, one MCVideo client assumes the responsibility for arbitration of transmission requests for all group members within range. All requests for transmission are directed to the arbitrator, and the arbitrator checks the configured limits on the simultaneous transmissions, and grants or denies the request. If an MCVideo client is out of range of the current arbitrator, the MCVideo client is allowed to transmit and also become a transmission arbitrator. If there is insufficient capacity to carry an extra transmission i.e. the configured limit for simultaneous transmissions is reached, the MCVideo client can request that an existing transmitting MCVideo client is pre-empted; the pre-emption request is sent to the transmission arbitrator.

In the self arbitration approach, each MCVideo client decides for itself whether there is sufficient capacity to carry the transmission. If it determines that there is insufficient capacity i.e. the configured limit for simultaneous transmissions is reached, and from its perspective another transmitting MCVideo client has a lower priority, the requesting MCVideo client can send an override request directly to this other transmitting MCVideo client, which will either accept the override request and give way, or deny the override request.

In both the single arbitrator approach and the self arbitration approach, if there is insufficient capacity to carry the communication i.e. the configured limit on the simultaneous transmissions is reached, the MCVideo client can report this to the MCVideo user. The MCVideo user can decide to transmit anyway, and instruct the MCVideo client to proceed with the transmission.

7.2 Transmission participant procedures for single arbitrator approach

7.2.1 Transmission participant procedures at MCVideo session initialisation

This subclause applies when no active transmission control session exists.

Before a transmission control entity is initiated a state machine with a single state, named as 'Start-stop' state, shall exist. At 'Start-stop' state, when the MCVideo client receives a request of the MCVideo call control entity to initiate the transmission control as originating client, then the MCVideo client shall initiate a transmission control entity and the transmission control entity shall enter into the 'O: transmission arbitration' state. Otherwise, if MCVideo client receives a request of the MCVideo call control entity to initiate the transmission control as terminating client, then the MCVideo client shall initiate a transmission control entity and the transmission control entity for an MCVideo group call shall enter into the 'O: silence' state or for both MCVideo private call and MCVideo broadcast call shall enter the 'O: has no permission' state.

Once the session is initiated, the initial transmission control messages are sent according to the state machine presented in subclause 7.2.3. Normally, once the session is started the originating MCVideo client has the transmission implicitly. For an on-going off-network group call, if an MCVideo client joins later, then it starts the transmission control session and takes the role of transmission participant and enters 'O: silence' state.

7.2.1.2 Determine off-network transmission priority

In the absence of a mission critical organization's method for determining off-network transmission priority, the following procedure shall be used. Otherwise, the mission critical organization's method shall supersede this subclause.

Upon receiving a Transmission Request message, to determine the transmission priority of the Transmission Request message, the transmission arbitrator:

1. shall check the presence of Transmission priority field in the received Transmission Request message. If present, the transmission arbitrator:

    a. shall determine the transmission priority of the Transmission Request message by choosing the lowest value from the following inputs:

        i. the value of the Transmission priority field in the received Transmission Request message;

        ii. the value of the "/<*x*>/<x>/Common/MCPTTGroupMemberList/<x>/UserPriority" leaf node of the sender of the Transmission Request message, present in group configuration as specified in 3GPP TS 24.483 [4]; and

iii. the value of the "/<x>/OffNetwork/NumLevelHierarchy" leaf node present in service configuration as specified in 3GPP TS 24.483 [4]; and

2. if the Transmission priority field is not present in the Transmission Request message, the transmission arbitrator:

   a. shall use the minimum value allowed for the Transmission priority as transmission priority of the Transmission Request message.

Once the transmission priority of the Transmission Request message is determined, to determine the effective priority of the Transmission Request message, if the number of transmitters has reached maximum, the transmission arbitrator:

1. shall check the type of call indicated by the Transmission Indicator field of the received Transmission Request message and:

   a. if the type of call indicated by the Transmission Indicator field is Normal call and:

      i. if the current type of the call is normal, shall continue to check the next input parameter from step 2; or

      ii if the current type of the call is emergency or imminent-peril, shall deny the transmission request and skip step 2;

   b. if the type of call indicated by the Transmission Indicator field is Imminent peril call and:

      i. if the current type of the call is normal:

         A. shall pre-empt a current transmitter;

         B. shall grant the transmission request; and

         C. shall skip step 2;

      ii. if the current type of the call is imminent-peril, shall continue to check the next input parameter from step 2; and

      iii. if the current type of the call is emergency, shall deny the transmission request and skip step 2;

   c. if the type of the call indicated by the Transmission Indicator field is Emergency call and:

      i. if the current type of the call is normal or imminent-peril:

         A. shall pre-empt a current transmitter; and

         B. shall grant the transmission request;

         C. shall skip step 2;

      ii. if the current type of the call is emergency, shall continue to check the next input parameter from step 2; and

2. shall compare the determined transmission priority of the received Transmission Request message to the effective priority of the current transmitters (determined at the time of transmission grant to the current transmitters) and:

   a. if the effective priority of all the current transmitters are equal to or higher than the determined transmission priority of the Transmission Request message, shall deny the transmission request; and

   b. if the determined transmission priority of the Transmission Request message is higher than any of the current transmitters:

      i. shall pre-empt a current transmitter with lower priority; and

      ii. shall grant the transmission request.

7.2.2 Transmission participant procedures at MCVideo call release

This subclause applies when an active transmission control session exists.

When the off-network call is released the transmission control session is terminated. The off-network transmission control session can also be terminated when no media transmission or reception takes place during transmission control session hold time, T230 (Inactivity). The termination of the transmission control session as a result of the expiry of timer T230 (Inactivity) may terminate the call session.

7.2.3 Transmission participant state diagram – basic operation

7.2.3.1 General

The transmission participant shall behave according to the state diagram and the transitions specified in this subclause.

The received transmission messages and the RTP media packets are inputs to the state machine according to their arrival order. They are not ignored unless otherwise stated.

The MCVideo client also provides input to the state machine as request to transmit video (click video transmission send button) or as end of video transmission (click video transmission end button).

Figure 7.2.3.1-1 show the 'Transmission participant state diagram – basic operation'.

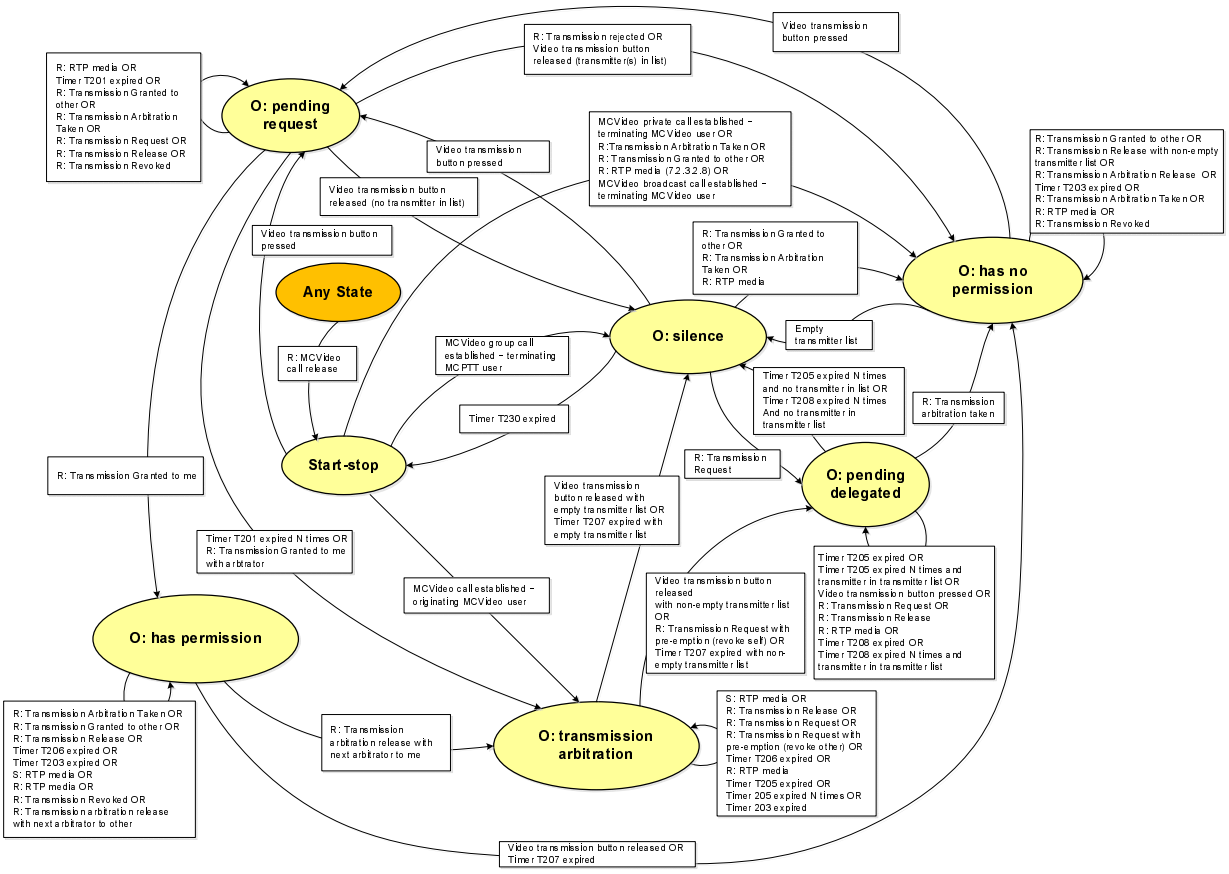


Figure 7.2.3.1-1: 'Transmission participant state diagram – basic operation'

State details are explained in the following subclauses.

If an RTP media packet or a transmission control message arrives in a state where there is no specific procedure specified for the RTP media packet or the received transmission control message, the transmission participant shall discard the transmission control message or the RTP media packet and shall remain in the current state.

NOTE: A badly formatted RTP packet or transmission control message received in any state is ignored by the transmission participant and does not cause any change of the current state.

7.2.3.2 State: 'Start-stop'

7.2.3.2.1 General

When a new instance of the state machine is created, before any transmission control related input is applied, the state machine is in the 'Start-stop' state. Similarly when the call is released or the transmission control session is terminated, the state machine shall return to the 'Start-stop' state.

7.2.3.2.2 MCVideo call established – originating MCVideo user

When an MCVideo call is established with session announcement including an explicit transmission request, the originating transmission participant:

1. shall create an instance of a transmission participant state transition diagram for basic operation state machine;
2. shall send Transmission Granted message towards other transmission participants. The Transmission Granted message:
   a. shall include the granted priority in the Transmission priority field;
   b. shall include the MCVideo user's own MCVideo ID in the User ID field; and
   c. if the transmission request is a broadcast group call, system call, emergency call or an imminent peril call, shall include a Transmission Indicator field indicating the relevant call types; and
3. shall enter 'O: transmission arbitration' state.

7.2.3.2.3 MCVideo group call established – terminating MCVideo user

When an MCVideo call is established the terminating transmission participant:

1. shall create an instance of a transmission participant state transition diagram for basic operation state machine;
2. shall start timer T230 (Inactivity); and
3. shall enter 'O: silence' state.

7.2.3.2.4 MCVideo private call established – terminating MCVideo user

When an MCVideo private call is established the terminating transmission participant:

1. shall create an instance of a transmission participant state transition diagram for basic operation state machine;
2. shall start timer T203(End of RTP media); and
3. shall enter 'O: has no permission' state.

7.2.3.2.5 Send Transmission Request message (click video transmission send button)

If the transmission participant receives an indication from the MCVideo user to send media, the transmission participant:

1. shall create an instance of a transmission participant state transition diagram for basic operation state machine;
2. shall send the Transmission Request message to other transmission participants. The Transmission Request message:
   a. if a different priority than the normal priority is required, shall include the Transmission Priority field with the requested priority in the <Transmission Priority> value;

b. shall include the MCVideo ID of the MCVideo user in the <User ID> value of the User ID field; and

c. if the transmission request is a broadcast group call, system call, emergency call or an imminent peril call, shall include a Transmission Indicator field indicating the relevant call types;

3. shall initialise the counter C201 (Transmission request) with value set to 1;

4. shall start the timer T201 (Transmission request); and

5. shall enter 'O: pending request' state.

7.2.3.2.6 Receive Transmission Arbitration Taken message (R: Transmission Arbitration Taken)

When a Transmission Arbitration Taken message is received, the transmission participant:

1. shall create an instance of a transmission participant state transition diagram for basic operation state machine;

2. may provide a transmission taken notification to the MCVideo user;

3. shall set the stored current transmission arbitrator to Granted Party's Identity value of the Granted Party's Identity field in the Transmission Arbitration Taken message;

4. shall start timer T203 (End of RTP media) and store the current transmission arbitrator in transmitter list; and

5. shall enter 'O: has no permission' state.

7.2.3.2.7 Receive Transmission Granted message (R: Transmission Granted to other)

When a Transmission Granted message is received, the transmission participant:

1. shall create an instance of a transmission participant state transition diagram for basic operation state machine;

2. may provide a transmission taken notification to the MCVideo user;

3. shall set the stored current transmission arbitrator to the identity of sender of Transmission Granted message;

4. shall start timer T203 (End of RTP media) and store the user to whom the transmission was granted in the Transmission Granted message in transmitter list; and

5. shall enter 'O: has no permission' state.

7.2.3.2.8 Receive RTP media (R: RTP media)

Upon receiving RTP media packets, the transmission participant:

1. shall create an instance of a transmission participant state transition diagram for basic operation state machine;

2. may provide a transmission taken notification to the MCVideo user;

3. shall restart timer T203 (End of RTP media);

4. shall request the MCVideo client to start rendering received RTP media packets; and

5. shall enter 'O: has no permission' state.

7.2.3.2.9 MCVideo broadcast call established – terminating MCVideo user

When an MCVideo broadcast call is established the terminating transmission participant:

1. shall create an instance of a transmission participant state transition diagram for basic operation state machine;

2. shall start timer T203 (End of RTP media); and

3. shall enter 'O: has no permission' state.

NOTE: In MCVideo broadcast call, only originating MCVideo user is allowed to request transmission and transmit media. A Transmission Request message is locally denied to terminating MCVideo user, if requested.

7.2.3.3 State: 'O: silence'

7.2.3.3.1 General

When in this state the MCVideo client for the session is unaware of any MCVideo client acting as a transmission arbitrator, has not itself initiated a transmission control request and is not currently receiving RTP media packets.

Timer T230 (Inactivity) is running in this state.

7.2.3.3.2 Send Transmission Request message (click video transmission send button)

If the transmission participant receives an indication from the MCVideo user to send media, the transmission participant:

1. shall send the Transmission Request message to other transmission participants. The Transmission Request message:

   a. if a priority different than the default transmission priority is required, shall include the Transmission Priority field with the requested priority in the <Transmission Priority> element;

   b. shall include the MCVideo ID of the MCVideo user in the <User ID> value of the User ID field; and

   c. if the transmission request is a broadcast group call, system call, emergency call or an imminent peril call, shall include a Transmission Indicator field indicating the relevant call types;

2. shall initialise the counter C201 (Transmission request) with value set to 1;

3. shall stop timer T230 (Inactivity);

4. shall start timer T201 (Transmission Request); and

5. shall enter 'O: pending request' state.

7.2.3.3.3 Receive RTP media (R: RTP media)

Upon receiving RTP media packets, the transmission participant:

1. may provide a transmission taken notification to the MCVideo user;

2. shall stop timer T230 (Inactivity);

3. shall start timer T203 (End of RTP media) for the SSRC of RTP media packet;

4. shall request the MCVideo client to start rendering received RTP media packets; and

5. shall enter 'O: has no permission' state.

7.2.3.3.4 Receive Transmission Granted message (R: Transmission Granted to other)

When a Transmission Granted message is received and if the User ID in the Transmission Granted message does not match its own User ID, the transmission participant:

1. may provide a transmission taken notification to the MCVideo user;

2. if the Transmission Indicator field is included and the B-bit is set to '1' (Broadcast group call), shall provide a notification to the user indicating that this is a broadcast group call;

3. shall stop timer T230 (Inactivity);

4. shall start timer T203 (End of RTP media) and store the identity of the user, to whom the transmission was granted in the Transmission Granted message, in transmitter list; and

5. shall enter 'O: has no permission' state.

7.2.3.3.5 Receive Transmission Request message (R: Transmission Request)

The transition is used in private call only. When a Transmission Request message is received, the transmission participant:

1. shall send a Transmission Granted message toward the other transmission participant. The Transmission Granted message:
   a. shall include the MCVideo ID of the Transmission Request message received in User ID value of the User ID field;
   b. shall include the SSRC of the Transmission Request message received in the SSRC of transmission control server field;
   c. shall include the max duration as configured in the MCVideo client in the OffNetwork/MaxDuration parameter in the <Duration> value of the Duration field; and
   d. shall include the priority of the Transmission Request message received in the <Transmission Priority> value of the Transmission Priority field;
2. shall stop timer T230 (Inactivity);
3. shall start timer T205 (Transmission Granted); and
4. shall enter 'O: pending delegated' state.

7.2.3.3.6 Receive Transmission Arbitration Taken message (R: Transmission Arbitration Taken)

When a Transmission Arbitration Taken message is received, the transmission participant:

1. may provide a transmission taken notification to the MCVideo user;
2. shall set the stored the current transmission arbitrator to Granted Party's Identity value of the Granted Party's Identity field in the Transmission Arbitration Taken message;
3. shall stop timer T230 (Inactivity);
4. shall start timer T203 (End of RTP media) and store the identity of the current transmission arbitrator in transmitter list; and
5. shall enter 'O: has no permission' state.

7.2.3.3.7 Timer T230 (Inactivity) expired

Upon expiry of timer T230 (Inactivity), the transmission participant:

1. shall indicate to the call control that timer T230 (inactivity) has expired;
2. shall terminate the instance of transmission participant state transition diagram; and
3. shall enter 'Start-stop' state.

7.2.3.4 State: 'O: has no permission'

7.2.3.4.1 General

In this state the MCVideo client does not have permission to send media.

7.2.3.4.2 Sending Transmission Request message (click video transmission send button)

If the transmission participant receives an indication from the MCVideo user that the MCVideo user wants to send media, the transmission participant:

1. shall send the Transmission Request message to other clients. The Transmission Request message:

a. if a priority different than the default transmission priority is required, shall include the Transmission Priority field with the requested priority in the <Transmission Priority> element;

b. shall include the MCVideo ID of the MCVideo user in the User ID field; and

c. if the transmission request is a broadcast group call, system call, emergency call or an imminent peril call, shall include a Transmission Indicator field indicating the relevant call types;

2. shall initialise the counter C201 (Transmission request) with value set to 1;

3. shall start timer T201 (Transmission Request); and

4. shall enter 'O: pending request' state.

7.2.3.4.3 Receive Transmission Release message (R: Transmission Release)

When a Transmission Release message is received and if the User ID in the Transmission Release message matches with the stored User ID in transmitter list, the transmission participant:

1. may provide transmission released notification to the MCVideo user;

2. shall request the MCVideo client to stop rendering received RTP media packets;

3. shall stop timer T203 (End of RTP media) for User ID in the Transmission Release message;

4. shall delete the User ID from the transmitter list;

5. if there is no transmitter in transmitter list, shall start timer T230 (Inactivity) and enter 'O: silence' state; or

6. if there are transmitter(s) in transmitter list, shall remain in 'O: has no permission' state.

7.2.3.4.4 Receive Transmission Arbitration Release message (R: Transmission Arbitration Release)

When a Transmission Arbitration Release message is received and if the User ID in the Transmission Arbitration Release message matches with the stored current transmission arbitrator, the transmission participant:

1. may provide transmission arbitration idle notification to the MCVideo user;

2. shall stop timer T203 (End of RTP media) for User ID in the Transmission Arbitration Release message;

3. shall delete the User ID in transmitter list;

4. shall clear the stored current transmission arbitrator;

5. if there is no User ID in transmitter list, shall start timer T230 (Inactivity) and enter 'O: silence' state; or

6. if there are transmitter(s) in transmitter list, shall remain in 'O: has no permission' state.

7.2.3.4.5 Timer T203 (End of RTP media) expired

On expiry of T203 (End of RTP media) timer, the transmission participant:

1. may provide transmission lost notification to the MCVideo user for the User ID whose associated timer T203 (End of RTP media) expired;

3. shall delete the associated User ID from the transmitter list;

4. if there is no User ID in transmitter list, shall start timer T230 (Inactivity) and enter 'O: silence' state; or

5. if there are transmitter(s) in transmitter list, shall remain in 'O: has no permission' state.

7.2.3.4.6 Receive Transmission Granted message (R: Transmission Granted to other)

When a Transmission Granted message is received and if the <User ID> value in the User ID field does not match its own MCVideo ID, the transmission participant:

1. shall start timer T203 (End of RTP media) for the User ID;

2. shall store the user to whom the transmission was granted in the Transmission Granted message in transmitter list;

3. may provide a transmission taken notification to the MCVideo user;

4. if the Transmission Indicator field is included with the B-bit set to '1' (Broadcast group call), shall provide a notification to the user indicating that this is a broadcast group call; and

5. shall remain in the 'O: has no permission' state.

7.2.3.4.7 Receive RTP media (R: RTP media)

Upon receiving RTP media packets and with SSRC not associated with any transmitter stored in the transmitter list, the transmission participant:

1. shall request the MCVideo client to render the received RTP media packets;

2. shall store the SSRC of RTP media packet in the transmitter list as unknown user;

3. shall start timer T203 (End of RTP media) associated with the SSRC; and

4. shall remain in 'O: has no permission' state.

Otherwise, if SSRC of transmission participant sending the media matches the stored SSRC of a user in transmitter list, the transmission participant:

1. shall request the MCVideo client to render the received RTP media packets;

2. shall restart timer T203 (End of RTP media) associated with the User ID; and

3. shall remain in 'O: has no permission' state.

7.2.3.4.8 Receive Transmission Arbitration Taken message (R: Transmission Arbitration Taken)

When a Transmission Arbitration Taken message is received and there is no stored current transmission arbitrator, the transmission participant:

1. if the <User ID> value in the User ID field in Transmission Arbitration Taken message doesn't match with User ID in transmitter list, shall start timer T203 (End of RTP media);

2. shall store the value of <User ID> field of the Transmission Arbitration Taken message as the current transmission arbitrator; and

3. shall remain in 'O: has no permission' state.

7.2.3.4.9 Receive Transmission Revoked message (R: Transmission Revoked)

When a Transmission Revoked message is received and if the User ID in the Transmission Revoked message matches with a stored User ID in transmitter list, the transmission participant:

1. may provide transmission revoked notification to the MCVideo user;

2. shall request the MCVideo client to stop rendering received RTP media packets from the revoked user;

3. shall stop timer T203 (End of RTP media) for User ID in the Transmission Revoked message;

4. shall delete the User ID inform the transmitter list;

5. if the User ID in the Transmission Revoked message matches with the stored User ID of current transmission arbitrator, shall clear current transmission arbitrator;

6. if there is no transmitter in transmitter list, shall start timer T230 (Inactivity) and enter 'O: silence' state; or

7. if there are transmitter(s) in transmitter list, shall remain in 'O: has no permission' state.

7.2.3.5 State: 'O: transmission arbitration'

7.2.3.5.1 General

In this state the MCVideo client is acting as a transmission control server (transmission arbitrator) and has the permission to send media.

Timer T206 (Stop talking warning) and timer T207 (Stop Talking) are running in this state.

7.2.3.5.2 Send RTP Media packets (S: RTP Media)

Upon receiving encoded media from the user or if encoded media is already buffered the transmission participant:

1. shall start timer T206 (Stop talking warning);
2. shall request the MCVideo client to start sending RTP media packets towards other MCVideo clients; and
3. shall remain in 'O: transmission arbitration' state.

7.2.3.5.3 Receive Transmission Release message (R: Transmission Release)

When a Transmission Release message is received and if the User ID in the Transmission Release message matches with a stored User ID in transmitter list, the transmission participant:

1. may provide transmission release notification to the MCVideo user;
2. shall request the MCVideo client to stop rendering received RTP media packets from the user;
3. shall stop timer T203 (End of RTP media) associated with the User ID in the Transmission Release message;
4. shall delete the User ID from the transmitter list; and
5. shall remain in 'O: transmission arbitration' state.

7.2.3.5.4 Receive Transmission Request message (R: Transmission Request)

Upon receiving a Transmission Request message which is not pre-emptive and if the number of current transmitter have reached maximum then, the transmission participant:

1. shall send the Transmission Rejected message. The Transmission Rejected message:
   a. shall include in the Reject Cause field the <Reject Cause> value cause #1 (Transmission limit reached);
   b. may include in the Reject Cause field an additional text string explaining the reason for rejecting the transmission request in the <Reject Phrase> value; and
   c. shall include the User ID field received in the Transmission Request message; and
2. shall remain in 'O: transmission arbitration' state.

Upon receiving a Transmission Request message which is not pre-emptive and if the number of current transmitter have not reached the maximum limit, the transmission participant:

1. shall send the Transmission Granted message toward the other transmission participants. The Transmission Granted message:
   a. shall include the MCVideo ID of the granted transmission participant in the User ID field;
   b. shall include the SSRC of the granted transmission participant in the SSRC of the granted transmission participant field; and
   c. if the transmission request is a broadcast group call, system call, emergency call or an imminent peril call, shall include a Transmission Indicator field indicating the relevant call types;
2. shall start timer T205 (Transmission Granted) and shall initiate counter C205 (Transmission Granted) to 1;
3. shall remain in 'O: transmission arbitration' state.

7.2.3.5.5 Send Transmission Arbitration Release message (click video transmission end button with empty transmitter list)

Upon receiving an indication from the MCVideo user to release permission to send RTP media and there is no transmitter in transmitter list, the transmission participant:

1. shall stop timer T206 (Stop talking warning), if running;
2. shall stop timer T207 (Stop talking), if running;
3. shall send a Transmission Arbitration Release message towards other transmission participants. The Transmission Arbitration Release message:
   a. shall include the MCVideo ID of the MCVideo user in the User ID field; and
   b. if the session is not initiated as a broadcast group call with the B-bit set to '1' (Broadcast group call), shall include a Transmission Indicator field set to '0' (normal call);
4. shall start timer T230 (Inactivity); and
5. shall enter 'O: silence' state.

7.2.3.5.6 Send Transmission Arbitration Release message (click video transmission end button with non-empty transmitter list)

When no more encoded media is received from the user and if at least one transmitter is present in the transmitter list , the transmission participant:

1. shall stop timer T206 (Stop talking warning), if running;
2. shall stop timer T207 (Stop talking), if running;
3. shall request the MCVideo client to stop sending RTP media packets towards other MCVideo clients;
4. shall send the Transmission Arbitration Release message toward the other transmission participants. The Transmission Arbitration Release message:
   a. shall include the MCVideo ID of the MCVideo user in the User ID field;
   b. shall include the MCVideo ID of the first transmission participant in the transmitter list in the Next Arbitrator field;
   c. shall remove the first transmission participant from the transmitter list;
   d for the remaining transmission participants in the transmitter list:
      i. shall include the MCVideo ID of the transmission participant in the User ID field; and
      ii. shall include the SSRC of the transmission participant in the SSRC of transmission participant field; and
5. shall start timer T208 (Transmission Arbitration Release) and shall initiate counter C208 (Transmission Arbitration Release) to 1; and
6. shall enter the 'O: pending delegated' state.

7.2.3.5.7 Receive Transmission Request message with pre-emption indication and revoking self (R: Transmission Request with pre-emption)

Upon receiving a Transmission Request message which is pre-emptive and the transmission arbitrator revokes self, the transmission participant:

1. shall stop timer T206 (Stop talking warning), if running;
2. shall stop timer T207 (Stop talking), if running;
3. shall request the MCVideo client to stop sending RTP media packets towards other MCVideo clients;

4. shall send the Transmission Revoked message toward the other transmission participants. The Transmission Revoked message:

   a. shall include the MCVideo ID of the MCVideo user in the User ID field;

   b. shall include in the Reject Cause field the <Reject Cause> value cause #1 (Transmission limit reached);

   c. may include in the Reject Cause field an additional text string explaining the reason for rejecting the transmission request in the <Reject Phrase> value; and

   d. if the session is not initiated as a broadcast group call with the B-bit set to '1' (Broadcast group call), shall include a Transmission Indicator field set to '0' (normal call);

5. shall send the Transmission Granted message toward the other transmission participants. The Transmission Granted message:

   a. shall include the MCVideo ID of the granted transmission participant in the User ID field;

   b. shall include the SSRC of the granted transmission participant in the SSRC of the granted transmission participant field;

   c. shall include the MCVideo ID of the granted transmission participant in the Next Arbitrator field; and

   d for the transmission participants in the transmitter list:

      i. shall include the MCVideo ID of the transmission participant in the User ID field; and

      ii. shall include the SSRC of the transmission participant in the SSRC of transmission participant field;

6. shall start timer T205 (Transmission Granted) and shall initiate counter C205 (Transmission Granted) to 1; and

7. shall enter the 'O: pending delegated' state.

7.2.3.5.8 Receive Transmission Request message with pre-emption indication and revoking a transmitter (R: Transmission Request with pre-emption)

Upon receiving a Transmission Request message which is pre-emptive and the transmission arbitrator determines to revoke a transmitter from the transmitter list, the transmission participant:

1. shall request the MCVideo client to stop rendering RTP media packets from the MCVideo user to be revoked;

2. shall send the Transmission Revoked message toward the other transmission participants. The Transmission Revoked message:

   a. shall include the MCVideo ID of the MCVideo user to be revoked in the User ID field;

   b. shall include in the Reject Cause field the <Reject Cause> value cause #1 (Transmission limit reached);

   c. may include in the Reject Cause field an additional text string explaining the reason for rejecting the transmission request in the <Reject Phrase> value; and

   d. if the session is not initiated as a broadcast group call with the B-bit set to '1' (Broadcast group call), shall include a Transmission Indicator field set to '0' (normal call);

3. shall send the Transmission Granted message toward the other transmission participants. The Transmission Granted message:

   a. shall include the MCVideo ID of the granted transmission participant in the User ID field; and

   b. shall include the SSRC of the granted transmission participant in the SSRC of the granted transmission participant field;

4. shall start timer T205 (Transmission Granted) and shall initiate counter C205 (Transmission Granted) to 1; and

5. shall remain in the current state.

7.2.3.5.9 Transmission time limit warning (Timer T206 expires)

When timer T206 (Stop talking warning) expires, the transmission participant:

1. may notify the MCVideo user that the transmission time limit is about to reach;
2. shall start timer T207 (Stop talking); and
3. shall remain in the current state.

7.2.3.5.10 Transmission time limit reached with transmitter(s) in transmitter list (Timer T207 expires with transmitter(s))

When the timer T207 (Stop talking) expires and if at least one transmitter information is stored in transmitter list, the transmission participant:

1. shall request the MCVideo client to stop sending RTP media packets towards other MCVideo clients;
2. shall send the Transmission Arbitration Release message toward the other transmission participants. The Transmission Arbitration Release message:
   a. shall include the MCVideo ID of the MCVideo user in the User ID field;
   b. shall include the MCVideo ID of the first transmission participant in the transmitter list in the Next Arbitrator field;
   c. shall remove the first transmission participant from the transmitter list;
   d for the remaining transmission participants in the transmitter list:
      i. shall include the MCVideo ID of the transmission participant in the User ID field; and
      ii. shall include the SSRC of the transmission participant in the SSRC of transmission participant field; and
3. shall start timer T208 (Transmission Arbitration Release) and shall initiate counter C208 (Transmission Arbitration Release) to 1; and
4. shall enter the 'O: pending delegated' state.

7.2.3.5.11 Transmission time limit reached with no transmitter in transmitter list (Timer T207 expires with no transmitter)

When the timer T207 (Stop talking) expires and if no transmitter information is stored in transmitter list, the transmission participant:

1. shall send a Transmission Arbitration Release message towards other transmission participants. The Transmission Arbitration Release message:
   a. shall include the MCVideo ID of the MCVideo user in the User ID field; and
   b. if the session is not initiated as a broadcast group call with the B-bit set to '1' (Broadcast group call), shall include a Transmission Indicator field set to '0' (normal call);
2. shall start timer T230 (Inactivity); and
3. shall enter 'O: silence' state.

7.2.3.5.12 Receive RTP media (R: RTP media)

Upon receiving RTP media packets and with SSRC not associated with any transmitter stored in the transmitter list, the transmission participant:

1. shall request the MCVideo client to render the received RTP media packets;
2. shall store the SSRC of RTP media packet in the transmitter list as unknown user;
3. shall start timer T203 (End of RTP media) associated with the SSRC; and

4. shall remain in 'O: has no permission' state.

Otherwise, if SSRC of transmission participant sending the media matches the stored SSRC of a user in transmitter list, the transmission participant:

1. shall request the MCVideo client to render the received RTP media packets;
2. shall restart timer T203 (End of RTP media) associated with the User ID; and
3. shall remain in 'O: has no permission' state.

7.2.3.5.13 Timer T205 (Transmission Granted) expired (timer T205 expired)

On expiry of timer T205 (Transmission Granted) and counter C205 (Transmission Granted) is less than the upper limit, the transmission participant:

1. shall send the Transmission Granted message toward the other transmission participants. The Transmission Granted message:
   a. shall include the MCVideo ID of the granted transmission participant in the User ID field;
   b. shall include the SSRC of the granted transmission participant in the SSRC of the granted transmission participant field; and
   c. if the transmission request is a broadcast group call, system call, emergency call or an imminent peril call, shall include a Transmission Indicator field indicating the relevant call types;
2. shall restart timer T205 (Transmission Granted) and shall increment counter C205 (Transmission Granted) by 1; and
3. shall remain in the current state.

7.2.3.5.14 Timer T205 (Transmission Granted) expired N times (Timer T205 expired N times)

On the expiry of timer T205 (Transmission Granted) for the configured upper limit of counter C205 (Transmission Granted), the transmission participant:

1. shall reset the value of counter C205 (Transmission Granted) to 1;
2. shall remain in the current state.

7.2.3.5.15 Timer T203 (End of RTP media) expired

On expiry of T203 (End of RTP media) timer, the transmission participant:

1. may provide transmission lost notification to the MCVideo user.
2. shall request the MCVideo client to stop rendering received RTP media packets;
3. shall remove the User ID matching with the SSRC of RTP media packet from transmitter list; and
4. shall remain in the current state.

7.2.3.6 State: 'O: has permission'

7.2.3.6.1 General

In this state the MCVideo client has the permission to send media.

Timer T206 (Stop talking warning) and timer T207 (Stop Talking) are running in this state.

7.2.3.6.2 Send RTP Media packets (S: RTP Media)

Upon receiving encoded media from the user or if encoded media is already buffered the transmission participant:

1. shall start timer T206 (Stop talking warning);
2. shall request the MCVideo client to start sending RTP media packets towards other MCVideo clients; and
3. shall remain in 'O: has permission' state.

7.2.3.6.3 Receive Transmission Release message (R: Transmission Release)

When a Transmission Release message is received and if the User ID in the Transmission Release message matches with a stored User ID in transmitter list, the transmission participant:

1. may provide transmission released notification to the MCVideo user;
2. shall request the MCVideo client to stop rendering received RTP media packets;
3. shall stop timer T203 (End of RTP media) for User ID in the Transmission Release message;
4. shall delete the User ID from the transmitter list; and
5. shall remain in 'O: has permission' state.

7.2.3.6.4 Send Transmission Release message (click video transmission end button)

Upon receiving an indication from the MCVideo user to release permission to send RTP media, the transmission participant:

1. shall stop timer T206 (Stop talking warning), if running;
2. shall stop timer T207 (Stop talking), if running;
3. shall send a Transmission Release message towards other transmission participants. The Transmission Release message:
   a. shall include the MCVideo ID of the MCVideo user in the User ID field; and
   b. if the session is not initiated as a broadcast group call with the B-bit set to '1' (Broadcast group call), shall include a Transmission Indicator field set to '0' (normal call); and
4. shall enter 'O: has no permission' state.

7.2.3.6.5 Receive RTP media (R: RTP media)

Upon receiving RTP media packets and with SSRC not associated with any transmitter stored in the transmitter list, the transmission participant:

1. shall request the MCVideo client to render the received RTP media packets;
2. shall store the SSRC of RTP media packet in the transmitter list as unknown user;
3. shall start timer T203 (End of RTP media) associated with the SSRC; and
4. shall remain in 'O: has no permission' state.

Otherwise, if SSRC of transmission participant sending the media matches the stored SSRC of a user in transmitter list, the transmission participant:

1. shall request the MCVideo client to render the received RTP media packets;
2. shall restart timer T203 (End of RTP media) associated with the User ID; and
3. shall remain in 'O: has no permission' state.

7.2.3.6.6 Transmission time limit warning (Timer T206 expires)

When timer T206 (Stop talking warning) expires, the transmission participant:

1. may notify the MCVideo user that the transmition time limit is about to reach;
2. shall start timer T207 (Stop talking); and
3. shall remain in the current state.

7.2.3.6.7 Transmission time limit (Timer T207 expires)

When the timer T207 (Stop talking) expires, the transmission participant:

1. shall send a Transmission Release message towards other transmission participants. The Transmission Release message:
   a. shall include the MCVideo ID of the MCVideo user in the User ID field; and
   b. if the session is not initiated as a broadcast group call with the B-bit set to '1' (Broadcast group call), shall include a Transmission Indicator field set to '0' (normal call); and
2. shall enter 'O: has no permission' state.

7.2.3.6.8 Timer T203 (End of RTP media) expired

On expiry of T203 (End of RTP media) timer, the transmission participant:

1. may provide transmission lost notification to the MCVideo user.
2. shall request the MCVideo client to stop rendering received RTP media packets;
3. shall delete the User ID matching with the SSRC of RTP media packet in transmitter list; and
4. shall remain in the current state.

7.2.3.6.9 Receive Transmission Granted message (R: Transmission Granted to other)

When a Transmission Granted message is received and if the <User ID> value in the User ID field does not match its own MCVideo ID, the transmission participant:

1. shall start timer T203 (End of RTP media) for the User ID;
2. shall store the user to whom the transmission was granted in the Transmission Granted message in transmitter list;
3. may provide a transmission taken notification to the MCVideo user;
4. shall remain in the 'O: has permission' state.

7.2.3.6.10 Receive Transmission Arbitration Taken message (R: Transmission Arbitration Taken)

When a Transmission Arbitration Taken message is received and there is no stored current transmission arbitrator, the transmission participant:

1. if the <User ID> value in the User ID field in Transmission Arbitration Taken message doesn't match with User ID in transmitter list, shall start timer T203 (End of RTP media);
2. shall store the value of <User ID> field of the Transmission Arbitration Taken message as the current transmission arbitrator; and
3. shall remain in 'O: has permission' state.

7.2.3.6.11 Receive Transmission Arbitration Release message with next arbitrator to me (R: Transmission Arbitration Release with next arbitrator to me)

When a Transmission Arbitration Release message is received and if the User ID in the Transmission Arbitration Release message matches with the stored current transmission arbitrator and Next Arbitrator matches with the own MCVideo User ID, the transmission participant:

1. shall send the Transmission Arbitration Taken message toward the other transmission participants. The Transmission Arbitration Taken message:

   a. shall include the transmission participant's own SSRC in the SSRC field;

   b. shall include the transmission participant's own MCVideo ID in the User ID field; and

2. shall enter 'O: transmission arbitration' state.

7.2.3.6.12 Receive Transmission Revoked message (R: Transmission Revoked)

When a Transmission Revoked message is received and if the User ID in the Transmission Revoked message matches with a stored User ID in transmitter list, the transmission participant:

1. may provide transmission revoked notification to the MCVideo user;
2. shall request the MCVideo client to stop rendering received RTP media packets;
3. shall stop timer T203 (End of RTP media) for User ID in the Transmission Revoked message;
4. shall delete the User ID in transmitter list;
5. if the User ID in the Transmission Revoked message matches with the stored User ID of current transmission arbitrator, shall clear current transmission arbitrator; and
6. shall remain in 'O: has permission' state.

7.2.3.6.13 Receive Transmission Arbitration Release message with next arbitrator to other (R: Transmission Arbitration Release with next arbitrator to other)

When a Transmission Arbitration Release message is received and if the User ID in the Transmission Arbitration Release message matches with the stored current transmission arbitrator and Next Arbitrator does not match with own MCVideo User ID, the transmission participant:

1. shall update the identity of the transmission arbitrator to the identity of the user indicated in the Next Arbitrator field of the Transmission Arbitration release message
2. shall remain in the current state.

7.2.3.7 State: 'O: pending request'

7.2.3.7.1 General

In this state the MCVideo client is waiting for a response to a Transmission request message.

In this state timer T201 (Transmission Request) is running.

To resolve race condition between multiple simultaneous transmission requests, the MCVideo client resets the counter associated with timer T201, if another transmission request with higher priority or higher SSRC, in case the priority is same, is received.

7.2.3.7.2 Receive RTP media (R: RTP media)

Upon receiving RTP media packets and with SSRC not associated with any transmitter stored in the transmitter list, the transmission participant:

1. shall request the MCVideo client to render the received RTP media packets;
2. shall store the SSRC of RTP media packet in the transmitter list as unknown user;

3. shall start timer T203 (End of RTP media) associated with the SSRC; and
4. shall remain in 'O: has no permission' state.

Otherwise, if SSRC of transmission participant sending the media matches the stored SSRC of a user in transmitter list, the transmission participant:

1. shall request the MCVideo client to render the received RTP media packets;
2. shall restart timer T203 (End of RTP media) associated with the User ID; and
3. shall remain in 'O: has no permission' state.

7.2.3.7.3 Receive Transmission Rejected message (R: Transmission Rejected)

Upon receiving Transmission Rejected message, if the <User ID> value in the User ID field matches its own MCVideo ID and User ID of transmission participant sending the Transmission Rejected message matches the stored User ID of current transmission arbitrator, the transmission participant:

Editor's Note: How a new participant obtains the identity of the transmission arbitrator is FFS.

1. shall stop the timer T201 (Transmission Request);
2. shall provide transmission deny notification to the user;
3. may display the transmission deny reason to the user using information in the Reject Cause field; and
4. shall enter 'O: has no permission' state.

Otherwise, if the <User ID> value in the User ID field matches its own MCVideo ID and there is no stored the current transmission arbitrator, the transmission participant:

1. shall stop the timer T201 (Transmission Request);
2. shall set the stored User ID of the current transmission arbitrator to the value in the User ID of transmission control server field as received in the Transmission Rejected message;
3. shall provide transmission deny notification to the user;
4. may display the transmission deny reason to the user using information in the Reject Cause field; and
5. shall enter 'O: has no permission' state.

7.2.3.7.4 Send Transmission Release message (click video transmission end button with no transmitter)

When an indication from the MCVideo user to release the pending request for the transmission is received and if there is no transmitter in transmitter list, the transmission participant:

1. shall send a Transmission Release message towards other transmission participants. The Transmission Release message:
   a. shall include the MCVideo ID of the MCVideo user in the <User ID> value of the User ID field; and
2. shall stop the timer T201 (Transmission Request);
3. shall start the timer T230 (Inactivity) and enter 'O: silence' state;

7.2.3.7.5 Send Transmission Release message (click video transmission end button with transmitter)

When an indication from the MCVideo user to release the pending request for the transmission is received and if at least one transmitter information is stored in transmitter list, the transmission participant:

1. shall send a Transmission Release message towards other transmission participants. The Transmission Release message:

a. shall include the MCVideo ID of the MCVideo user in the <User ID> value of the User ID field; and

b. if the session is not initiated as a broadcast group call with the B-bit set to '1' (Broadcast group call), shall include a Transmission Indicator field set to '0' (normal call);

2. shall stop the timer T201 (Transmission Request); and

3. shall enter 'O: has no permission' state;

7.2.3.7.6 Send Transmission Arbitration Taken message (Timer T201 expired N times)

When timer T201 (Transmission Request) expires and counter C201 (Transmission Request) reaches its upper limit, the transmission participant:

1. shall send the Transmission Arbitration Taken message toward the other transmission participants. The Transmission Arbitration Taken message:

   a. shall include the transmission participant's own SSRC in the SSRC field;

   b. shall include the transmission participant's own MCVideo ID in the User ID field; and

   c. if the transmission request is a broadcast group call, system call, emergency call or an imminent peril call, shall include a Transmission Indicator field indicating the relevant call types; and

2. shall enter 'O: transmission arbitration' state.

7.2.3.7.7 Receive Transmission Granted message (R: Transmission Granted to me)

Upon receiving Transmission Granted message and if the <User ID> value in the User ID field matches its own MCVideo ID and User ID of transmission participant sending the Transmission Granted message matches the stored User ID of current transmission arbitrator, the transmission participant:

1. shall stop timer T201 (Transmission Request);

2. may provide a transmission granted notification to the MCVideo user; and

3. shall enter 'O: has permission' state.

Otherwise, if the <User ID> value in the User ID field matches its own MCVideo ID and there is no stored User ID of the current transmission arbitrator, the transmission participant:

1. shall set the stored User ID of the current transmission arbitrator to User ID of transmission participant sending the Transmission Granted message;

2. shall stop timer T201 (Transmission Request);

3. may provide a transmission granted notification to the MCVideo user; and

4. shall enter 'O: has permission' state.

7.2.3.7.8 Receive Transmission Granted message with next arbitrator (R: Transmission Granted with next arbitrator to me)

Upon receiving Transmission Granted message and if the <User ID> value in the User ID field matches its own MCVideo ID and User ID of transmission participant sending the Transmission Granted message matches the stored User ID of current transmission arbitrator, the transmission participant:

1. shall stop timer T201 (Transmission Request);

2. clear the stored current transmission arbitrator;

3. shall store the transmitter list of the Transmission Granted message;

4. may provide a transmission granted notification to the MCVideo user; and

5. shall enter 'O: has permission' state.

7.2.3.7.9 Receive Transmission Granted message (R: Transmission Granted to other)

When a Transmission Granted message is received and if the <User ID> value in the User ID field does not match its own MCVideo ID, the transmission participant:

1. shall start timer T203 (End of RTP media) for the User ID;
2. shall store the user to whom the transmission was granted in the Transmission Granted message in transmitter list;
3. may provide a transmission taken notification to the MCVideo user;
4. if the Transmission Indicator field is included with the B-bit set to '1' (Broadcast group call), shall provide a notification to the user indicating that this is a broadcast group call; and
5. shall remain in 'O: pending request' state.

7.2.3.7.10 Timer T201 (Transmission Request) expired (Timer T201 expired)

On expiry of timer T201 (Transmission Request) if the counter C201 (Transmission Request) has not reached its upper limit, the transmission participant:

1. shall send the Transmission Request message to other transmission participants. The Transmission Request message:
   a. if a priority different than the default transmission priority is required, shall include the Transmission Priority field with the requested priority in the <Transmission Priority> element;
   b. shall include the MCVideo ID of the own MCVideo user in the User ID field; and
   c. if the transmission request is a broadcast group call, system call, emergency call or an imminent peril call, shall include a Transmission Indicator field indicating the relevant call types;
2. shall restart the timer T201 (Transmission Request) and increment counter C201 (Transmission Request) by 1; and
3. shall remain in the 'O: pending request' state.

7.2.3.7.11 Receive Transmission Request message (R: Transmission request)

Upon receiving Transmission Request message, if the priority of received request is higher than priority of the transmission participant or if the SSRC of received request is higher, if the priority is same, the transmission participant:

1. shall reset the value of the counter C201 (Transmission Request) to 1;
2. shall re-start timer T201 (Transmission Request); and
3. shall remain in 'O: pending request' state.

7.2.3.7.12 Receive Transmission Arbitration Taken message (R: Transmission Arbitration Taken)

When a Transmission Arbitration Taken message is received and there is no stored current transmission arbitrator, the transmission participant:

1. if the <User ID> value in the User ID field in Transmission Arbitration Taken message doesn't match with User ID in transmitter list, shall start timer T203 (End of RTP media);
2. shall store the value of <User ID> field of the Transmission Arbitration Taken message as the current transmission arbitrator; and
3. shall remain in 'O: pending request' state.

7.2.3.7.13 Receive Transmission Release message (R: Transmission Release)

When a Transmission Release message is received and if the User ID in the Transmission Release message matches with a stored User ID in transmitter list, the transmission participant:

1. may provide transmission released notification to the MCVideo user;
2. shall request the MCVideo client to stop rendering received RTP media packets;
3. shall stop timer T203 (End of RTP media) for User ID in the Transmission Release message;
4. shall delete the User ID in transmitter list; and
5. shall remain in 'O: pending request' state.

7.2.3.7.14 Receive Transmission Revoked message (R: Transmission Revoked)

When a Transmission Revoked message is received and if the User ID in the Transmission Revoked message matches with a stored User ID in transmitter list, the transmission participant:

1. may provide transmission revoked notification to the MCVideo user;
2. shall request the MCVideo client to stop rendering received RTP media packets;
3. shall stop timer T203 (End of RTP media) for User ID in the Transmission Revoked message;
4. shall delete the User ID in transmitter list;
5. if the User ID in the Transmission Revoked message matches with the stored User ID of current transmission arbitrator, shall clear current transmission arbitrator; and
6. shall remain in 'O: pending request' state.

7.2.3.8 State: 'O: pending delegated'

7.2.3.8.1 General

In this state the MCVideo client is waiting for another client to take over the role of transmission controller.

The timer T205 (Transmission Granted) and timer T208 (Transmission Arbitration Release) are running in this state.

7.2.3.8.2 Receive RTP media (R: RTP Media)

Upon receiving RTP media packets and with SSRC not associated with any transmitter stored in the transmitter list, the transmission participant:

1. shall request the MCVideo client to render the received RTP media packets;
2. shall store the SSRC of RTP media packet in the transmitter list as unknown user;
3. shall start timer T203 (End of RTP media) associated with the SSRC; and
4. shall remain in 'O: has no permission' state.

Otherwise, if SSRC of transmission participant sending the media matches the stored SSRC of a user in transmitter list, the transmission participant:

1. shall request the MCVideo client to render the received RTP media packets;
2. shall restart timer T203 (End of RTP media) associated with the User ID; and
3. shall remain in 'O: has no permission' state.

7.2.3.8.3 Timer T205 (Transmission Granted) expired (timer T205 expired)

On expiry of timer T205 (Transmission Granted) and counter C205 (Transmission Granted) is less than the upper limit, the transmission participant:

1. shall send the Transmission Granted message toward the other transmission participants. The Transmission Granted message:
    a. shall include the MCVideo ID of the granted transmission participant in the User ID field;

b. shall include the SSRC of the granted transmission participant in the SSRC of the granted transmission participant field;

c. shall include the MCVideo ID of the granted transmission participant in the Next Arbitrator field;

d for the remaining transmission participants in the transmitter list:

i. shall include the MCVideo ID of the transmission participant in the User ID field;

ii. shall include the SSRC of the transmission participant in the SSRC of transmission participant field; and

e. if the transmission request is a broadcast group call, system call, emergency call or an imminent peril call, shall include a Transmission Indicator field indicating the relevant call types;

2. shall restart timer T205 (Transmission Granted) and shall increment counter C205 (Transmission Granted) by 1; and

3. shall remain in 'O: pending delegated' state.

7.2.3.8.4 Timer T205 (Transmission Granted) expired N times with transmitter(s) in the transmitter list (Timer T205 expired N times and transmitter in transmitter list)

On the expiry of timer T205 (Transmission Granted) for the configured upper limit of counter C205 (Transmission Granted) and if there is transmitter(s) in transmitter list, the transmission participant:

1. shall reset the value of counter C205 (Transmission Granted) to 1;

2. shall send the Transmission Arbitration Release message toward the other transmission participants. The Transmission Arbitration Release message:

a. shall include the MCVideo ID of the MCVideo user in the User ID field ;

b. shall include the MCVideo ID of the first transmission participant in the transmitter list in the Next Arbitrator field;

c. shall remove the first transmission participant from the transmitter list;

d for the remaining transmission participants in the transmitter list:

i. shall include the MCVideo ID of the transmission participant in the User ID field; and

ii. shall include the SSRC of the transmission participant in the SSRC of transmission participant field; and

e. if the transmission request is a broadcast group call, system call, emergency call or an imminent peril call, shall include a Transmission Indicator field indicating the relevant call types;

3. shall start timer T208 (Transmission Arbitration Release) and shall initiate counter C208 (Transmission Arbitration Release) to 1; and

4. shall remain in 'O: pending delegated' state.

7.2.3.8.5 Timer T205 (Transmission Granted) expired N times with no transmitter in the transmitter list (Timer T205 expired N times and no transmitter in transmitter list)

On the expiry of timer T205 (Transmission Granted) for the configured upper limit of counter C205 (Transmission Granted) and if at least one transmitter in transmitter list is stored, the transmission participant:

1. shall reset the value of counter C205 (Transmission Granted) to 1;

2. shall start timer T230 (Inactivity); and

. shall enter 'O: silence' state.

7.2.3.8.6 Click Video transmission send button

If the transmission participant receives an indication from the MCVideo user to send media, the transmission participant:

1. may notify the MCVideo user about rejection; and,
2. shall remain in 'O: pending delegated' state.

7.2.3.8.7 Receive Transmission Release message (R: Transmission Release)

Upon receiving a Transmission Release message, the transmission participant:

1. shall remove the sender of the Transmission Release message from the transmitter list, if the User ID in the transmission release message matches a User ID in the transmitter list; and
2. shall remain in 'O: pending delegated' state.

7.2.3.8.8 Receive Transmission Request message (R: Transmission Request)

When a Transmission Request message is received, the transmission participant:

1. shall send the Transmission Rejected message toward the other transmission participant. The Transmission Rejected message:
   a. shall include in the Reject Cause field the <Reject Cause> value cause #1 (Transmission limit reached);
   b. may include in the Reject Cause field an additional text string explaining the reason for rejecting the transmission request in the <Reject Phrase> value; and
   c. shall include the User ID field received in the Transmission Request message; and
2. shall remain in 'O: pending delegated' state.

7.2.3.8.9 Receive Transmission Arbitration Taken message (R: Transmission Arbitration Taken)

When a Transmission Arbitration Taken message is received and if the User ID in the Transmission Arbitration Taken message matches with the stored User ID of next transmission arbitrator, the transmission participant:

1. shall set the stored current transmission arbitrator to the <User ID> value in the User ID field in the Transmission Arbitration Taken message; and
2. shall remain in 'O: pending request' state.

7.2.3.8.10 Timer T208 (Transmission Arbitration Release) expired (timer T208 expired)

On expiry of timer T208 (Transmission Arbitration Release) and counter C208 (Transmission Arbitration Release) is less than the upper limit, the transmission participant:

1. shall send the Transmission Arbitration Release message toward the other transmission participants. The Transmission Arbitration Release message:
   a. shall include the MCVideo ID of the MCVideo user in the User ID field;
   b. shall include the MCVideo ID of the first transmission participant in the transmitter list in the Next Arbitrator field;
   c for the remaining transmission participants in the transmitter list:
      i. shall include the MCVideo ID of the transmission participant in the User ID field; and
      ii. shall include the SSRC of the transmission participant in the SSRC of transmission participant field; and
   d. if the transmission request is a broadcast group call, system call, emergency call or an imminent peril call, shall include a Transmission Indicator field indicating the relevant call types;
2. shall restart timer T208 (Transmission Arbitration Release) and shall increment counter C208 (Transmission Arbitration Release) by 1; and
3. shall remain in 'O: pending delegated' state.

7.2.3.8.11 Timer T208 (Transmission Arbitration Release) expired N times with transmitter(s) in the transmitter list (Timer T208 expired N times and transmitter in transmitter list)

On the expiry of timer T208 (Transmission Arbitration Release) for the configured upper limit of counter C208 (Transmission Arbitration Release) and if there is transmitter(s) in transmitter list, the transmission participant:

1. shall reset the value of counter C208 (Transmission Arbitration Release) to 1;
2. shall send the Transmission Arbitration Release message toward the other transmission participants. The Transmission Arbitration Release message:
   a. shall include the MCVideo ID of the MCVideo user in the User ID field;
   b. shall include the MCVideo ID of the first transmission participant in the transmitter list in the Next Arbitrator field;
   c. shall remove the first transmission participant from the transmitter list;
   d for the remaining transmission participants in the transmitter list:
      i. shall include the MCVideo ID of the transmission participant in the User ID field; and
      ii. shall include the SSRC of the transmission participant in the SSRC of transmission participant field; and
   e. if the transmission request is a broadcast group call, system call, emergency call or an imminent peril call, shall include a Transmission Indicator field indicating the relevant call types;
3. shall start timer T208 (Transmission Arbitration Release) and shall initiate counter C208 (Transmission Arbitration Release) to 1; and
4. shall remain in 'O: pending delegated' state.

7.2.3.8.12 Timer T208 (Transmission Arbitration Release) expired N times with no transmitter in the transmitter list (Timer T208 expired N times and no transmitter in transmitter list)

On the expiry of timer T208 (Transmission Arbitration Release) for the configured upper limit of counter C208 (Transmission Arbitration Release) and if at least one transmitter in transmitter list is stored, the transmission participant:

1. shall reset the value of counter C208 (Transmission Granted) to 1;
2. shall start timer T230 (Inactivity); and
3. shall enter 'O: silence' state.

7.2.3.9 In any state

7.2.3.9.1 General

This subclause describes the actions to be taken in all states defined for the basic state diagram with the exception of the 'Start-stop' state.

7.2.3.9.2 Receive MCVideo call release (R: MCVideo call release)

Upon receiving an MCVideo call release request from the application and signalling plane when the MCVideo call is going to be released, the transmission participant:

1. shall stop sending transmission control messages towards other transmission participants;
2. shall request the MCVideo client to stop sending and receiving RTP media packets;
3. shall release all resources including any running timers associated with the MCVideo call;
4. shall terminate the instance of transmission participant state transition diagram; and

5. shall enter 'Start-stop' state.

8 Communication release media plane procedures

9 Coding

9.1 Introduction

9.1.1 General

The media plane control protocols specified in the present document are based on the RTCP Application Packets (RTCP: APP), as defined in IETF RFC 3550 [3], but the media plane control messages do not conform to the rules for compound RTCP packets or RTCP packet transmission.

Each media plane control message is one RTCP: APP packet. These RTCP: APP packets are not to be sent in compound RTCP packets, but more than one media plane control message can be sent in a single IP packet.

The three first 32-bit words in any of the media plane control protocols defined in the present document are structured commonly as described in subclause 9.1.2.

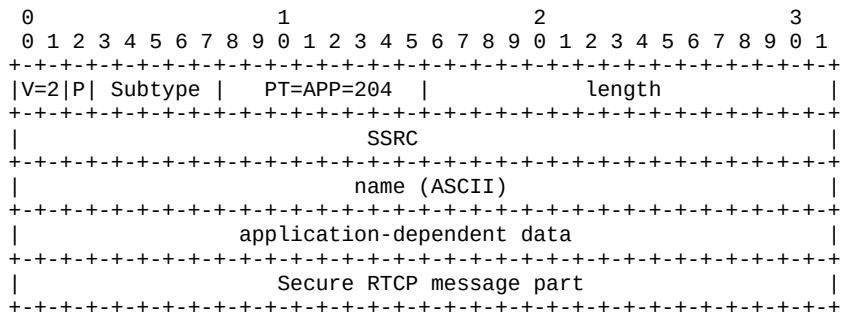
Outside tables, binary values are expressed with a decimal value with single quotation marks e.g. 00000000 is '0', 00000001 is '1', 00000010 is '2' and so on.

9.1.2 RTCP: APP message format

The definition of the fields in the RTCP APP packet is found in IETF RFC 3550 [3].

Table 9.1.2-1 shows the RTCP APP packet format.

Table 9.1.2-1: RTCP: APP message format



P

The padding bit P is set to '0'.

Subtype:

Dependent upon the relevant set of media plane control messages, as identified by the Name field, the possible Subtype values are defined in the following tables:

- Name field = "MCV0" (i.e. Transmission control messages sent by the transmission control participant to the transmission control server): Table 9.2.2.1-1;
- Name field = "MCV1" (i.e. Transmission control messages sent by the transmission control server and transmission control participant): Table 9.2.2.1-2;

- Name field = "MCV2" (i.e. Transmission control messages sent by transmission control participant to the transmission control server and by the transmission control server to the transmission control participant): Table 9.2.2.1-3; and
- Name field= "MCV3" (i.e. MBMS subchannel control): Table 9.2.2.1-4
- Name field= "MCV4" (i.e. Notification control): Table 9.4.2-1.

Length

The length field in the RTCP header is the length of the packet in 32-bit words, not counting the first 32-bit word in which the length field resides.

NOTE: The length field can indicate message size longer than specified in this version of the protocol. This can be the case e.g. if message is of later version of this protocol.

SSRC

The content of this field is described for each transmission control message separately.

Name

The 4-byte ASCII string in the RTCP header is used to define the set of media plane control messages to be unique with respect to other APP packets that the media plane might receive.

The present document specified the use of the following names:

1. For the transmission control protocol messages sent by the client to the server specified in the present document the ASCII name string is: MCV0;
2. For the transmission control protocol messages sent by the server to the client specified in the present document the ASCII name string is: MCV1; and
3. For the transmission control protocol messages sent by both the client to the server and the server to the client specified in the present document the ASCII name string is: MCV2; and
4. For the MBMS subchannel control protocol specified in the present document the ASCII name string is: MCV3.

Application-dependent data

The application-dependent data contains zero or more application specific data fields is specified in subclause 9.1.3.

This part is encrypted if SRTCP is used.

Secure RTCP message part

The content of the secure RTCP message part is in specified in clause x and in IETF RFC 3711 [4].

9.1.3 Application specific data field

.Each application specific data field is composed of:

1. a field ID which is one octet long;
2. a length value which is:
   - one octet long, if the field ID is less than 192; and
   - two octets long, if the field ID is equal to or greater than 192;
3. a field value. The length in octets of the field value is indicated in the length value; and
4. a padding. The padding is zero, one, two, or three octets long. The value of the padding octet(s) is set to zero by sender and ignored by receiver.

An application specific data field has always a multiple of 4 octets.

Table 9.1.3-1 shows the application dependent data field structure when the field ID is less than 192. Table 9.1.3-2 shows the application dependent data field structure when the field ID is equal to or greater than 192.

Table 9.1.3.-1: Application specific data field structure when the field ID is less than 192

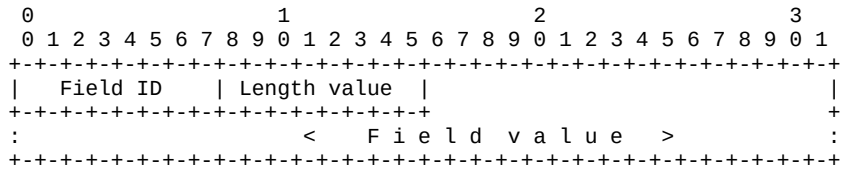
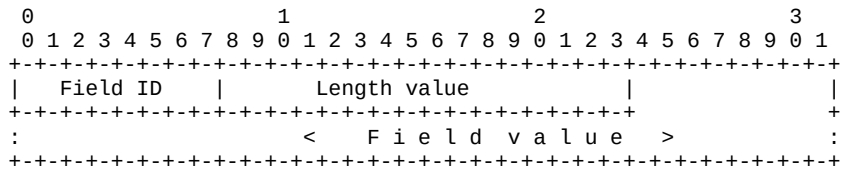


Table 9.1.3.-2: Application specific data field structure when the field ID is equal to or greater than 192



9.1.4 Handling of unknown messages and fields

When an RTCP APP message is received, the receiver shall:

1. ignore the whole message, if the subtype is unknown;
2. ignore the unspecified fields in the message (e.g. specified in future version of the protocol); and
3. ignore the syntactically incorrect optional fields.

9.2 Transmission control

9.2.1 Introduction

The transmission control messages are coded as described in subclause 9.1.2 where the transmission control message is part of the application-dependent data.

For the transmission control protocol the ASCII name string is: MCVx (Mission Critical Video x) with x=0, 1 or 2 as specified in subclause 9.1.2.

A list of transmission control messages can be found in subclause 9.2.2.1.

The transmission control specific fields are specified in subclause 9.2.3.

9.2.2 Transmission control messages

9.2.2.1 General

The table 9.2.2.1-1 provides a list of transmission control messages sent by the transmission participant.

Table 9.2.2.1-1: Transmission control specific messages sent by the transmission participant

Message name	Subtype	Reference	Direction
Transmission Request	x0000	Subclause 9.2.4	Client → server
Transmission Release	x0010	Subclause 9.2.7	Client → server
Queue Position Request	x0011	Subclause 9.2.11	Client → server
Receive media request	x0100	Subclause 9.2.14	Client → server
Transmission cancel request	x0101	Subclause 9.2.17	Client → server
Remote Transmission request	x0111	Subclause 9.2.22	Client → server
Remote Transmission cancel request	x1000	Subclause 9.2.24	Client → server
NOTE: The transmission control server is the server and the transmission participant is the client.			

The table 9.2.2.1-2 provides a list of transmission control messages sent by the transmission control server.

Table 9.2.2.1-2: Transmission control specific messages sent by the transmission control server

Message name	Subtype	Reference	Direction
Transmission Granted	x0000	Subclause 9.2.5	Server → client
Transmission Rejected	x0001	Subclause 9.2.6	Server → client
Transmission Arbitration Taken	x0010	Subclause 9.2.8	Server → client
Transmission Arbitration Release	x0011	Subclause 9.2.9	Server → client
Transmission Revoked	x0100	Subclause 9.2.10	Server → client
Queue Position Info	x0101	Subclause 9.2.12	Server → client
Media transmission notification	x0110	Subclause 9.2.13	Server → client
Receive media response	x0111	Subclause 9.2.15	Server → client
Media reception notification	x1000	Subclause 9.2.16	Server → client
Transmission cancel response	x1001	Subclause 9.2.18	Server → client
Transmission cancel request notify	x1010	Subclause 9.2.19	Server → client
Remote Transmission response	x1011	Subclause 9.2.23	Server → client
Remote Transmission cancel response	x1100	Subclause 9.2.25	Server → client
Media reception override notification	x1101	Subclause 9.2.28	Server → client
Transmission end notify	x1110	Subclause 9.2.29	Server → client
Transmission idle	01111	Subclause 9.2.30	Server → client
NOTE: The transmission control server is the server and the transmission participant is the client.			

The table 9.2.2.1-3 provides a list of transmission control messages sent by both the transmission control server and transmission control participant.

Table 9.2.2.1-3: Transmission control specific messages sent by both the transmission control server and transmission control participant

Message name	Subtype	Reference	Direction
Transmission end request	x0000	Subclause 9.2.20	Client → server and Server → client
Transmission end response	x0001	Subclause 9.2.21	Client → server and Server → client
Media reception end request	x0010	Subclause 9.2.26	Client → server and Server → client
Media reception end response	x0011	Subclause 9.2.27	Client → server and Server → client
Transmission control ack	x0100	Subclause 9.2.31	Client → server and Server → client
NOTE: The transmission control server is the server and the transmission participant is the client.			

For some messages the first bit (marked as x in the subtype) can be used to indicate if the sender wants to have an acknowledgment. The x is coded as follows:

'0' Acknowledgment is not required

'1' Acknowledgment is required

NOTE: Whether a message needs to be acknowledged or not is described in clause 6.

If an acknowledgment is required the Transmission control ack message is used to acknowledge the message.

9.2.3 Transmission control specific fields

9.2.3.1 Introduction

This subclause describes the transmission control specific data fields.

The transmission control messages can include transmission control specific data fields contained in the application-dependent data of the transmission control message. The transmission control specific data fields follow the syntax specified in subclause 9.1.3.

Table 9.2.3.1-1 lists the available transmission control specific data fields including the assigned field ID.

Table 9.2.3.1-1: Transmission control specific data fields

Field name	Field ID		Reference
	Decimal	Binary	
Transmission Priority	000	00000000	Subclause 9.2.3.2
Duration	001	00000001	Subclause 9.2.3.3
Reject Cause	002	00000010	Subclause 9.2.3.4
Queue Info	003	00000011	Subclause 9.2.3.5
Granted Party's Identity	004	00000100	Subclause 9.2.3.6
Permission to Request the Transmission	005	00000101	Subclause 9.2.3.7
User ID	006	00000110	Subclause 9.2.3.8
Queue Size	007	00000111	Subclause 9.2.3.15
Message Sequence-Number	008	00001000	Subclause 9.2.3.9
Queued User ID	009	00001001	Subclause 9.2.3.14
Source	010	00001010	Subclause 9.2.3.12
Track Info	011	00001011	Subclause 8.2.3.13
Message Type	012	00001100	Subclause 9.2.3.10
Transmission Indicator	013	00001101	Subclause 9.2.3.11
SSRC	014	00001110	Subclause 9.2.3.16
Result	015	00001111	Subclause 9.2.3.17
Message Name	016	00010000	Subclause 9.2.3.18
Overriding ID	017	00010001	Subclause 9.2.3.8
Overridden ID	018	00010010	Subclause 9.2.3.8
Reception Priority	019	00010011	Subclause 9.2.3.19
MCVideo Group Identity	020	00010100	Subclause 9.2.3.20

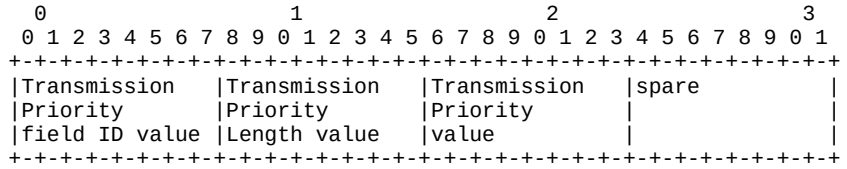
The following subclauses describe the coding of each field.

9.2.3.2 Transmission Priority field

The Transmission Priority field describes the level of priority requested in a Transmission Request message or granted in a Transmission Granted message. The max transmission priority that can be requested in a Transmission Request message is negotiated between the MCVideo client and the controlling MCVideo function using the "mc_priority" fmtp parameter as specified in clause 14.

Table 9.2.3.2-1 describes the coding of the Transmission Priority field.

Table 9.2.3.2-1: Transmission Priority field coding



The <Transmission Priority field ID> value is a binary value and is set according to table 9.2.3.1-1.

The <Transmission Priority length> value is a binary value and has the value '2' indicating the total length in octets of the <Transmission priority> value item and the spare bits.

The <Transmission Priority> value consists of 8 bit parameter giving the transmission priority ('0' to '255') where '0' is the lowest priority and '255' is the highest priority. If the Transmission Priority field is not included in the message the default priority is used as the Transmission Priority value. The value of the default priority is '0'. The default priority is sometimes referred to as normal priority. Whether a transmission priority is pre-emptive or not is determined:

1. for on-network by the transmission control server as described in subclause x.y; and
2. for off-network by the transmission arbitrator as described in subclause y.z.

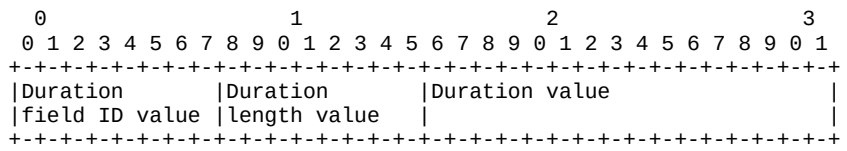
The spare bits are set to zero.

9.2.3.3 Duration field

The Duration field describes the time in seconds for which the granted party is allowed to transmit.

Table 9.2.3.3-1 describes the coding of the Duration field.

Table 9.2.3.3-1: Duration field coding



The <Duration field ID> value is a binary value and is set according to table 9.2.3.1-1.

The <Duration length> value is a binary value and has the value '2' indicating the total length in octets of the <Duration> value item.

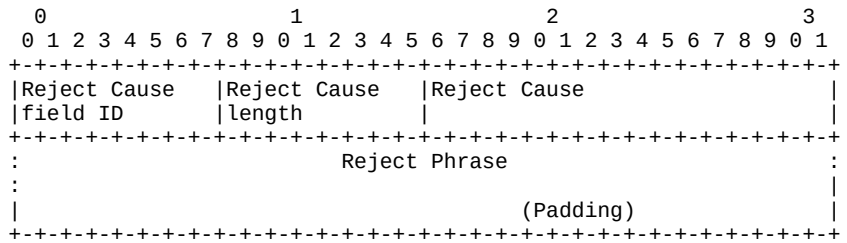
The <Duration> value is a binary value in seconds.

9.2.3.4 Reject Cause field

The Reject Cause field contains a <Reject Cause> value and can contain a <Reject Phrase> value. The content of the <Reject Cause> value is transmission control message dependent and is described per individual transmission control message carrying the Reject Cause field.

Table 9.2.3.4-1 describes the coding of the Reject Cause field.

Table 9.2.3.4-1: Reject Cause field coding



The <Reject Cause field ID> value is a binary value and is set according to table 9.2.3.1-1.

The <Reject Cause length> value is a binary value and indicates the total length in octets of the <Reject Cause > value and the <Reject Phrase> value items excluding any padding octets. If the length field is set to '2', there is no <Reject Phrase> value in the Reject Cause field.

The <Reject Cause> value is a 16 bit binary value as defined in subclause 9.2.6.2 for Transmission Rejected message and as defined in subclause 9.2.10.2 for Transmission Revoked message.

The <Reject Phrase> value is a text string encoded the text string in the SDES item CNAME as specified in IETF RFC 3550 [3].

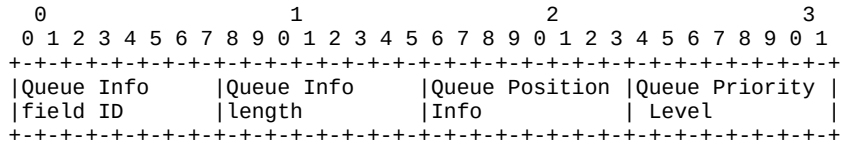
If the length of the <Reject Cause> value is not (2 + multiple of 4) bytes, the Reject Cause field is padded to (2 + multiple of 4) bytes. The value of the padding bytes is set to zero. The padding bytes are ignored by the receiver.

9.2.3.5 Queue Info field

The Queue Info field includes information about the position for one MCVideo client in the transmission control queue and the priority of the transmission request.

Table 9.2.3.5-1 describes the coding of the Queue Info field.

Table 9.2.3.5-1: Queue Info field coding



The <Queue Info field ID> value is a binary value and is set according to table 9.2.3.1-1.

The <Queue Info length> value is a binary value and has the value '2' indicating the total length in octets of the <Queue position info> value and the <Queue Priority Level> value items.

The <Queue Position Info> value is a binary value. The <Queue Position Info> value has the value '254' if the MCVideo client is not queued. The <Queue Position Info> value has the max value ('255') if the MCVideo client is queued but the MCVideo server is unable to determine the queue position or if MCVideo server policy is not to release information of the queue position to the MCVideo client.

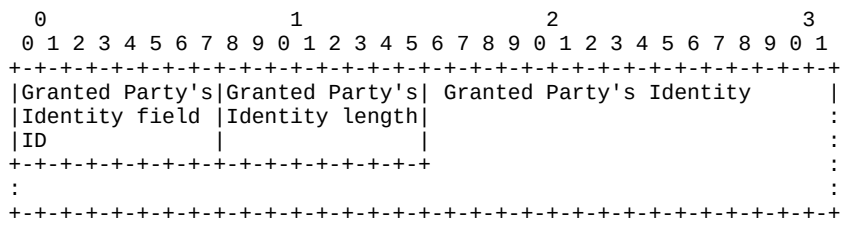
The <Queue Priority Level> value is coded as the <Transmission Priority> value in subclause 9.2.3.2.

9.2.3.6 Granted Party's Identity field

The Granted Party's Identity field identifies the MCVideo user that is granted to send media.

Table 9.2.3.6-1 describes the coding of the Granted Party's Identity field.

Table 9.2.3.6-1: Granted Party's Identity field coding



The <Granted Party's Identity field ID> value is a binary value and is set according to table 9.2.3.1-1.

The <Granted Party's Identity length> value is coded as the <User ID length> value in subclause 9.2.3.8.

The <Granted Party's Identity> value is coded as the <User ID> value in subclause 9.2.3.8.

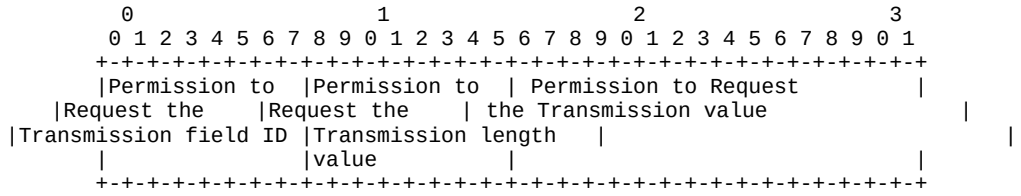
If the length of the <Granted Party's> value is not (2 + multiple of 4) bytes, the Granted Party's Identity field shall be padded to (2 + multiple of 4) bytes. The value of the padding bytes is set to zero. The padding bytes are ignored by the receiver.

9.2.3.7 Permission to Request the Transmission field

The Permission to Request the Transmission field indicates whether receiving parties are allowed to request the transmission or not.

Table 9.2.3.7-1 describes the coding of the Permission to Request the Transmission field.

Table 9.2.3.7-1: Permission to Request the Transmission field coding



The <Permission to Request the Transmission field ID> value is a binary value and is set according to table 9.2.3.1-1.

The <Permission to Request the Transmission length> value is a binary value and has the value '2' indicating the total length in octets of the <Duration> value item.

The <Permission to Request the Transmission> value is binary and coded as follows:

0 The receiver is not permitted to request transmission.

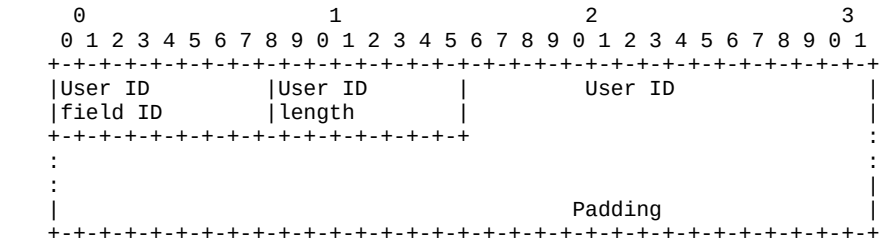
1 The receiver is permitted to request transmission.

9.2.3.8 User ID field

The User ID field contains the MCVideo ID of an MCVideo user.

Table 9.2.3.8-1 describes the coding of the User ID field.

Table 9.2.3.8-1: User ID field coding



The <User ID field ID> value is a binary value and is set according to table 9.2.3.1-1.

The <User ID length> value is a binary value and includes the value indicating the length in octets of the <User ID> value item except padding.

The <User ID> value is coded as described in table 9.2.3.8-2.

Table 9.2.3.8-2: ABNF syntax of string values of the <User ID> value

```
user-id = URI
```

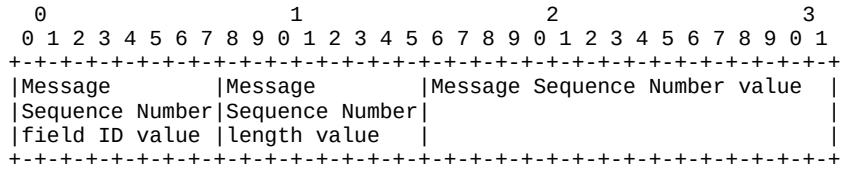
If the length of the <User ID> value is not (2 + multiple of 4) bytes User ID field shall be padded to (2 + multiple of 4) bytes. The value of the padding bytes is to zero. The padding bytes are ignored by the receiver.

9.2.3.9 Message Sequence Number field

The Message Sequence Number field is used to bind a number of Transmission Arbitration Taken or bind a number of Transmission Idle messages together.

Table 9.2.3.9-1 describes the coding of the Message Sequence Number field.

Table 9.2.3.9-1: Message Sequence Number field coding



The <Message Sequence Number field ID> value is a binary value and is set according to table 9.2.3.1-1.

The <Message Sequence Number length> value is a binary value and has the value '2' indicating the total length in octets of the <Message Sequence Number> value item.

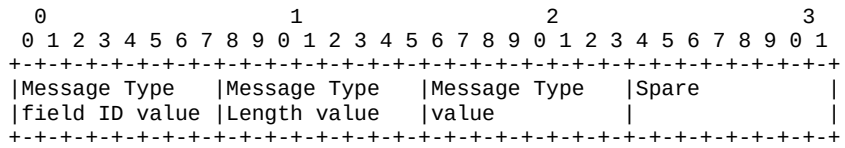
The <Message Sequence Number> value is a binary value. The <Message Sequence Number> value can be between '0' and '65535'. When the '65535' value is reached, the <Message Sequence Number> value starts from '0' again.

9.2.3.10 Message Type field

The Message Type field contains the transmission control message type of the message that is acknowledged.

Table 9.2.3.10-1 describes the coding of the Message Type field.

Table 9.2.3.10-1: Message Type field coding



The <Message Type field ID> value is a binary value and is set according to table 9.2.3.1-1.

The <Message Type Length> value is a binary value and has the value '2'.

The <Message Type> value is an 8 bit binary value containing the binary value consisting of the 5 bit message subtype as coded in table 9.2.2.1-1, table 9.2.2.1-2 and table 9.2.2.1-3 (including the first bit (used by some transmission control messages to indicate that a Transmission control Ack message is requested) of the five bit subtype) preceeded by "000".

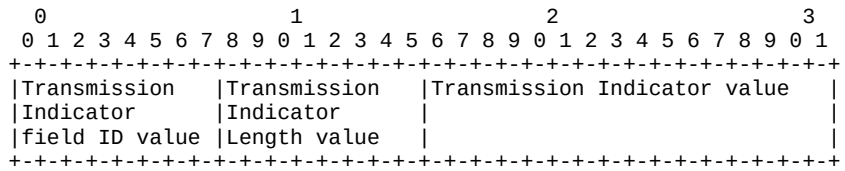
The spare bits are set to zero.

9.2.3.11 Transmission Indicator field

The Transmission Indicator contains additional information about a received transmission control message.

Table 9.2.3.11-1 describes the coding of the Transmission Indicator field.

Table 9.2.3.11-1: Transmission Indicator field coding

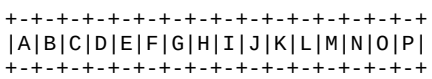


The <Transmission Indicator field ID> value is a binary value and is set according to table 9.2.3.1-1.

The <Transmission Indicator Length> value is a binary value and has the value '2'.

The <Transmission Indicator> value is a 16 bit bit-map named as shown in table 9.2.3.11-2:

Table 9.2.3.11-2: Transmission Indicator bit marking



When set to 1, the bit has the following meaning:

A = Normal call

B = Broadcast group call

C = System call

D = Emergency call

E = Imminent peril call

NOTE 1: The indicators C, D and E are only informative. There are no procedures specified for the C, D and E indicators in this release of the present document and the use of the indicators are implementation specific.

Bits F to P are reserved for future use and are set to 0.

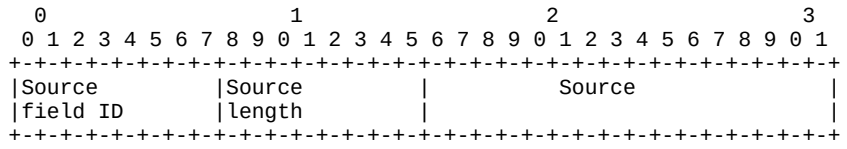
There can be more than one bit set to 1 at the same time. The local policy in the transmission control server decides which combinations are possible and the priority of the indications.

9.2.3.12 Source field

The Source field contains the source of the message.

Table 9.2.3.12-1 describes the coding of the Source field.

Table 9.2.3.12-1: Source field coding



The <Source field ID> value is a binary value and is set according to table 9.2.3.1-1.

The <Source length> value is a binary value and has the value 2 indicating the total length in octets of the <Source> value item.

The <Source> value is a 16 bit binary value where:

'0' the transmission participant is the source

'1' the participating MCVideo function is the source

'2' the controlling MCVideo function is the source

'3' the non-controlling MCVideo function is the source

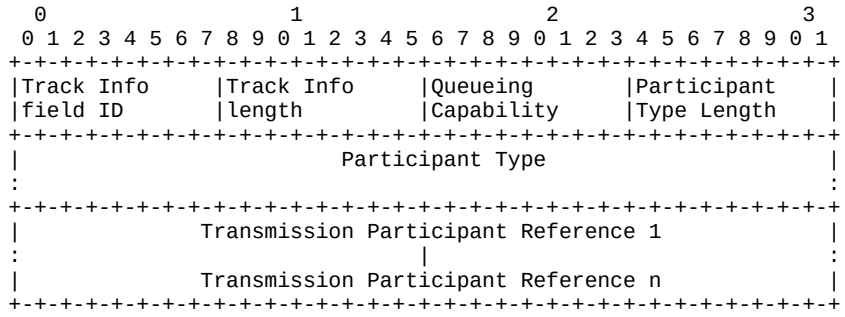
All other values are reserved for future use.

9.2.3.13 Track Info field

The Track Info field contains the path a transmission control message has been routed along with the priority and the queueing capability of the MCVideo client.

Table 9.2.3.13-1 describes the coding of the Track Info field.

Table 9.2.3.13-1: Track Info field coding



The <Track Info field ID> value is a binary value and is set according to table 8.2.3.1-2.

The <Track Info length> value is a binary value and has a value indicating the total length in octets of the <Queueing Capability> value and one or more <Transmission Participant Reference> value items.

The <Queueing Capability> value is an 8 bit binary value where:

'0' the transmission participant in the MCVideo client does not support queueing

'1' the transmission participant in the MCVideo client supports queueing

All other values are reserved for future use.

The <Participant Type Length> value is 8 bit binary value set to the length of the <Participant Type> value.

The <Participant Type> value is string coded as specified in table 9.2.3.13-1:

Table 9.2.3.13-2: ABNF syntax of values of the <Participant Type> value

```
participant-type = 1*( %x20-7E / UTF8-NONASCII )
```

If the length of the <Participant Type> value is not a multiple of 4 bytes, the <Participant Type> value is padded to a multiple of 4 bytes. The value of the padding bytes is set to zero. The padding bytes are ignored by the receiver.

NOTE 1: The content of the <Participant Type> value is MCVideo service provider specific and out of scope of the present document.

The <Transmission Participant Reference> value is a 32 bit binary value containing a reference to the transmission participant in the non-controlling MCVideo function of an MCVideo group.

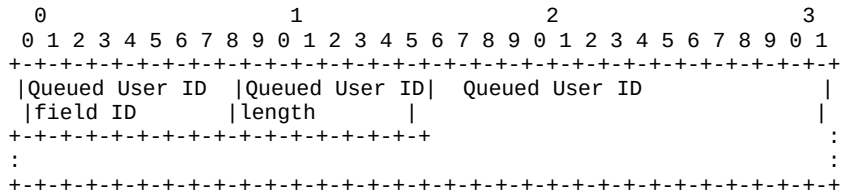
NOTE 2: The reference to the transmission participant is a value only understandable by the transmission control server interface in the non-controlling MCVideo function of an MCVideo group.

9.2.3.14 Queued User ID field

The Queued User ID field includes information about the identity of a queued MCVideo user.

Table 9.2.3.14-1 describes the coding of the Queued User ID field.

Table 9.2.3.14-1: Queued User ID field coding



The <Queued User ID field ID> value is a binary value and is set according to table 9.2.3.1-1.

The <Queued User ID length> value is coded as the <User ID length> value in subclause 9.2.3.8.

The <Queued User ID> value is coded as the <User ID> value in subclause 9.2.3.8.

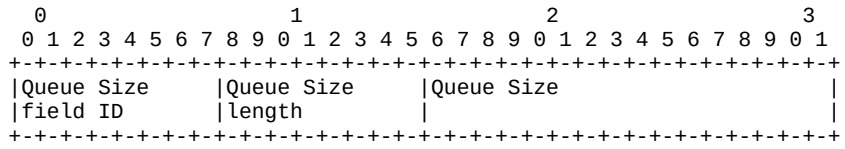
If the length of the <Queued User ID> value is not (2 + multiple of 4) bytes, the Queued User ID field shall be padded to (2 + multiple of 4) bytes. The value of the padding bytes is set to zero. The padding bytes are ignored by the receiver.

9.2.3.15 Queue Size field

The Queue Size field contains the numbers of queued MCVideo clients in an MCVideo call.

Table 9.2.3.15-1 describes the coding of the Queue size field.

Table 9.2.3.15-1: Queue Size field coding



The <Queue Size field ID> value is a binary value and is set according to table 9.2.3.1-1.

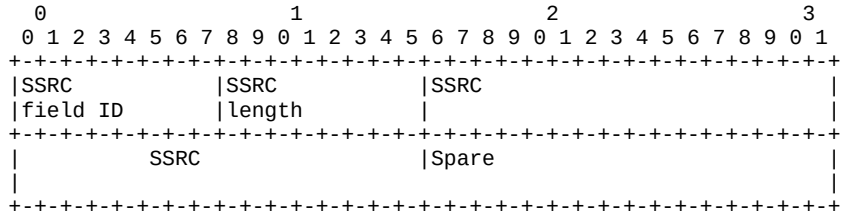
The <Queue Size length> value is a binary value and has the value '2' indicating the total length in octets of the <Queue Size> value item.

The <Queue Size> value is a 16 bit binary value.

9.2.3.16 SSRC field

The content of the SSRC field is coded as specified in IETF RFC 3550 [3]. An SSRC field can also have a Field ID and a length value. This subclause specifies an SSRC field including a Field ID and a length value.

Table 9.2.3.16-1: SSRC field coding



The <SSRC field ID> value is a binary value and is set according to table 9.2.3.1-1.

The <SSRC length> value is a binary value and has the value '6'.

The <SSRC> value is coded as the SSRC specified in IETF RFC 3550 [3].

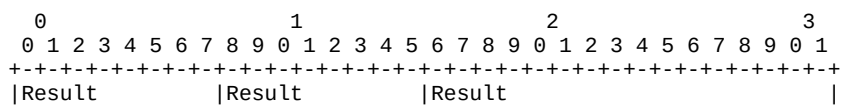
The spare bits are set to zero.

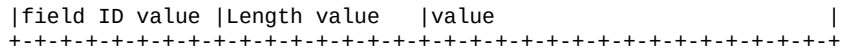
9.2.3.17 Result

The Result field conveys the result of the operation (e.g. success, failure).

Table 9.2.3.17-1 describes the coding of the Result field.

Table 9.2.3.17-1: Result field coding





The <Result field ID> value is a binary value and is set according to table 9.2.3.1-1.

The <Result length> value is a binary value and has the value '2' indicating the total length in octets of the <Result> value item and the spare bits.

The <Result> value is binary and is coded as follows:

0 The receiver is not permitted (rejected) to receive the media transmission.

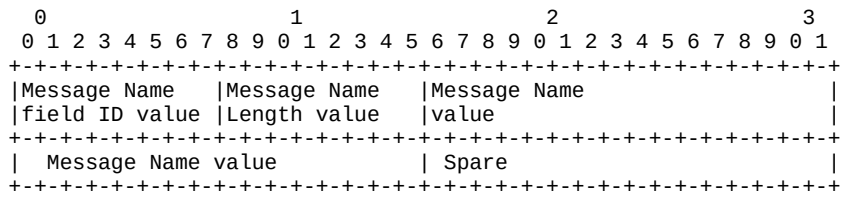
1 The receiver is permitted (granted) to receive the media transmission.

9.2.3.18 Message Name field

The Message Name field contains the transmission control message name of the message that is acknowledged.

Table 9.2.3.18-1 describes the coding of the Message Name field.

Table 9.2.3.18-1: Message Name field coding



The <Message Name field ID> value is a binary value and is set according to table 9.2.3.1-1.

The <Message Name Length> value is a binary value and has the value '6'.

The <Message Name> value is as coded as the ascii name field in table 9.1.2-1.

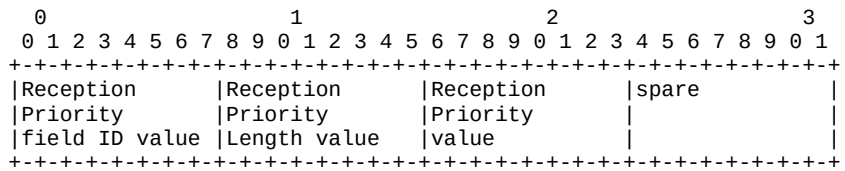
The spare bits are set to zero.

9.2.3.19 Reception Priority field

The Reception Priority field describes the level of reception priority requested in a Reception Request message or granted in a Reception Granted message. The max reception priority that can be requested in a Reception Request message is negotiated between the transmission control participant and the transmission control server as specified in subclause 14.

Table 9.2.3.19-1 describes the coding of the Reception Priority field.

Table 9.2.3.19-1: Reception Priority field coding



The < Reception Priority field ID> value is a binary value and is set according to table 9.2.3.1-1.

The < Reception Priority length> value is a binary value and has the value '2' indicating the total length in octets of the < Reception Priority> value item and the spare bits.

The < Reception Priority> value consists of 8 bit parameter giving the reception priority ('0' to '255') where '0' is the lowest reception priority and '255' is the highest reception priority. If the Reception Priority field is not included in the message the default reception priority is used as the Reception Priority value. The value of the default reception priority is '0'. The default reception priority is sometimes referred to as normal reception priority.

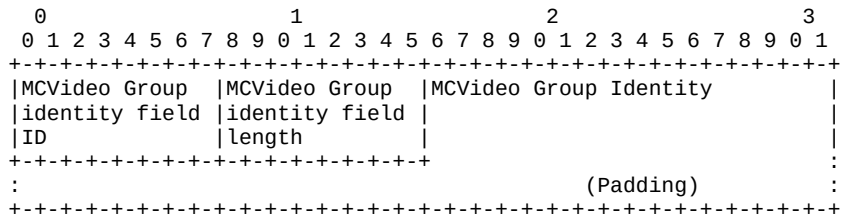
The spare bits are set to zero.

9.2.3.20 MCVideo Group Identity field

The MCVideo Group Identity field contains a URI identifying the group that an MCVideo client is invited to.

Table 9.2.3.20-1 describes the coding of the MCVideo Group Identity field.

Table 9.2.3.20-1: MCVideo Group Identity field coding



The <MCVideo Group Identity field ID> value is a binary value and shall be set according to table 9.2.3.1-1.

The <MCVideo Group Identity length> value is a binary value indicating the length in octets of the <MCVideo Group Identity> value item.

<MCVideo Group Identity> value contains the MCVideo group identity or the temporary MCVideo group identity as defined in 3GPP TS 24.281 [2]. The <MCVideo Group Identity> value shall be coded as specified in the table 9.2.3.20-2.

Table 9.2.3.20-2: ABNF syntax of string values of the <MCVideo Group Identity> value

```
mcvideo-group-identity = URI
```

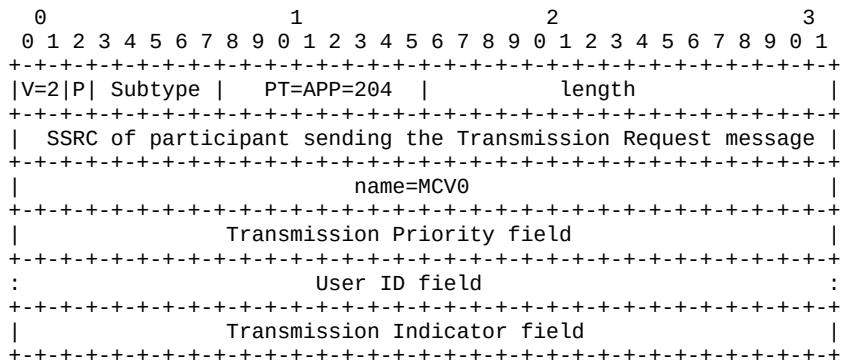
If the length of the <MCVideo Group Identity> value is not (2 + multiple of 4) bytes, the <MCVideo Group Identity> value shall be padded to (2 + multiple of 4) bytes. The value of the padding bytes should be set to zero. The padding bytes shall be ignored.

9.2.4 Transmission Request message

The Transmission Request message is a request from a transmission participant to get permission to send media.

Table 9.2.4-1 shows the content of the Transmission Request message.

Table 9.2.4-1: Transmission Request message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-1.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission participant sending the Transmission Request message.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

Transmission priority:

The Transmission Priority field is coded as described in subclause 9.2.3.2.

User ID:

The User ID field is used in off-network only and is coded as described in subclause 9.2.3.8.

Transmission Indicator:

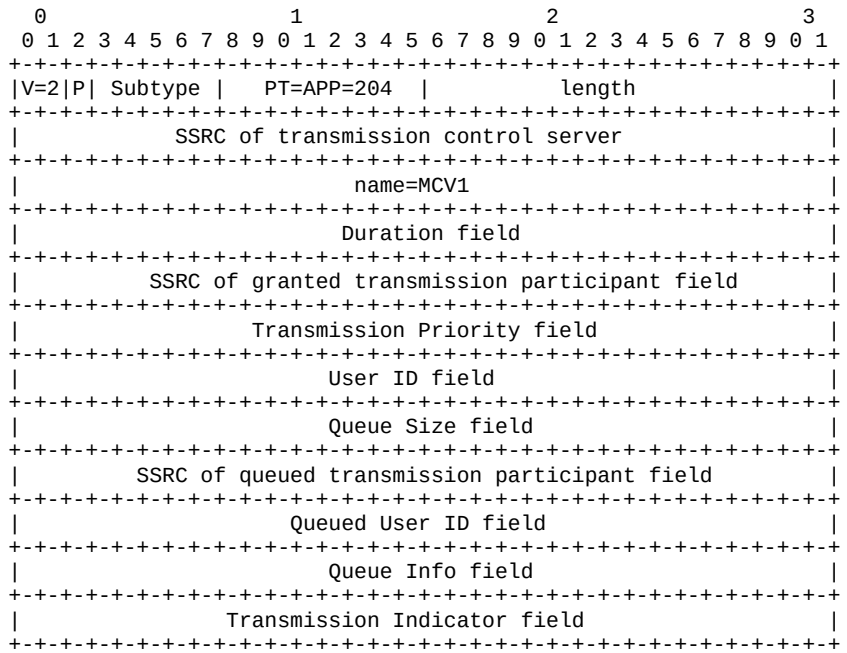
The Transmission Indicator field is coded as described in subclause 9.2.3.11.

9.2.5 Transmission Granted message

The Transmission Granted message is sent by the transmission control server to inform the requesting transmission participant that it has been granted the permission to send media.

Table 9.2.5-1 shows the content of the Transmission Granted message.

Table 9.2.5-1: Transmission Granted message



With the exception of the three first 32-bit words the order of the fields are irrelevant. However, any set of Queue size field, SSRC of queued transmission participant field, Queued User ID field and the Queue Info field shall be kept together.

Subtype:

The subtype is coded according to table 9.2.2.1-2.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field shall carries the SSRC of the transmission control server.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

Duration:

The Duration field is coded as specified in subclause 9.2.3.3.

SSRC of granted transmission participant:

The content of the SSRC of granted transmission participant is coded as the SSRC specified in IETF RFC 3550 [3].

Transmission Priority:

The Transmission Priority field contains the granted transmission priority and is coded as specified in subclause 9.2.3.2.

User ID:

The User ID field is used in off-network only. The User ID field shall carries the MCVideo ID of the transmission participant granted the transmission. The User ID field is coded as described in subclause 9.2.3.8.

Queue Size:

The Queue Size field is only applicable in off-network and contains the numbers of queued MCVideo clients in the MCVideo call.

The Queue Size field is coded as specified in subclause 9.2.3.15.

For each waiting transmission participant the following set of fields are included:

1. the SSRC of queued transmission participant;
2. the Queued User ID field; and
3. the Queue info field.

SSRC of queued transmission participant:

The SSRC of queued transmission participant is only applicable in off-network and carries the SSRC of the transmission participant in the queue.

The content of the SSRC of queued transmission participant is coded as the SSRC specified in IETF RFC 3550 [3].

Queued User ID:

The Queued User ID field is only applicable in off-network and contains the MCVideo ID of the transmission participant in the queue.

The Queued User ID field is coded as specified in subclause 9.2.3.14.

Queue Info:

The Queue Info field is only applicable in off-network and defines the queue position and granted transmission priority in the queue.

The Queue Info field is coded as specified in subclause 9.2.3.5.

Transmission Indicator:

The Transmission Indicator field is coded as described in subclause 9.2.3.11.

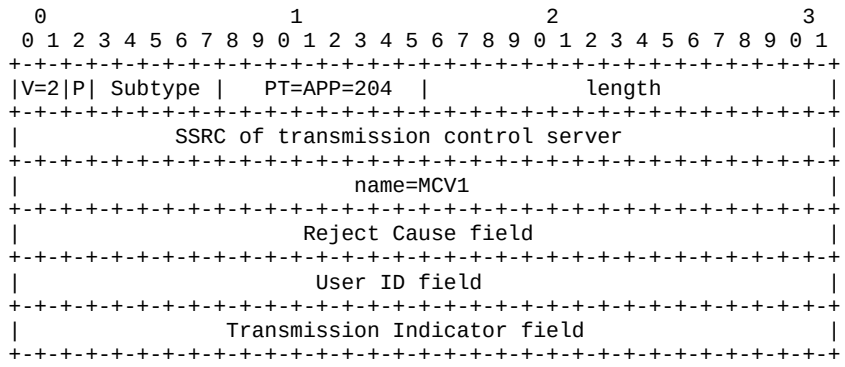
9.2.6 Transmission Rejected message

9.2.6.1 General

The Transmission Rejected message is sent as an action from the transmission control server to the requesting transmission participant to inform that the transmission request was rejected.

Table 9.2.6.1-1 shows the content of the Transmission Rejected message.

Table 9.2.6.1-1: Transmission Rejected message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-2.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control server.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

Reject Cause:

The Reject Cause field includes the reason for the rejecting the transmission request and can be followed by a text-string explaining why the transmission request was rejected. Therefore the length of the packet will vary depending on the size of the application dependent field.

The Reject Cause field contains:

1. a <Reject Cause> value; and
2. a <Reject Phrase> value.

Available <Reject Cause> values are listed in subclause 9.2.6.2. The Reject Cause field is coded as described in subclause 9.2.3.4.

User ID:

The User ID field is used in off-network only. The User ID carries the MCVideo ID of the requesting transmission participant to which the Transmission Rejected message is sent.

The User ID field is coded as specified in subclause 9.2.3.8.

Transmission Indicator:

The Transmission Indicator field is coded as described in subclause 9.2.3.11.

9.2.6.2 Rejection cause codes and rejection cause phrase

Cause #1 - Transmission limit reached

The <Reject cause> value set to '1' indicates that the number of transmitters have reached maximum.

Cause #2 - Internal transmission control server error

The <Reject cause> value set to '2' indicates that the transmission control server cannot grant the transmission request due to an internal error.

Cause #3 - Only one participant

The <Reject cause> value set to '3' indicates that the transmission control server cannot grant the transmission request, because the requesting party is the only participant in the MCVideo session.

Cause #4 - Retry-after timer has not expired

The <Reject cause> value set to '4' indicates that the transmission control server cannot grant the transmission request, because timer T9 (Retry-after) has not expired after permission to send media has been revoked.

Cause #5 - Receive only

The <Reject cause> value set to '5' indicates that the transmission control server cannot grant the transmission request, because the requesting party only has receive privilege.

Cause #6 - No resources available

The <Reject cause> value set to '6' indicates that the transmission control server cannot grant the transmission request due to congestion.

Cause #255 - Other reason

The <Reject cause> value set to '255' indicates that the transmission control server does not grant the transmission request due to the transmission control server local policy.

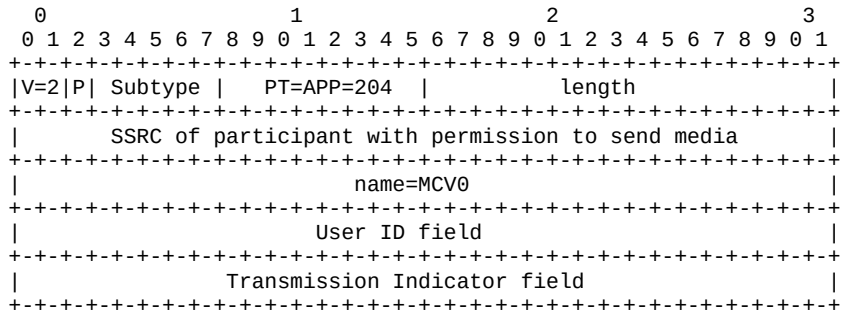
9.2.7 Transmission Release message

The Transmission Release message is sent as an action from the transmission participant to the transmission control server to inform that the transmission can be released.

The Transmission Release message can also be sent if the transmission participant has a request in the transmission request queue. In this case, the Transmission Release message is sent to cancel the transmission request in the queue.

Table 9.2.7-1 shows the content of the Transmission Release message.

Table 9.2.7-1: Transmission Release message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-1.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission participant with permission to send media.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

User ID:

The User ID field is used in off-network only. The User ID field carries the MCVideo ID of the transmission participant sending the Transmission Release message.

The User ID field is coded as specified in subclause 9.2.3.8.

Transmission Indicator:

The Transmission Indicator field is coded as described in subclause 9.2.3.11.

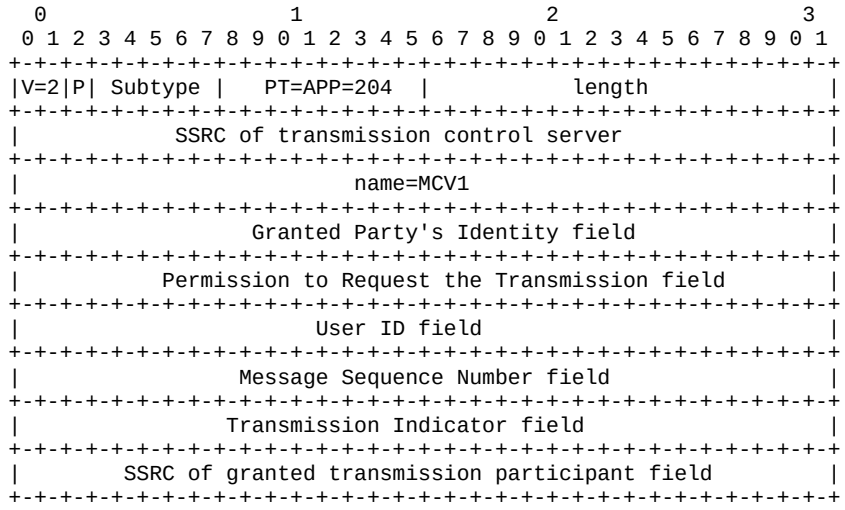
9.2.8 Transmission Arbitration Taken message

The Transmission Arbitration Taken message is sent as an action from the transmission control server to inform non-requesting transmission participant(s) that someone has been granted permission to send media.

In case of off-network, the transmission arbitrator acts as the transmission control server.

Table 9.2.8-1 shows the content of the Transmission Arbitration Taken message.

Table 9.2.8-1: Transmission Arbitration Taken message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-2.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control server.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

Granted Party's Identity:

The Granted Party's Identity field is coded as specified in subclause 9.2.3.6.

Permission to request the transmission:

The Permission to Request the Transmission field is coded as specified in subclause 9.2.3.7.

User ID:

The User ID field is used in off-network only. The User ID field carries the MCVideo user ID of the transmission participant sending the Transmission Arbitration Taken message.

The User ID field is coded as specified in subclause 9.2.3.8.

Message Sequence Number:

The Message Sequence Number field is coded as specified in to subclause 9.2.3.9.

Transmission Indicator:

The Transmission Indicator field is coded as described in subclause 9.2.3.11.

SSRC of granted transmission participant:

The content of the SSRC of granted transmission participant is coded as the SSRC specified in IETF RFC 3550 [3].

9.2.9 Transmission Arbitration Released message

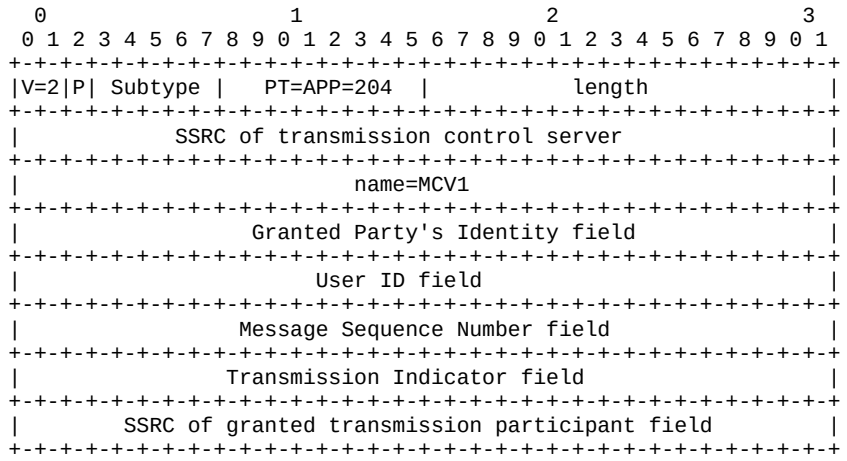
The Transmission Arbitration Released message is sent as an action from the transmission control server to inform non-requesting transmission participant(s) that the transmission control server has released the role of transmission arbitration.

In case of off-network, the transmission arbitrator acts as the transmission control server.

The Transmission Arbitration Released message is used in the off-network mode

Table 9.2.9-1 shows the content of the Transmission Arbitration Released message.

Table 9.2.9-1: Transmission Arbitration Released message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-2.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control server.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

Granted Party's Identity:

The Granted Party's Identity field is coded as specified in subclause 9.2.3.6.

Permission to request the transmission:

The Permission to Request the Transmission field is coded as specified in subclause 9.2.3.7.

User ID:

The User ID field is used in off-network only. The User ID field carries the MCVideo user ID of the transmission participant sending the Transmission Arbitration Released message.

The User ID field is coded as specified in subclause 9.2.3.8.

Message Sequence Number:

The Message Sequence Number field is coded as specified in to subclause 9.2.3.9.

Transmission Indicator:

The Transmission Indicator field is coded as described in subclause 9.2.3.11.

SSRC of granted transmission participant:

The content of the SSRC of granted transmission participant is coded as the SSRC specified in IETF RFC 3550 [3].

9.2.10 Transmission Revoked message

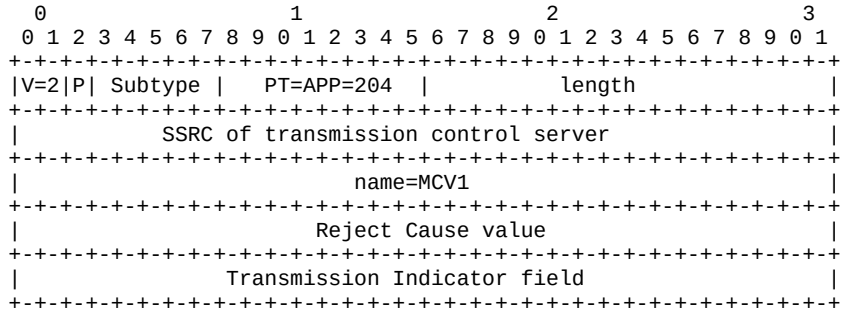
9.2.10.1 General

The Transmission Revoked message is sent from the transmission control server to the transmission participant with the permission to send media to inform that the permission to send media is revoked.

The Transmission Revoked message is only used over the unicast bearer.

Table 9.2.10.1-1 shows the content of the Transmission Revoked message.

Table 9.2.10.1-1: Transmission Revoked message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-2.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control server.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

Reject Cause:

The Reject Cause field for the Transmission Revoked message includes <Reject Cause> cause value in the Reject Cause field explaining why the transmission control server wants the transmission participant to stop sending media and can be followed by additional information. Therefore the length of the packet can vary depending on the value of the rejection cause.

The coding of the <Reject Cause> value is specified in subclause 9.2.3.4.

Transmission Indicator:

The Transmission Indicator field is coded as described in subclause 9.2.3.11.

9.2.10.2 Transmission revoked cause codes and revoked cause phrases

Cause #1 – Only one MCVideo client

> The <Reject Cause> value set to '1' indicates that the MCVideo client is the only MCVideo client in the MCVideo session or the only participant connected to a transmission control server. No additional information included.

Cause#2 – Media burst too long

> The <Reject Cause> value set to '2' indicates that the MCVideo User has transmitted too long (e.g., the stop-transmission timer has expired). No additional information included.

Cause#3 - No permission to send a Media Burst

> The <Reject Cause> value set to '3' indicates that the MCVideo client does not have permission to send media. No additional information is included.

Cause#4 - Media Burst pre-empted

> The <Reject Cause> value set to '4' indicates that the MCVideo client 's permission to send a media is being pre-empted. No additional information is included.

Cause#5 - Terminate the RTP stream

> The <Reject Cause> value set to '5' indicates that the MCVideo client's permission to send a media is being revoked. No additional information is included.

Cause#6 - No resources available

> The <Reject Cause> value set to '6' indicates that the transmission control server can no longer grant MCVideo client to send media due to congestion. No additional information is included.

Cause#7 - Queue the transmission

> The <Reject Cause> value set to '7' indicates that the MCVideo client's permission to send a media is being queued. No additional information is included.

Cause#255 – Other reason

> The <Reject Cause> value set to '255' indicates that the transmission control server can no longer grant MCVideo client to send media due to the transmission control server local policy. No additional information is included.

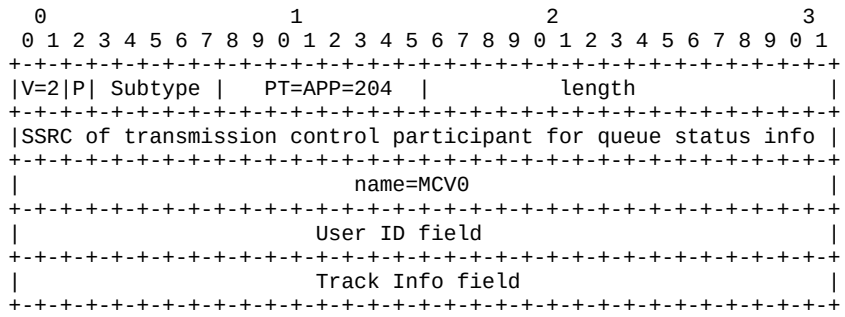
9.2.11 Queue Position Request message

The Queue Position Request message is a request from a transmission control participant to get information about the transmission control participant's position in the transmission control request queue.

The Queue Position Request message is used in the off-network mode and in the on-network mode. In the on-network mode the Queue Position Request message is only used over the unicast bearer..

Table 8.2.11-1 shows the content of the Queue Position Request message.

Table 9.2.11-1: Queue Position Request message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-1.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control participant that is requesting information about its position in the transmission request queue.

The SSRC field is coded as specified in IETF RFC 3550 [3].

User ID:

The User ID field is used in off-network only. The User ID field carries the MCVideo user ID of the transmission participant sending the Queue Position Request message.

The User ID field is coded as specified in subclause 9.2.3.8.

Track Info:

The Track Info field is included when an MCVideo call involves a non-controlling MCVideo function. The coding of the Track Info field is described in subclause 9.2.3.13.

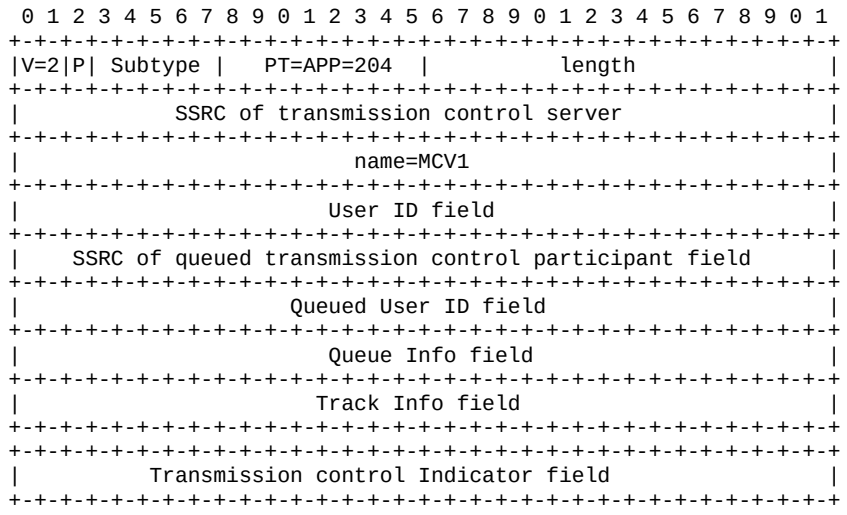
9.2.12 Queue Position Info message

The Queue Position Info message is sent by the transmission control server to notify the transmission control participant of its position in the transmission control request queue.

The Queue Position Info message is used in off-network and in on-network mode. In the on-network mode the Queue Position Info message is only used over the unicast bearer.

Table 9.2.12-1 shows the content of the Queue Position Info message.

Table 9.2.12-1: Queue Position Info message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-2.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control server.

The SSRC field is coded as specified in IETF RFC 3550 [3].

User ID:

The User ID field is used in off-network only. The User ID field carries the MCVideo ID of the transmission control participant sending the Queue Position Info message.

The User ID value is coded as specified in subclause 9.2.3.8.

SSRC of queued transmission participant:

The SSRC of queued transmission participant is only applicable in off-network and shall carry the SSRC of the queued transmission participant.

The SSRC field shall be coded as specified in IETF RFC 3550 [3].

Queued User ID:

The Queued User ID field is used in off-network only. The Queued User ID field carries the MCVideo ID of the queued transmission control participant.

The Queued User ID value is coded as specified in subclause 9.2.3.8.

Queue Info:

The Queue Info field defines the queue position and granted transmission control priority in the queue.

The Queue Info field is coded as specified in subclause 9.2.3.5.

Track Info:

The Track Info field is included when an MCVideo call involves a non-controlling MCVideo function. The coding of the Track Info field is described in subclause 9.2.3.13.

Transmission Control Indicator:

The Transmission Control Indicator field is coded as described in subclause 9.2.3.15.

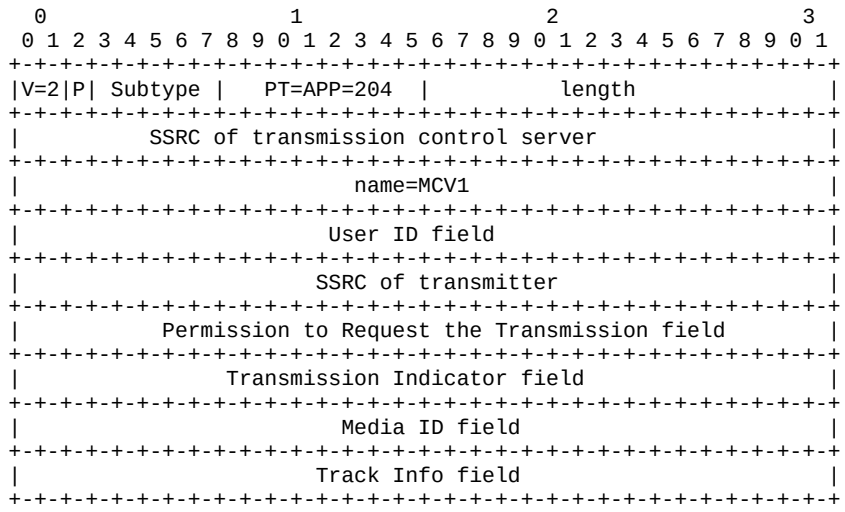
9.2.13 Media transmission notification

The Media transmission notification message is sent by the transmission control server to notify the transmission control participant that a media transmission is available from another user.

The Media transmission notification message is used in off-network and in on-network mode. In the on-network mode the Media transmission notification message is used over both the unicast bearer and MBMS bearer.

Table 9.2.13-1 shows the content of the Media transmission notification message.

Table 9.2.13-1: Media transmission notification message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-2.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control server.

The SSRC field is coded as specified in IETF RFC 3550 [3].

User ID:

The User ID field carries the MCVideo ID of the user transmitting the media.

The User ID value is coded as specified in subclause 9.2.3.8.

SSRC of transmitter:

The SSRC of transmitter field carries the SSRC of the user transmitting the media.

The SSRC of transmitter field is coded as described in subclause 9.2.3.16.

Permission to request the transmission:

The Permission to Request the Transmission field is coded as specified in subclause 9.2.3.7.

Transmission Indicator:

The Transmission Indicator field is coded as described in subclause 9.2.3.11.

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field identified a media flow within a media multiplex.

The Media ID value is coded as specified in subclause 9.2.3.x.

Track Info:

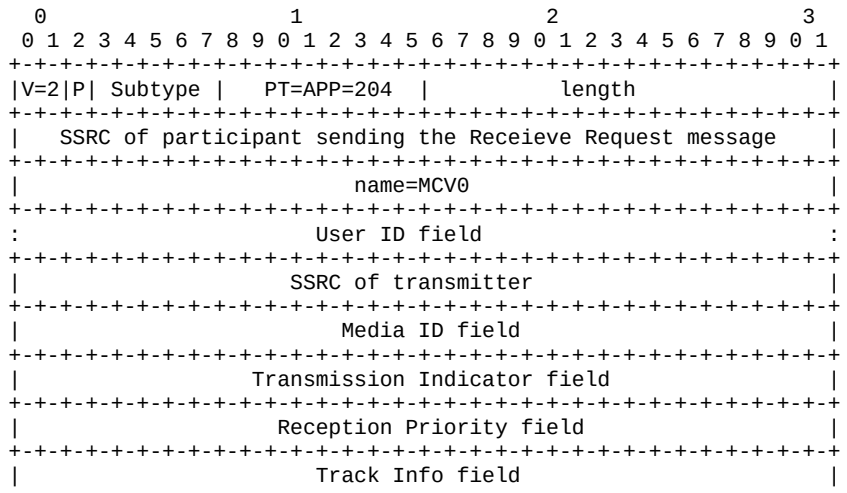
The Track Info field is included when an MCVideo call involves a non-controlling MCVideo function. The coding of the Track Info field is described in subclause 9.2.3.13.

9.2.14 Receive media request

The Receive media request message is a request from a transmission control participant to get permission to send media. The Receive media request message is sent over unicast bearers only from the transmission control participant towards the transmission control server.

Table 9.2.14-1 shows the content of the Receive Request message.

Table 9.2.14-1: Receive media request message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-1.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission participant requesting the reception of the media from another user.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

User ID:

The User ID field is used to carry the identity of the user who is requesting the reception of the media and is coded as described in subclause 9.2.3.8.

SSRC of transmitter:

The SSRC of transmitter field carries the SSRC of the user transmitting the media.

The SSRC of transmitted field is coded as described in subclause 9.2.3.16.

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field identified a media flow within a media multiplex.

The Media ID value is coded as specified in subclause 9.2.3.x.

Transmission Indicator:

The Transmission Indicator field is coded as described in subclause 9.2.3.11.

Reception priority:

The Reception Priority field is coded as described in subclause 9.2.3.19.

Track Info:

The Track Info field is included when an MCVideo call involves a non-controlling MCVideo function. The coding of the Track Info field is described in subclause 9.2.3.13.

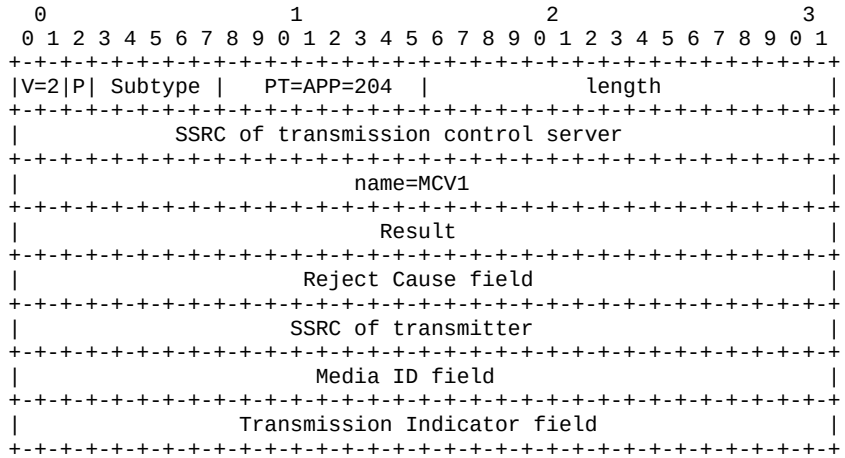
9.2.15 Receive media response

9.2.15.1 General

The Receive media response message is sent from the transmission control server to the transmission control participant to indicate whether the media reception is possible or not.

Table 9.2.15.1-1 shows the content of the Receive media response message.

Table 9.2.15.1-1: Receive media response message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-2.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control server.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

Result:

The Result field indicates whether media reception is possible as per the request. This field is coded as described subclause 9.2.3.x.

Reject Cause:

The Reject Cause field includes the reason for the rejecting the media receive request and can be followed by a text-string explaining why the media receive request was rejected. Therefore the length of the packet will vary depending on the size of the application dependent field.

The Reject Cause field contains:

1. a <Reject Cause> value; and
2. a <Reject Phrase> value.

Available <Reject Cause> values are listed in subclause 9.2.15.2. The Reject Cause field is coded as described in subclause 9.2.3.4.

SSRC of transmitter:

The SSRC of transmitter field carries the SSRC of the user transmitting the media.

The SSRC of transmitted field is coded as described in subclause 9.2.3.16.

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field identified a media flow within a media multiplex.

The Media ID value is coded as specified in subclause 9.2.3.x.

Transmission Indicator:

The Transmission Indicator field is coded as described in subclause 9.2.3.11.

9.2.6.2 Rejection cause codes and rejection cause phrase

Cause #2 - Internal transmission control server error

The <Reject cause> value set to '2' indicates that the transmission control server cannot grant the receive media request due to an internal error.

Cause #4 - Retry-after timer has not expired

The <Reject cause> value set to '4' indicates that the transmission control server cannot grant the receive media request, because timer T9 (Retry-after) has not expired after permission to send media has been revoked.

Cause #5 - Send only

The <Reject cause> value set to '5' indicates that the transmission control server cannot grant the receive media request, because the requesting party only has send privilege.

Cause #6 - No resources available

The <Reject cause> value set to '6' indicates that the transmission control server cannot grant the receive media request due to congestion.

Cause #255 - Other reason

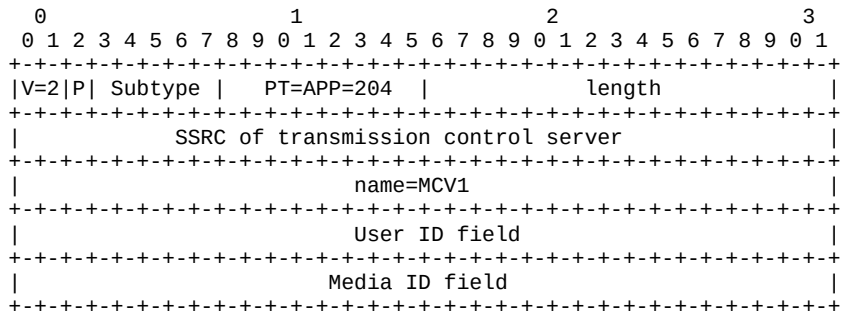
The <Reject cause> value set to '255' indicates that the transmission control server does not grant the receive media request due to the transmission control server local policy.

9.2.16 Media reception notification

The Media reception notification message is sent from the transmission control server to the transmission control participant to indicate that a media reception has been initiated to a user.

Table 9.2.16-1 shows the content of the Media reception notification message.

Table 9.2.16-1: Media reception notification message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-2.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control server.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

User ID:

The User ID field is used to carry the identity of the user who is receiving the media and is coded as described in subclause 9.2.3.8.

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field identified a media flow within a media multiplex.

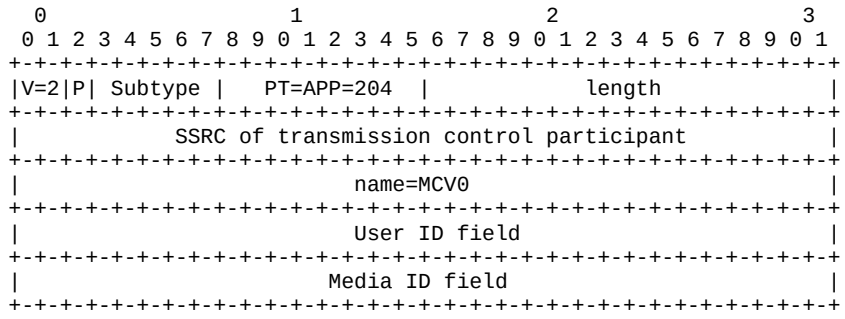
The Media ID value is coded as specified in subclause 9.2.3.x

9.2.17 Transmission cancel request

The Transmission cancel request message is sent from the transmission control participant to the transmission control server to indicate the cancellation of a transmitted media.

Table 9.2.17.1-1 shows the content of the Transmission cancel request message.

Table 9.2.17-1: Transmission cancel request message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-1.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control server.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

User ID:

The User ID field is used to carry the identity of the user whose media transmission is requested for cancellation and is described in subclause 9.2.3.8.

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field identified a media flow within a media multiplex.

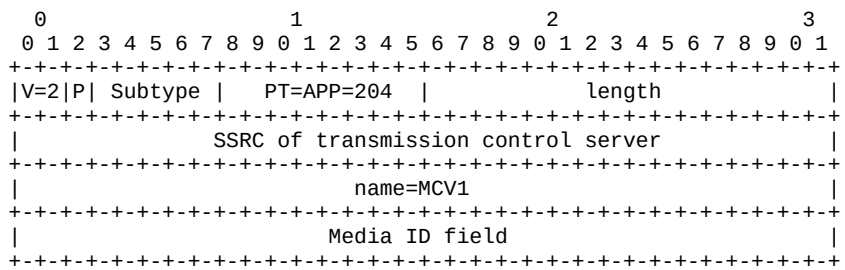
The Media ID value is coded as specified in subclause 9.2.3.x

9.2.18 Transmission cancel response

The Transmission cancel response message is sent from the transmission control server to the transmission control participant to indicate the cancellation of a transmitted media.

Table 9.2.18.1-1 shows the content of the Transmission cancel response message.

Table 9.2.18.1-1: Transmission cancel response message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-2.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control server.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field identified a media flow within a media multiplex.

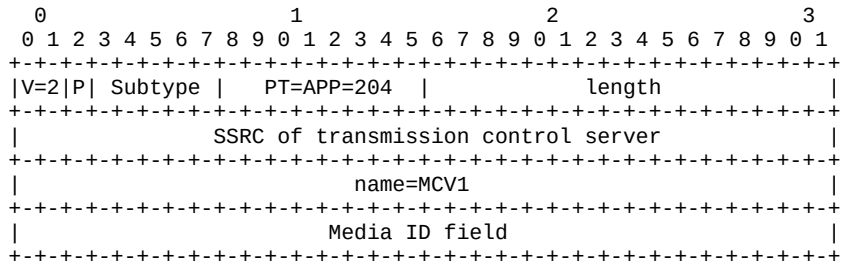
The Media ID value is coded as specified in subclause 9.2.3.x

9.2.19 Transmission cancel request notify

The Transmission cancel request notify message is sent from the transmission control server to the transmission control participant..

Table 9.2.19-1 shows the content of the Transmission cancel request notify message.

Table 9.2.19-1: Transmission cancel request notify message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-2.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control server.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field identified a media flow within a media multiplex.

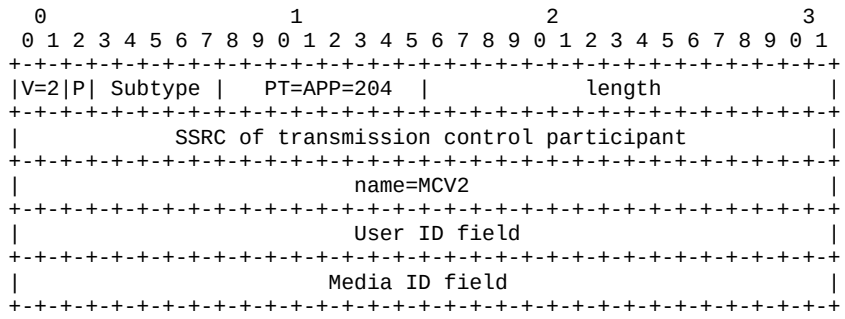
The Media ID value is coded as specified in subclause 9.2.3.x

9.2.20 Transmission end request

The Transmission end request message is sent from the transmission control participant to the transmission control server and from the transmission control server to the transmission control participant.

Table 9.2.20.1-1 shows the content of the Transmission end request message.

Table 9.2.20-1: Transmission end request message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-3.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control participant.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

User ID:

The User ID field is used to carry the identity of the user whose media transmission is requested to be terminated and is described in subclause 9.2.3.8.

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field identified a media flow within a media multiplex.

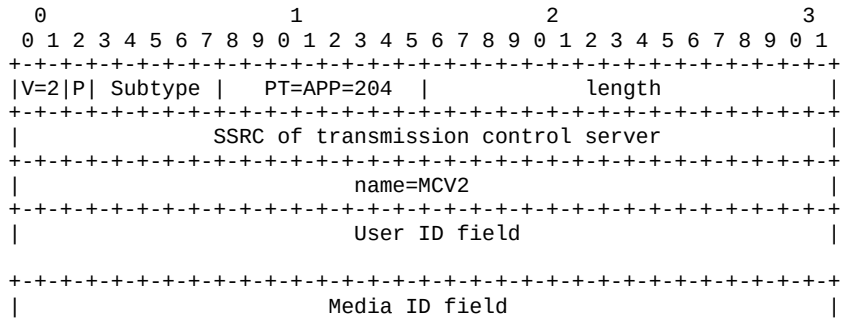
The Media ID value is coded as specified in subclause 9.2.3.x

9.2.21 Transmission end response

The Transmission end response message is sent from the transmission control participant to the transmission control server and from the transmission control server to the transmission control participant.

Table 9.2.21-1 shows the content of the Transmission end response message.

Table 9.2.21-1: Transmission end response message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-3.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control server.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

User ID:

The User ID field is used to carry the identity of the user whose media transmission is requested to be terminated and is coded as described in subclause 9.2.3.8.

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field identified a media flow within a media multiplex.

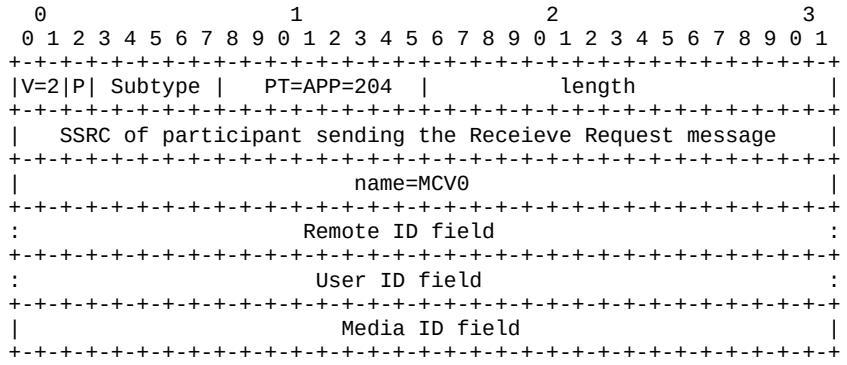
The Media ID value is coded as specified in subclause 9.2.3.x

9.2.22 Remote Transmission request

The Remote Transmission request message is sent from the transmission control participant to the transmission control server.

Table 9.2.22-1 shows the content of the Remote Transmission request message.

Table 9.2.22-1: Remote Transmission request message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-1.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission participant requesting the reception of the media from another user.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

Remote ID:

The Remote ID field is used to carry the identity of the user who remotely initiated the media transmission of another user and is coded as described in subclause 9.2.3.8.

User ID:

The User ID field is used to carry the identity of the user whose media transmission is requested and is coded as described in subclause 9.2.3.8.

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field identified a media flow within a media multiplex.

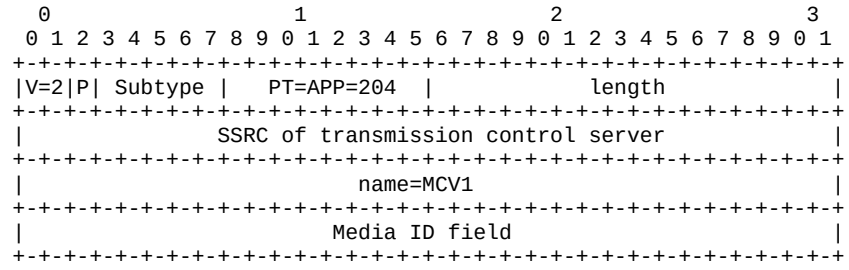
The Media ID value is coded as specified in subclause 9.2.3.x.

9.2.23 Remote Transmission response

The Remote Transmission response message is sent from the transmission control server to the transmission control participant.

Table 9.2.23-1 shows the content of the Remote Transmission response message.

Table 9.2.23-1: Remote Transmission response message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-2.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control server.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field identified a media flow within a media multiplex.

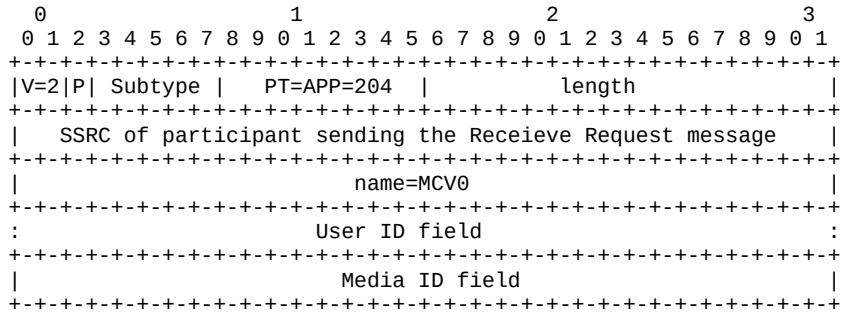
The Media ID value is coded as specified in subclause 9.2.3.x

9.2.24 Remote Transmission cancel request

The Remote Transmission cancel request message is sent from the transmission control participant to the transmission control server.

Table 9.2.24-1 shows the content of the Remote Transmission cancel request message.

Table 9.2.24-1: Remote Transmission cancel request message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-1.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission participant requesting the reception of the media from another user.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

User ID:

The User ID field is used to carry the identity of the user whose media transmission is requested for cancellation and is coded as described in subclause 9.2.3.8.

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field identified a media flow within a media multiplex.

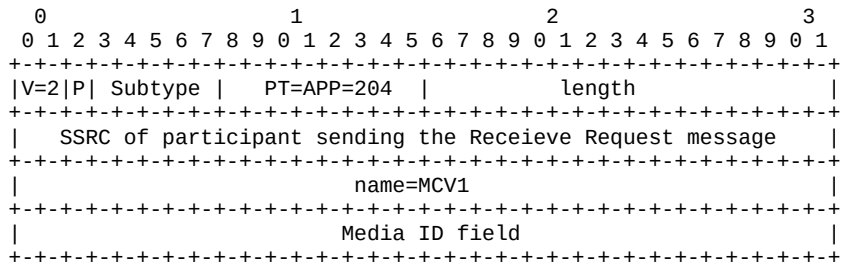
The Media ID value is coded as specified in subclause 9.2.3.x.

9.2.25 Remote Transmission cancel response

The Remote Transmission cancel response message is sent from the transmission control server to the transmission control participant.

Table 9.2.25-1 shows the content of the Remote Transmission cancel response message.

Table 9.2.25-1: Remote Transmission cancel response message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-2.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission participant requesting the reception of the media from another user.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field identified a media flow within a media multiplex.

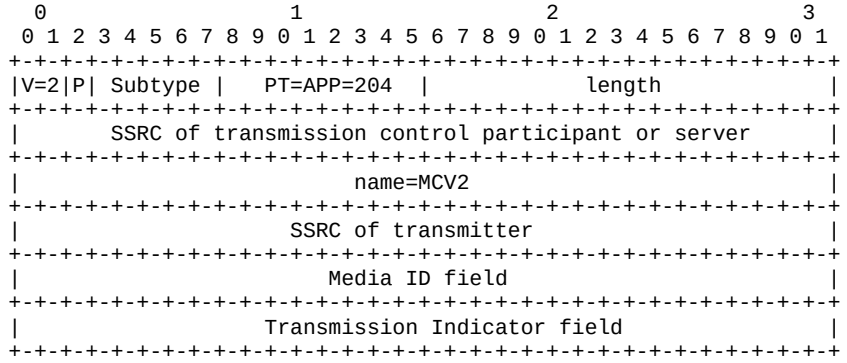
The Media ID value is coded as specified in subclause 9.2.3.x.

9.2.26 Media reception end request

The Media reception end request message is sent from the transmission control participant to the transmission control server and from the transmission control server to the transmission control participant.

Table 9.2.26.1-1 shows the content of the Media reception end request message.

Table 9.2.26-1: Media reception end request message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-3.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control server or the transmission control participant.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

SSRC of transmitter:

The SSRC of transmitter field carries the SSRC of the user transmitting the media.

The SSRC of transmitter field is coded as described in subclause 9.2.3.16.

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field identified a media flow within a media multiplex.

The Media ID value is coded as specified in subclause 9.2.3.x.

Transmission Indicator:

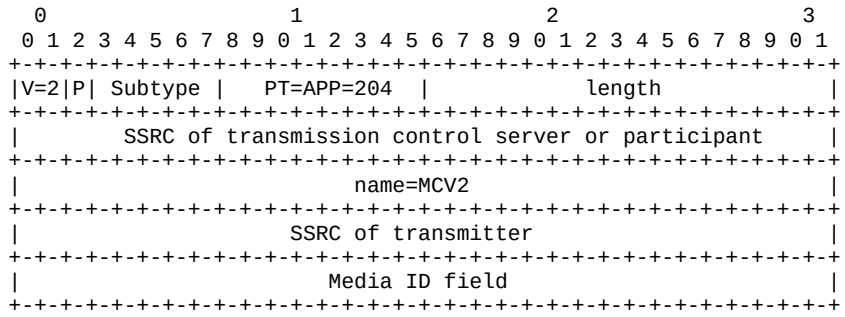
The Transmission Indicator field is coded as described in subclause 9.2.3.11.

9.2.27 Media reception end response

The Media reception end response message is sent from the transmission control participant to the transmission control server and from the transmission control server to the transmission control participant.

Table 9.2.27-1 shows the content of the Media reception end response message.

Table 9.2.27-1: Media reception end response message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-3.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control server or the transmission control participant.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

SSRC of transmitter:

The SSRC of transmitter field carries the SSRC of the user transmitting the media.

The SSRC of transmitted field is coded as described in subclause 9.2.3.16.

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field identified a media flow within a media multiplex.

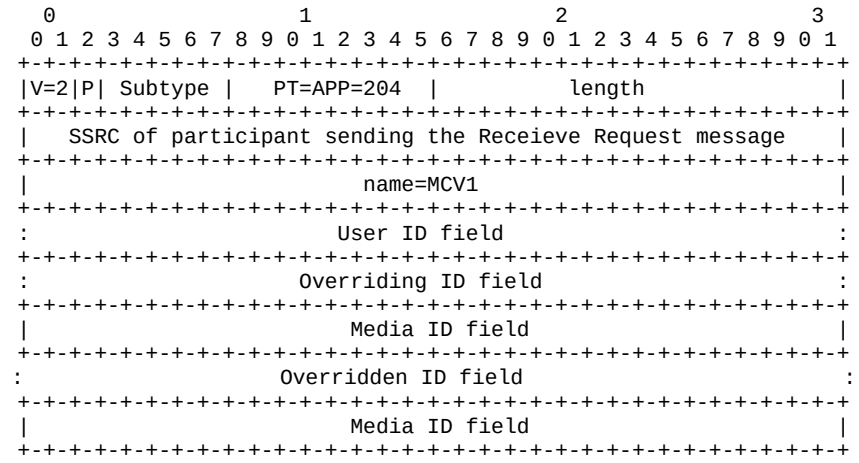
The Media ID value is coded as specified in subclause 9.2.3.x.

9.2.28 Media reception override notification

The Media reception override notification message is sent from the transmission control server to the transmission control participant.

Table 9.2.28-1 shows the content of the Media reception override notification message.

Table 9.2.28-1: Media reception override notification message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-2.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission participant requesting the reception of the media from another user.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

User ID:

The User ID field is used to carry the identity of the user who is requesting the reception of the media and is coded as described in subclause 9.2.3.8.

Overriding ID:

The Overriding ID field is used to carry the identity of the user of the overriding media and is coded as described in subclause 9.2.3.8.

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field Identifies the communication of overriding media within a media multiplex.

The Media ID value is coded as specified in subclause 9.2.3.x.

Overridden ID:

The Overridden ID field is used to carry the identity of the user of the overridden media and is coded as described in subclause 9.2.3.8.

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field Identifies the communication of overridden media within a media multiplex.

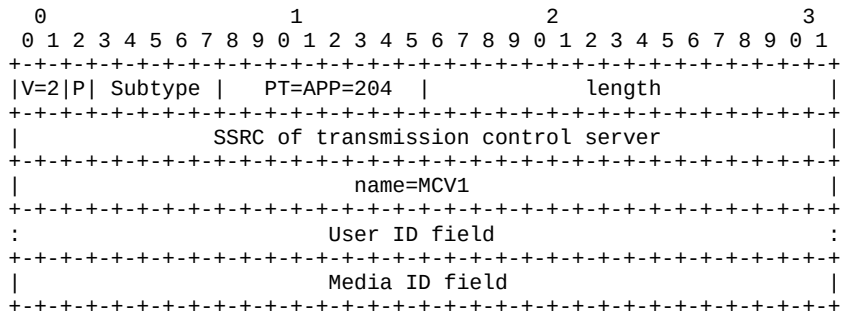
The Media ID value is coded as specified in subclause 9.2.3.x.

9.2.29 Transmission end notify

The Transmission end notify message is sent from the transmission control server to the transmission control participant.

Table 9.2.29-1 shows the content of the Transmission end notify message.

Table 9.2.29-1: Transmission end notify message



With the exception of the three first 32-bit words the order of the fields are irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-2.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control server.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

User ID:

The User ID field is used to carry the identity of the user whose media transmission has been released and is coded as described in subclause 9.2.3.8.

Media ID:

The Media ID field is present only if media multiplexing is used. The Media ID field identified a media flow within a media multiplex.

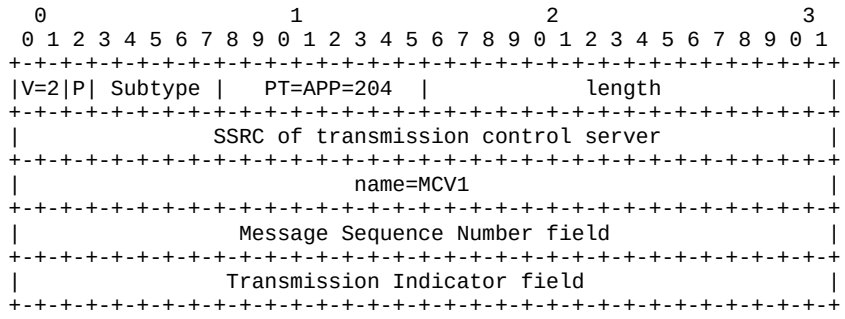
The Media ID value is coded as specified in subclause 9.2.3.x

9.2.30 Transmission idle

The Transmission idle message is sent from the transmission control server to the transmission control participant.

Table 9.2.30-1 shows the content of the Transmission idle message.

Table 9.2.30-1: Transmission idle message



With the exception of the three first 32-bit words, the order of the fields is irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-2.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control server.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

Message Sequence Number:

The Message Sequence Number field is coded as specified in to subclause 9.2.3.9.

Transmission Indicator:

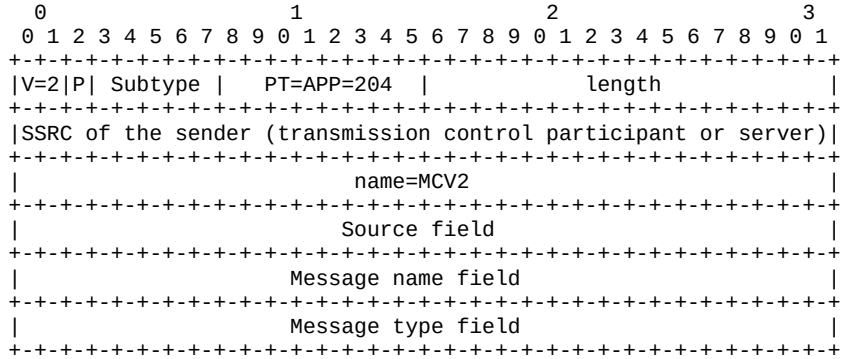
The Transmission Indicator field is coded as described in subclause 9.2.3.11.

9.2.31 Transmission control ack

The Transmission control ack message is sent from the transmission control server to the transmission control participant and from the transmission control participant to the transmission control server.

Table 9.2.31-1 shows the content of the Transmission control ack message.

Table 9.2.31-1: Transmission control ack message



With the exception of the three first 32-bit words the order of the fields is irrelevant.

Subtype:

The subtype is coded according to table 9.2.2.1-3.

Length:

The length is coded as specified in to subclause 9.1.2.

SSRC:

The SSRC field carries the SSRC of the transmission control participant or transmission control server sending the Transmission control ack.

The content of the SSRC field is coded as specified in IETF RFC 3550 [3].

Source:

The Source field contains the source of the message and is coded as described in subclause 9.2.3.12.

Message name:

The Message name field contains the transmission control message name that is being acknowledged and is coded asdescribed in subclause 9.2.3.18.

Message type:

The Message Type field contains the transmission control message type that is being acknowledged and is coded as described in subclause 9.2.3.10.

9.3 MBMS subchannel control

9.3.1 Introduction

The MBMS subchannel control messages shall be coded as described in subclause 9.1.2 where the MBMS subchannel control message is part of the application-dependent data.

For the MBMS subchannel control protocol the ASCII name string shall be: MCV3.

The list of MBMS subchannel control messages can be found in the subclause 9.3.2.

The MBMS subchannel control specific fields are specified in subclause 9.3.3.

9.3.2 MBMS subchannel control messages

Table 9.3.2-1 provides a list of MBMS subchannel control protocol messages.

Table 9.3.2-1: MBMS subchannel control protocol messages

Message name	Subtype	Reference	Direction
Map Group To Bearer	00000	subclause 9.3.4	Server → client
Unmap Group To Bearer	00001	subclause 9.3.5	Server → client
Application Paging	00010	subclause 9.3.6	Server → client
Bearer Announcement	a	subclause 9.3.7	Server → client
NOTE: The participating MCVideo function is the server and the MCVideo client is the client.			

9.3.3 MBMS subchannel control specific fields

9.3.3.1 Introduction

This subclause describes the MBMS subchannel control specific data fields.

The MBMS subchannel control specific data fields are contained in the application-dependent data of the MBMS subchannel control message. The MBMS subchannel control specific data fields follow the syntax specified in subclause 9.1.3.

Table 9.3.3.1-1 lists the available fields including the assigned Field ID.

Table 9.3.3.1-1: MBMS subchannel control specific data fields

Field name	Field ID		Description
	Decimal	Binary	
MBMS Subchannel	000	00000000	Subclause 9.3.3.3
TMGI	001	00000001	Subclause 9.3.3.4.
MCVideo Group ID	002	00000010	Subclause 9.3.3.2
Monitoring state	b	b	Subclause 9.3.3.5

9.3.3.2 MCVideo Group ID field

The MCVideo Group ID field contains a URI identifying the MCVideo group for which media and transmission control messages are going to be broadcasted over a MBMS subchannel.

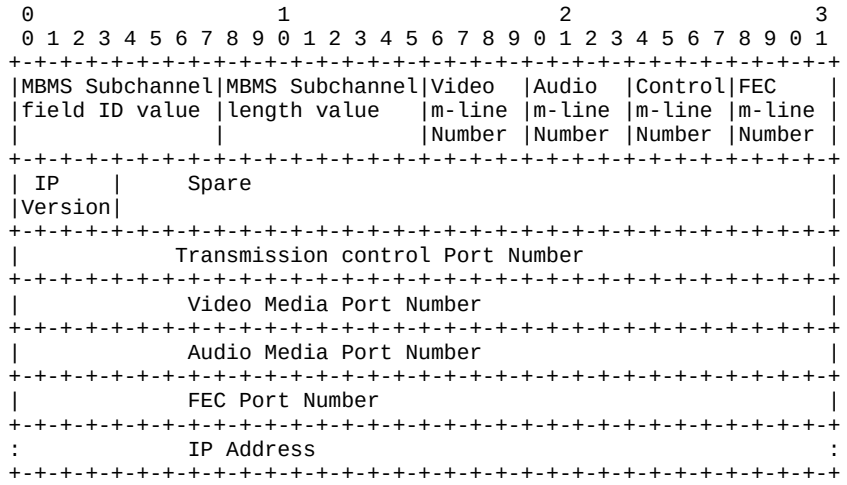
The MCVideo Group ID field is coded as the MCVideo Group Identity field specified in subclause 9.2.3.20.

9.3.3.3 MBMS Subchannel field

The MBMS Subchannel field describes which MBMS subchannel to use for media and for transmission control.

Table 9.3.3.3-1 describes the coding of the MBMS Subchannel field.

Table 9.3.3.3-1: MBMS Subchannel field coding



The <MBMS Subchannel field ID> value is a binary value and shall be set according to table 9.3.3.3-1.

The <MBMS Subchannel length> value is a binary value indicating the total length in octets of the <Video m-line Number> value, <Audio m-line Number> value, <Audio m-line Number> value, <Control m-line Number> value, <FEC m-line Number> value, <IP Version> value, spare, port number values and <IP address> items.

The <Video m-line Number> value shall consist of 4 bit parameter giving the number of the" m=video" m-line in the SIP MESSAGE request announcing the MBMS bearer described in 3GPP TS 24.281 [2].

The <Audio m-line Number> value shall consist of 4 bit parameter giving the number of the" m=audio" m-line in the SIP MESSAGE request announcing the MBMS bearer described in 3GPP TS 24.281 [2]. The <Audio m-line Number> value is set to "0" when audio is combined with video.

The <Control m-line Number> value shall consist of 4 bit parameter giving the number of the "m=application" m-line in the SIP MESSAGE request announcing the MBMS bearer described in 3GPP TS 24.281 [2].

The <FEC m-line Number> value shall consist of 4 bit parameter giving the number of the "m=application" m-line in the SIP MESSAGE request announcing the MBMS bearer described in 3GPP TS 24.281 [2]. The <FEC m-line Number> value is set to "0" when the media is not protected by FEC.

The <IP version> value indicates the IP version:

'0' IP version 4

'1' IP version 6

All other values are reserved for future use.

The <Transmission Control Port Number> value is a 32-bit binary value giving the port to be used if the<Control m-line Number> value is greater than '0'. If the <Control m-line Number> value is equal to '0', the < Transmission Control Port Number> value is not included in the MBMS Subchannel field.

The <Video Media Port Number> value is a 32-bit binary value giving the port to be used.

The <Audio Media Port Number> value is a 32-bit binary value giving the port to be used. If the <Audio m-line Number> value is equal to '0', the < Audio Port Number> value is not included in the MBMS Subchannel field.

.The <FEC Port Number> value is a 32-bit binary value giving the port to be used. If the <FEC m-line Number> value is equal to '0', the < FEC Port Number> value is not included in the MBMS Subchannel field.

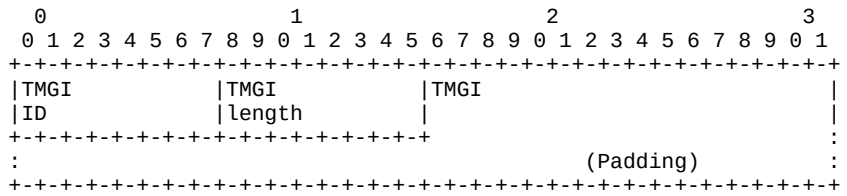
.The <IP Address> value is:

1. a 32 bit binary value containing the IP v4 address if the <IP version> indicates that the <IP Address> value is a IP v4 Address; or
2. four 32-bit words that together forms a 128 bit binary value representing the IP v6 address, if the <IP version> indicates that the <IP Address> value is a IP v6 Address.

9.3.3.4 TMGI field

Table 9.3.3.4-1 describes the coding of the TMGI field.

Table 9.3.3.4-1: TMGI field coding



The <TMGI field ID> value is a binary value and shall be set according to table 9.3.3.1-2.

The <TMGI length> value is a binary value indicating the length in octets of the <TMGI> value item.

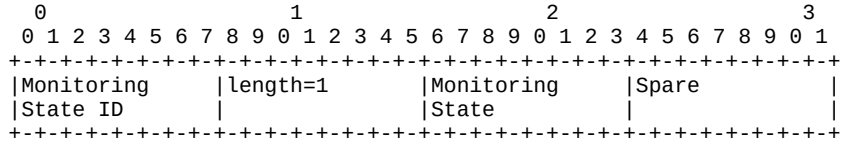
The <TMGI> value is coded as described in 3GPP TS 24.008 [11] subclause 10.5.6.13 excluding the Temporary Mobile Group Identity IEI and Length of Temporary Mobile Group Identity contents (octet 1 and octet 2 in 3GPP TS 24.008 [11] subclause 10.5.6.13).

If the length of the <TMGI> value is not (2 + multiple of 4) bytes, the <TMGI> value shall be padded to (2 + multiple of 4) bytes. The value of the padding bytes should be set to zero. The padding bytes shall be ignored.

9.3.3.5 Monitoring state

Table 9.3.3.5-1 describes the coding of the Monitoring State field.

Table 9.3.3.5-1: Monitoring State field coding



The <Monitoring State field ID> value is a binary value and shall be set according to table 9.3.3.1-1.

The <Monitoring State length> value is a binary value indicating the length in octets of the <Monitoring State> value item.

The <Monitoring State> value is a binary value where the following values are defined:

'0' Monitoring is inactive

'1' Monitoring is active

All other values are reserved for future use.

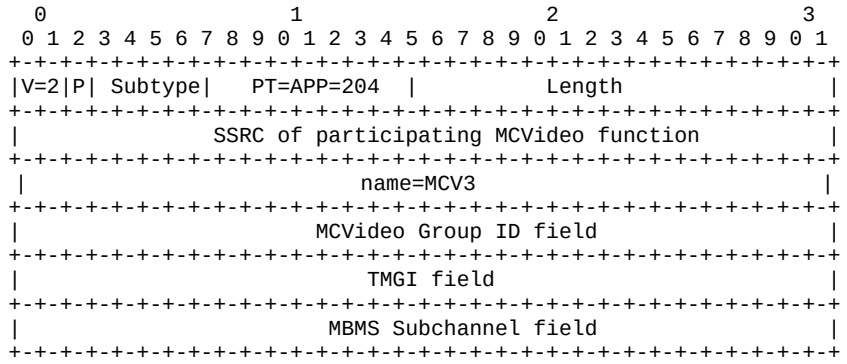
The spare bits are set to zero

9.3.4 Map Group To Bearer message

The Map Group To Bearer message is sent by the participating function when a transmission is started.

Table 9.3.4-1 shows the content of the Map Group To Bearer message.

Table 9.3.4-1: Map Group To Bearer message



With the exception of the three first 32-bit words, the order of the fields are irrelevant.

Subtype:

The subtype shall be coded according to table 9.3.2-1.

Length:

The length shall be coded as specified in subclause 8.1.2.

SSRC:

The SSRC field shall carry the SSRC of the participating MCVideo function.

The SSRC field shall be coded as specified in IETF RFC 3550 [3].

MCVideo Group ID:

The MCVideo Group ID field is coded as described in subclause 9.3.3.2.

TMGI:

The TMGI field is coded as described in subclause 9.3.3.4.

MBMS Subchannel:

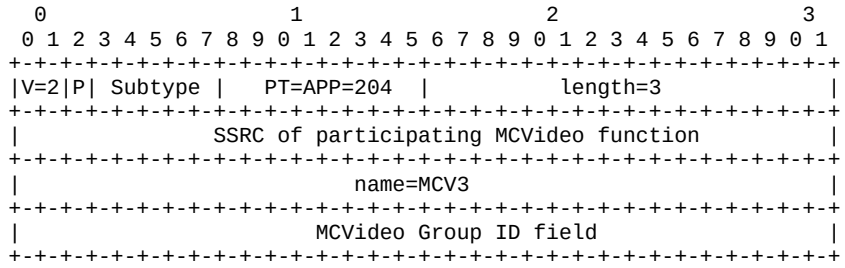
The MBMS Subchannel field is coded as described in subclause 9.3.3.3.

9.3.5 Unmap Group To Bearer message

The Unmap Group To Bearer message is sent by the participating function when a transmission is ended.

Table 9.3.5-1 shows the content of the Unmap Group To Bearer message.

Table 9.3.5-1: Unmap Group To Bearer message



With the exception of the three first 32-bit words, the order of the fields are irrelevant.

Subtype:

The subtype shall be coded according to table 9.3.2-1.

Length:

The length shall be coded as specified in subclause 8.1.2.

SSRC:

The SSRC field shall carry the SSRC of the participating MCVideo function.

The SSRC field shall be coded as specified in IETF RFC 3550 [3].

MCVideo Group ID:

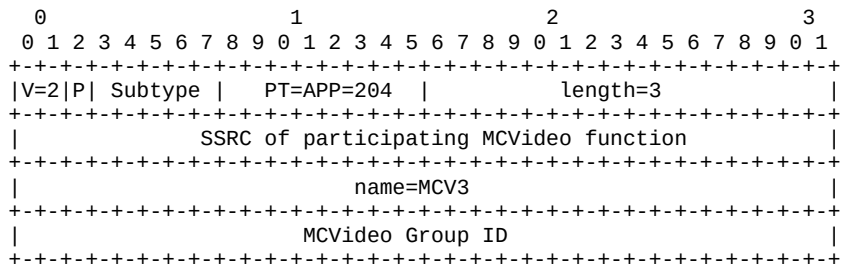
The MCVideo Group ID field is coded as described in subclause 9.3.3.2.

9.3.6 Application Paging message

The Application Paging message is sent by the participating function when an existing conversation is to be moved to unicast bearers or a new conversation is to be started on unicast bearers.

Table 9.3.6-1 shows the content of the Application Paging message.

Table 9.3.6-1: Application Paging message



With the exception of the three first 32-bit words, the order of the fields is irrelevant.

Subtype:

The subtype shall be coded according to table 9.3.2-1.

Length:

The length shall be coded as specified in subclause 9.1.2.

SSRC:

The SSRC field shall carry the SSRC of the participating MCVideo function.

The SSRC field shall be coded as specified in IETF RFC 3550 [3].

MCVideo Group ID:

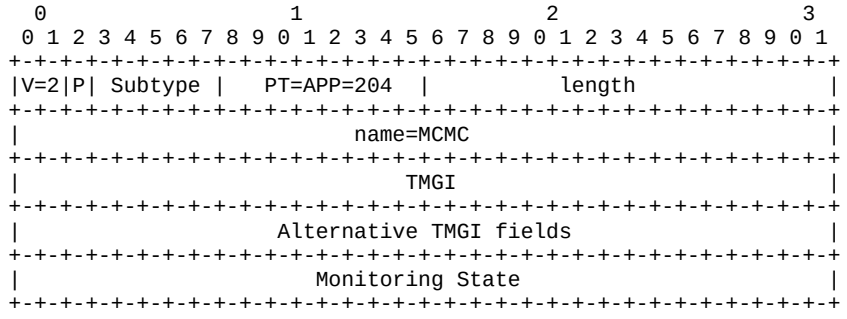
The MCVideo Group ID field is coded as described in subclause 9.3.3.2.

9.3.7 Bearer Announcement message

The Bearer Announcement message is sent by the participating function on an MBMS bearer for application control messages. It may be sent by the participating function in order to achieve a faster setup of the MBMS bearer

Table 9.3.7-1 shows the content of the Bearer Announcement message.

Table 9.3.7-1: Bearer Announcement message



With the exception of the three first 32-bit words and the internal order of the TMGI field and the Alternative TMGI fields, the order of the fields is irrelevant.

Subtype:

The subtype shall be coded according to table 9.3.2-1.

Length:

The length shall be coded as specified in subclause 9.1.2.

TMGI:

The TMGI field is coded as described in subclause 9.3.3.4. This field is mandatory.

Alternative TMGI:

Zero or more alternative TMGI fields are coded as described in subclause 9.3.3.4. This field is coded immediately after the TMGI field.

Monitoring State:

The monitoring state field is coded as described in subclause 9.3.3.5.

9.4 MBMS notifications

9.4.1 Introduction

The MBMS notifications messages shall be coded as described in subclause 8.1.2 where the MBMS notifications message is part of the application-dependent data.

For the MBMS notifications protocol the ASCII name string shall be: MCNC.

The list of MBMS notifications messages can be found in the subclause 9.4.2.

The MBMS notifications specific fields are specified in subclause 9.4.3.

9.4.2 MBMS notifications control messages

Table 9.4.2-1 provides a list of MBMS notifications protocol messages.

Table 9.4.2-1: MBMS notifications protocol messages

Message name	Subtype	Reference	Direction
Group Dynamic Data Notify	00000	subclause 9.4.4	Server → client
NOTE: The participating MCVideo function is the server and the MCVideo client is the client.			

9.4.3 MBMS notifications control specific fields

9.4.3.1 Introduction

This subclause describes the MBMS notifications control specific data fields.

The MBMS notifications control specific data fields are contained in the application-dependent data of the MBMS notifications control message. The MBMS notifications control specific data fields follow the syntax specified in subclause 8.1.3.

Table 9.4.3.1-1 lists the available fields including the assigned Field ID.

Table 9.4.3.1-1: MBMS notifications control specific data fields

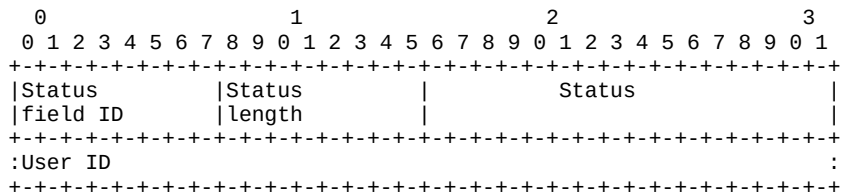
Field name	Field ID		Description
	Decimal	Binary	
Status	000	00000000	Subclause 9.4.3.2
Status changing MCVideo User Identity	001	00000001	Subclause 9.4.3.3
Group call ongoing	002	00000010	Subclause 9.4.3.4
Group broadcast alias	003	00000011	Subclause 9.4.3.5
Group regroup alias	004	00000100	Subclause 9.4.3.6

9.4.3.2 Status field

The Status field indicates the indication of the status of the group and also includes the MCVideo ID of the user that last changed the status of the group.

Table 9.4.3.2-1 describes the coding of the Status field.

Table 9.4.3.2-1: Status field coding



The <Status field ID> value is a binary value and is set according to table 9.4.3.1-1.

The <Status length> value is a binary value and shall have the value '2' indicating the total length in octets of the <Status> value item.

The <Status> value is a 16 bit binary value where:

'0' emergency

'1' in-peril

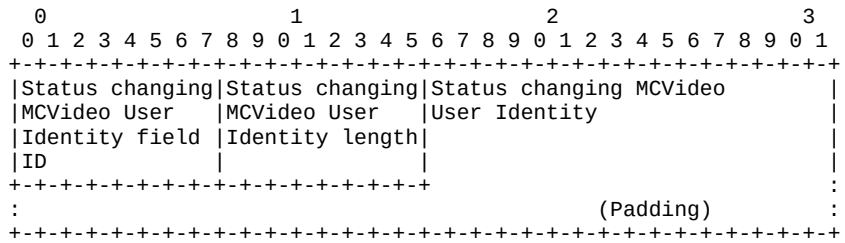
All other values are reserved for future use.

9.4.3.3 Status changing MCVideo User Identity field

The Status changing MCVideo User Identity field contains the MCVideo ID identifying the Status changing MCVideo user.

Table 9.4.3.3-1 describes the coding of the Status changing MCVideo User Identity field.

Table 9.4.3.3-1: Status changing MCVideo User Identity field coding



The <Status changing MCVideo User Identity field ID> value is a binary value and shall be set according to table 9.4.3.1-1.

The <Status changing MCVideo User Identity length> value is a binary value indicating the length in octets of the <MCVideo Group Identity> value item except padding.

The <Status changing MCVideo User Identity> value contains the MCVideo ID of the Status changing MCVideo user. The <Status changing MCVideo User Identity> value shall be coded as specified in the table 9.4.3.3-2. The MCVideo ID is specified in 3GPP TS 24.379 [2].

Table 9.4.3.3-2: ABNF syntax of string values of the <Status changing MCVideo User Identity> value

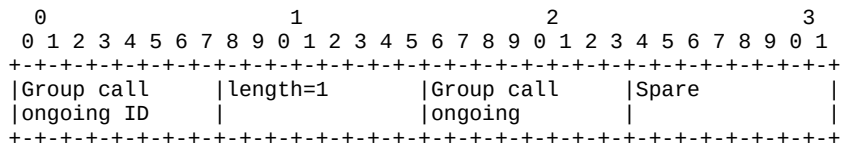
```
status-changing-mcvideo-user-identity = URI
```

If the length of the <Status changing MCVideo User Identity> value is not (2 + multiple of 4) bytes, the <Status changing MCVideo User Identity> value shall be padded to (2 + multiple of 4) bytes. The value of the padding bytes should be set to zero. The padding bytes shall be ignored.

9.4.3.4 Group call ongoing field

Table 9.4.3.4-1 describes the coding of the Monitoring State field.

Table 9.4.3.4-1: Group call ongoing field coding



The < Group call ongoing field ID> value is a binary value and shall be set according to table 9.4.3.1-1.

The <length> value is a binary value indicating the length in octets of the <Group call ongoing> value item and is set to '1'.

The <Group call ongoing> value is a binary value where the following values are defined:

'0' No Group call ongoing

'1' Group call ongoing

All other values are reserved for future use.

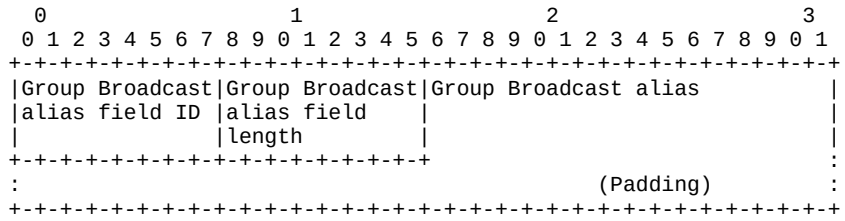
The spare bits are set to zero

9.4.3.5 Group broadcast alias field

The Group broadcast alias field contains the URI identifying the Group broadcast alias.

Table 9.4.3.5-1 describes the coding of the Group broadcast alias field.

Table 9.4.3.5-1: Group broadcast alias field coding



The <Group broadcast alias field ID> value is a binary value and shall be set according to table 9.4.3.1-1.

The <Group broadcast alias length> value is a binary value indicating the length in octets of the <Group broadcast alias> value item except padding.

The <Group broadcast alias> value contains the URI of the group broadcast alias. The <Group broadcast alias> value shall be coded as specified in the table 9.4.3.5-2. The group broadcast alias is specified in 3GPP TS 23.280 [23].

Table 9.4.3.5-2: ABNF syntax of string values of the <Group broadcast alias> value

```
group-broadcast-alias = URI
```

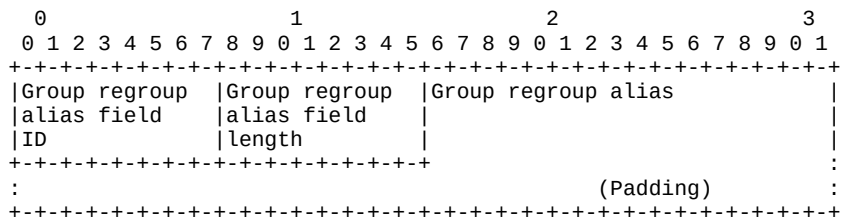
If the length of the <Group broadcast alias> value is not (2 + multiple of 4) bytes, the <Group broadcast alias> value shall be padded to (2 + multiple of 4) bytes. The value of the padding bytes should be set to zero. The padding bytes shall be ignored.

9.4.3.6 Group regroup alias field

The Group regroup alias field contains the URI identifying the Group regroup alias.

Table 9.4.3.6-1 describes the coding of the Group regroup alias field.

Table 9.4.3.6-1: Group regroup alias field coding



The <Group regroup alias field ID> value is a binary value and shall be set according to table 9.4.3.1-1.

The <Group regroup alias length> value is a binary value indicating the length in octets of the <Group regroup alias> value item except padding.

The <Group regroup alias> value contains the URI of the group regroup alias. The <Group regroup alias> value shall be coded as specified in the table 9.4.3.6-2. The Group regroup alias is specified in 3GPP TS 23.280 [23].

Table 9.4.3.6-2: ABNF syntax of string values of the <Group regroup alias> value

```
group-regroup-alias = URI
```

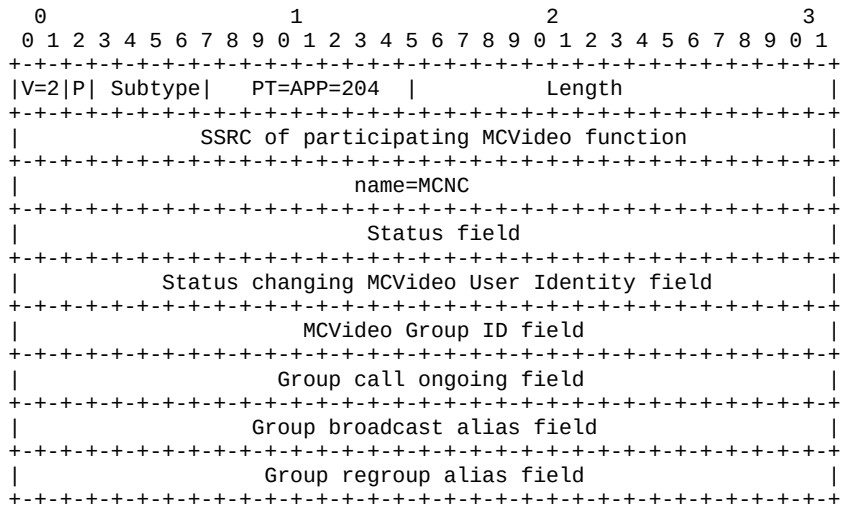
If the length of the <Group regroup alias> value is not (2 + multiple of 4) bytes, the <Group regroup alias> value shall be padded to (2 + multiple of 4) bytes. The value of the padding bytes should be set to zero. The padding bytes shall be ignored.

9.4.4 Group Dynamic Data Notify message

The Group Dynamic Data Notify message is sent by the participating function when a conversation is started.

Table 9.4.4-1 shows the content of the Group Dynamic Data Notify message.

Table 9.4.4-1: Group Dynamic Data Notify message



With the exception of the three first 32-bit words, the order of the fields are irrelevant.

Subtype:

The subtype shall be coded according to table 9.4.2-1.

Length:

The length shall be coded as specified in subclause 9.1.2.

SSRC:

The SSRC field shall carry the SSRC of the participating MCVideo function.

The SSRC field shall be coded as specified in IETF RFC 3550 [3].

MCVideo Group ID

The MCVideo Group ID field contains a SIP URI identifying the group that the group dynamic is related to.

The MCVideo Group ID field is coded as the MCVideo Group Identity field specified in subclause 9.2.3.20.

Status:

The Status field is coded as described in subclause 9.4.3.2.

Status changing MCVideo User Identity:

The Status changing MCVideo User Identity is coded as described in subclause 9.4.3.3.

Group call ongoing:

The Group call ongoing field is coded as described in subclause 9.4.3.4.

Group broadcast alias field:

The Group broadcast alias field is coded as described in subclause 9,4.3.5

Group regroup alias field:

The Group regroup alias field is coded as described in subclause 9.4.3.6

10 Media plane handling for MBMS

10.1 General

A participating MCVideo function sending transmission control messages and RTP media packets over a MBMS bearer shall support the procedures in the following subclauses.

The MBMS bearer can be used for transmissions in group calls. Prior to using the MBMS bearer the participating MCVideo function needs to activate the MBMS bearer and announce the MBMS bearer as described in subclause 4.1.2.

Transmission control messages and RTP media packets received over the MBMS subchannel are used as input to the Transmission participant state machine in the same way as Transmission control messages and RTP media packets received over the unicast bearer.

Media plane security procedures for media and Transmission control messages sent over the MBMS subchannels are specified in clause 13.

The MCVideo function can apply FEC to the RTP media packets by generating repair packets to be sent over the MBMS subchannel, or can ask to the BM-SC to apply FEC, as described in 3GPP TS 23.280 [12].

10.2 MBMS subchannel control procedure for the participating MCVideo function

10.2.1 General

If the participating MCVideo function supports the MBMS subchannel control procedure, the participating MCVideo function shall support the behaviour implied by the state machine specified in this subclause. The specifications are on the reception of transmission control messages from the controlling MCVideo function, sending of transmission control messages and the allocation/deallocation of MBMS subchannels for a transmission in a group session.

Figure 10.2.1-1 shows the participating MCVideo function MBMS subchannel control state diagram.

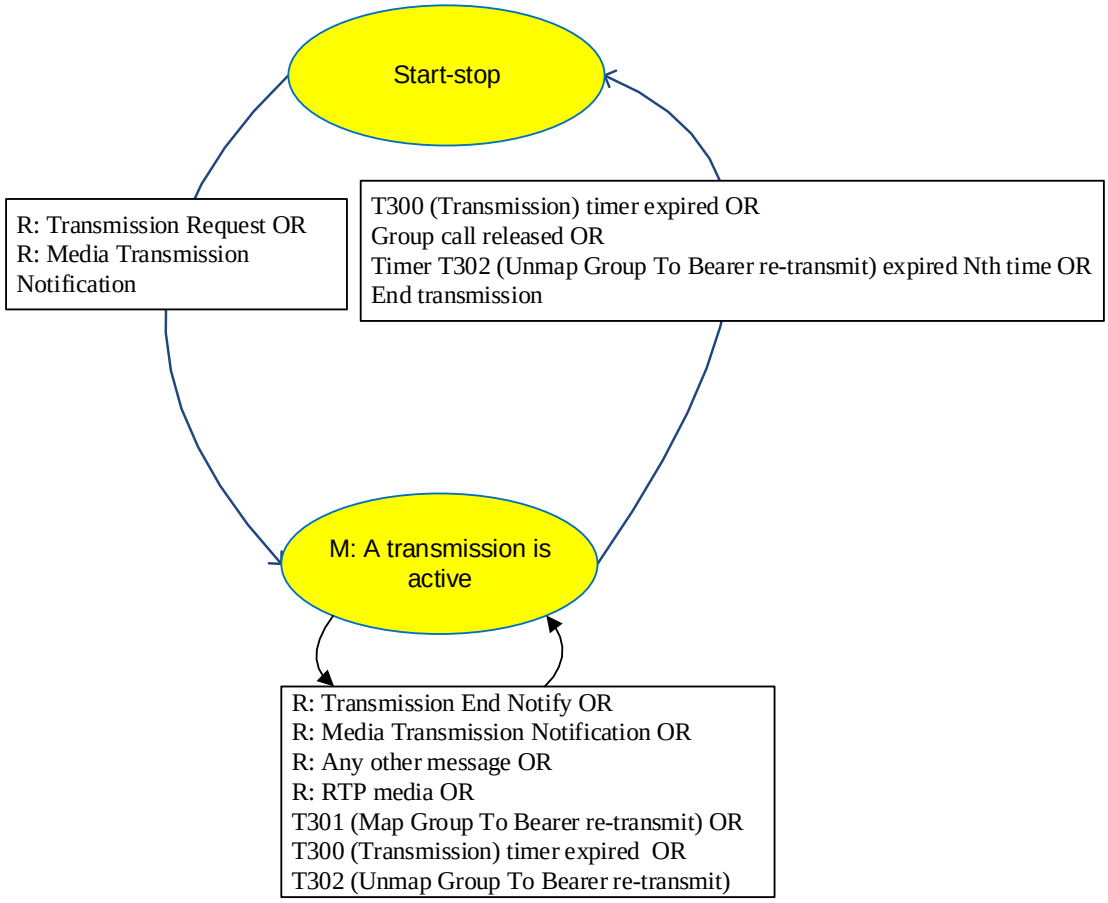


Figure 10.2.1-1: Participating MCVideo function MBMS subchannel control state diagram

If a transmission control message or RTP media packet arrives in a state where there are no procedures specified in the subclauses below, the participating MCVideo function shall discard the message.

10.2.2 State: 'Start-stop'

10.2.2.1 General

In this state:

- no instance of the 'Participating MCVideo function MBMS subchannel control state machine exists;
- a pre-activated MBMS bearer may exist;
- no transmission using a MBMS subchannel control is active but a group session exists where a transmissionover the unicast channel may be ongoing; and
- the participating MCVideo function handles transmission control messages and RTP media packets as for during normal operations described in subclause 6.4.

10.2.2.2 Send Map Group To Bearer message (R: Transmission Request, Media Transmission Notification)

Upon receiving a Transmission Request message or a Media Transmission Notification message and when the participating MCVideo function decides that an MBMS subchannel shall be used for a transmissionin an ongoing group session, the participating MCVideo function needs to determine if the MBMS bearer has sufficient capacity for the new conversation. If the new MBMS bearer has sufficient capacity the participating MCVideo function:

1. shall create an instance of the 'Participating MCVideo function MBMS subchannel control' state machine;

2. shall send a Map Group To Bearer message over the general purpose MBMS subchannel. The Map Group To Bearer message:

   a. shall include TMGI;

   b. shall include the identifier of the media stream; and

   c. shall include the MCVideo Group identifier field;

3. shall start timer T300 (Transmission);

4. shall start timer T302 (Unmap Group To Bearer);

5. shall enter the 'M: A transmission is active' state;

6. if the Transmission Request message was received, shall perform actions as described in subclause 6.4.2; and

7. if the Media Transmission Notification message was received, shall perform the actions described in subclause 10.2.3.3.

If the MBMS bearer does not have sufficient capacity for the new conversation the participating MCVideo function:

1. may free capacity for the new conversation by transfering an existing conversation over an MBMS bearer to unicast bearers following the procedure in subclause 10.2.3.13; or

2. may use the MBMS bearer for the signaling messages, while using unicast bearers for the media message.

10.2.3 State: 'M: A transmission is active'

10.2.3.1 General

In this state a MBMS subchannel exists and can be used by a group call.

In this state a transmission is active and Media Transmission Notification and Transmission Idle messages and RTP media packets shall be sent over the MBMS subchannel.

In this state timer T300 (Transmission) and timer T301 (Map Group To Bearer re-transmit) are running.

In this state the timer T302 (Unmap Group To Bearer) may be running.

10.2.3.2 Send Transmission Idle message (R: Transmission Idle)

When a Transmission Idle message destined to a transmission participant listening to the MBMS subchannel is received, the participating MCVideo function:

1. shall set the acknowledgment bit to '0' as specified in subclause 9.2.2, if not already set; and

2. shall send the received Transmission Idle message over the MBMS subchannel;

3. if the received Transmission Idle message indicates that a Transmission Ack message is expected (i.e. the acknowledgment bit is set to '1' as specified in subclause 9.2.2), shall send a Transmission Ack message towards the controlling MCVideo function. The Transmission Ack message:

   a. shall include the Message Type field set to '15' (Transmission Idle); and

   b. shall include the Source field set to '1' (participating MCVideo function is the source);

5. shall restart timer T300 (Transmission); and

6. shall remain in the 'M: A transmission is active' state.

10.2.3.3 Send Media Transmission Notification message (R: Media Transmission Notification)

When a Media Transmission Notification message destined to a transmission participant listening to the MBMS subchannel is received, the participating MCVideo function:

1. shall set the acknowledgment bit to '0' as specified in subclause 9.2.2, if not already set; and
2. shall send the Media Transmission Notification message over the MBMS subchannel; and
3. if the received Media Transmission Notification message indicates that a Transmission Ack message is expected (i.e. the acknowledgment bit is set to '1' as specified in subclause 9.2.2), shall send a Transmission Ack message towards the controlling MCVideo function The Transmission Ack message:
   a. shall include the Message Type field set to '6' (Media Transmission Notification); and
   b. shall include the Source field set to '1' (participating MCVideo function is the source);
5. shall restart timer T300 (Transmission); and
6. shall remain in the 'M: A transmission is active' state.

10.2.3.4 Send any other transmission control message (R: Any other message)

When a transmission control message other than the Media Transmission Notification and Transmission Idle message is received from a transmission participant or received from the transmission control server, the participating MCPVideo function:

1. shall forward the transmission control message as specified in subclause 6.4;
2. shall restart timer T300 (Transmission); and
3. shall remain in the 'M: A transmission is active' state.

10.2.3.5 Send RTP media packet over the MBMS subchannel (R: RTP packet)

When receiving a RTP media packet destined to one of the MCVideo client listening to the MBMS subchannel, the participating MCVideo function:

NOTE: An RTP media packet not destined to an MCVideo client listening to the MBMS subchannel is forwarded to the MCVideo client over the unicast bearer.

1. shall check if the media packet is already sent over the MBMS subchannel or not;
2. if the RTP media packet is already sent over the MBMS subchannel, shall discard the RTP media packet;
3. if the RTP media packet is not already sent over the MBMS sub channel, shall instruct the media distribution function to send the RTP media packet over the MBMS subchannel;

NOTE: if the media is protected by FEC and the FEC encoding is done by the participation MCVideo function, the media distribution function encodes the RTP media packet before delivery over the MBMS subchannel as specified in subclause 10.4.2.

4. shall restart timer T300 (Transmission); and
5. shall remain in the 'M: A transmission is active' state.

10.2.3.7 Timer T300 (Transmission) expired

Upon expiry of timer T300 (Transmission), the participating MCVideo function shall:

1. if the application indicates that there is no longer an MCVideo client listening to the MBMS bearer,
   a. shall release the instance of the 'Participating MCVideo function MBMS subchannel management' state machine used for the transmission; and
   b. shall enter the 'Start-stop' state; and
2. if the application indicates that there are MCVideo client still listening to the MBMS bearer:
   a. shall send the Unmap Group To Bearer message over the MBMS subchannel. The Unmap Group To Bearer message:

i. shall include the MCVideo Group ID field;

b. shall start timer T302 (Unmap Group To Bearer) and initialise counter C17 (Unmap Group To Bearer) to 1; and

c. shall remain in the 'M: A transmission is active' state.

10.2.3.8 Timer T301 (Map Group To Bearer) expired

Upon expiry of timer T301 (Map Group To Bearer), the participating MCVideo function:

1. shall send a Map Group To Bearer message over the general purpose MBMS subchannel. The Map Group To Bearer message:

   a. shall include a TMGI field;

   b. shall include a MBMS Subchannel field; and

   c shall include the MCVideo Group identifier field;

2. shall restart timer T301 (Map Group To Bearer); and

3. shall remain in the 'M: A transmission is active' state.

10.2.3.9 Timer T302 (Unmap Group To Bearer) expired

Upon expiry of timer T302 (Unmap Group To Bearer) less than the upper limit of counter C17 (Unmap Group To Bearer) times, the participating MCVideo function:

1. shall send the Unmap Group To Bearer message over the MBMS subchannel. The Unmap Group To Bearer message:

   a. shall include the MCVideo Group ID field; and

2. shall restart the timer T302 (Map Group To Bearer re-transmit) and increment counter C17 (Unmap Group To Bearer) by 1.

10.2.3.10 Timer T302 (Unmap Group To Bearer) expired Nth time

Upon expiry of timer T302 (Unmap Group To Bearer) by the upper limit of counter C17 (Unmap Group To Bearer), the participating MCVideo function:

1. shall send the Unmap Group To Bearer message over the MBMS subchannel. The Unmap Group To Bearer message:

   a. shall include the MCVideo Group ID field; and

2. shall release the instance of the 'Participating MCVideo function MBMS subchannel management' state machine used for the transmission.

10.2.3.11 End transmission over the MBMS bearer (End transmission)

Upon receiving an indication from the application and signalling plane that all MCVideo clients now listens to the unicast channel, the participating MCVideo function:

1. shall release the instance of the 'Participating MCVideo function MBMS subchannel management' state machine used for the transmission.

10.2.3.12 Group call released

If the control and signalling plane indicates that the group call session is released, the participating MCVideo function:

1. shall send the Unmap Group To Bearer message over the MBMS subchannel. The Unmap Group To Bearer message:

   a. shall include the MCVideo Group ID field;

2. shall stop timer T300 (Transmission), timer T301 (Map Group To Bearer) and timer T302 (Unmap Group To Bearer), if running; and

3. shall release the instance of the 'Participating MCVideo function MBMS subchannel management' state machine used for the transmission.

10.2.3.13 Move conversation to unicast

If the participating MCVideo server decides that an ongoing conversation over an MBMS bearer shall start using unicast bearers, the pariticpating MCVideo function may send an Application Paging message over the MBMS subchannel associated with this converstation.

NOTE: The Application Paging message can be sent at the same time as the conversation is started using unicast bearers, this will improve the MCVideo access time since the Application Paging message in most cases will reach the client quicker than using normal paging procedures.

10.3 MBMS subchannel control procedure for the MCVideo client

10.3.1 General

An MCVideo client that supports receiving transmission control messages and RTP media packets over an MBMS bearer shall support the procedures in the following subclauses.

The procedures in the following subclauses assume that an MBMS bearer is active and announced as described in subclause 4.1.2.

10.3.2 Transmission over a pre-activated MBMS bearer is started

When receiving a Map Group To Bearer message over the general purpose MBMS subchannel, the MBMS interface in the MCVideo client:

1. shall associate the TMGI in the TMGI field, the MBMS subchannels for video, audio, transmission control and FEC with the MCVideo group identity in the MCVideo Group ID field.

2. if the video and audio media are protected by FEC, as declared within the MBMS bearer announcement (3GPP TS 24.281 [2]), shall instantiate a FEC decoder for this subchannel as specified in suclause 8.2.2 of 3GPP TS 26.346 [13].

10.3.3 Receive transmission control messages, RTP media packets and FEC repair packets over a MBMS subchannel

If the MBMS interface receives RTP media packets or transmission control messages over the MBMS subchannel, the MBMS interface in the MCVideo client:

1. if there is an association between the TMGI and the MBMS subchannels to an ongoing transmission in a group session:

   a. shall forward the received transmission control messages to the transmission participant in the transmission; and

   b. if the media is protected by FEC, shall forward the RTP media packet to the FEC decoder as specified in 10.4.3;

   c. if the media is not protected by FEC, shall forward the RTP media packet to the media mixer.

   d. shall forward the FEC repair packet to the FEC decoder.

2. if there is no such association:

   a. shall ignore the received transmission control message or received RTP media packet.

10.3.4 Transmission ended

When receiving the Unmap Group To Bearer message over a MBMS subchannel, the MBMS interface in the MCVideo client:

1. shall remove the association between the TMGI, the MBMS subchannels from the transmission in the group session identified by the MCVideo Group ID field, if such an association exists.

10.3.5 Receive Application Paging message

When receiving an Application Paging message over an MBMS subchannel, an MCVideo client in idle mode shall make a service request to enter RRC Connected mode.

10.3.6 Receive MBMS bearer announcement over MBMS bearer

When receiving an MBMS bearer announcement message over an MBMS subchannel, an MCVideo client shall acknowledge this message by sending an MBMS bearer listening status report as as specified in 3GPP TS 24.379 [2] subclause 14.2.3.

10.4 Forward error correction

10.4.1 General

Video and audio RTP media packets delivered over a MBMS subchannel can be protected against loss by the application of FEC.

NOTE: In the current release, the FEC encoding can only be done within the participation MCVideo function, according to procedure 10.7.3.11.3 of 3GPP TS 23.280 [12].

FEC encoding is done after media plane encryption and FEC decoding is done before media plane decryption.

10.4.2 Participating MCVideo function procedure for FEC

If the participating MCVideo function decides to apply FEC to protect a given MBMS subchannel, the participating MCVideo function:

1) shall declare the usage of FEC within the MBMS bearer announcement, as specified in 3GPP TS 24.281 [2];

2) if the participating MCVideo function does the FEC encoding,

   a) the participating MCVideo function shall encode video and audio RTP packets as specified in subclause 8.2.2.4 of 3GPP TS 26.346 [13] before sending them over the MBMS subchannel;

   b) shall generate repair packets according the mechanism specified in subclause 8.2.2 of 3GPP TS 26.346 [13] with the UDP flow identity for video set to 1 and the UDP flow identity for audio set to 2; and

   c) send these repair packets over the MBMS subchannel on the destination port given into the Map Group To Bearer message.

10.4.3 MCVideo client procedure for FEC

If usage of FEC is declared within the MBMS bearer announcement, as specified in 3GPP TS 24.281 [2], the MC Video client:

1) shall decode the received video and audio RTP packets according the mechanism specified in subclause 8.2.2 of 3GPP TS 26.346 [13] with the UDP flow identity for video set to 1 and the UDP flow identity for audio set to 2; and2) shall forward the decoded RTP media packets to the media mixer.

10.5 Additional MBMS procedures

10.5.1 Group dynamic data notifications

Prior to using the MBMS bearer the participating MCVideo function needs to activate the MBMS bearer and announce the MBMS bearer as described in subclause 4.1.2.1. The participating MCVideo function uses the listening status reports to decide for which users the participating MCVideo function sends the group dynamic data notifications over MBMS, and for which users the participating MCVideo function continues to use unicast bearers.

This procedure is used when MCVideo clients subscribe to group dynamic data. When the terminating participating function receives a SIP NOTIFY request towards a user listening to the MBMS subchannel that comes from the controlling MCVideo function and is related to a subscription for group dynamic data, the participating MCVideo function shall:

1. respond to the SIP NOTIFY request with a SIP 200 (OK) request;
2. map the information in the SIP NOTIFY request to the information elements in subclause 9.4.3; and
3. send the Group Dynamic Data Notify message over the MBMS bearer.

11 Configurable parameters

11.1 Timers

11.1.1 Timers in the on-network transmission participant

The table 11.1.1-1 recommends timer values, describes the reason for starting the timer, normal stop and the action on expiry for the on-network transmission participant procedures.

Table 11.1.1-1: Timers in the on-network transmission participant

Timer	Timer value	Cause of start	Normal stop	On expiry
T100 (Transmission Request)	Configurable as specified in 3GPP TS 24.483 [6]. (NOTE 1)	When the transmission participant sends a Transmission Request message. T100 is also started when the application layer and signalling plane initiates a session as an implicit transmission request using the "mc_implicit_request" as specified in clause 14.	Reception of a Transmission Granted message, a Transmission Rejected message, a Transmission Queue Position Info message.	If the counter is less than the upper limit of C100, a new Transmission Request message is sent and counter is incremented by 1. When the limit in C100 is reached, the transmission participant stops sending the Transmission Request message.
T101 (TransmissionEnd request)	Configurable as specified in 3GPP TS 24.483 [6]. (NOTE 2)	When the transmission participant sends a Transmission end request message.	Reception of a Transmission end response message.	If the counter is less than the upper limit of C101, a new Transmission end request message is sent and counter is incremented by 1. When the limit in C101 is reached, the transmission participant stops sending the Transmission end request message.
T102 (Transmission Queue Position Request)	Configurable as specified in 3GPP TS 24.483 [6]. T102 shall only permit a certain number of retransmissions of the Transmission Queue Position Request message.	When the transmission participant sends a Transmission Queue Position Request message.	Reception of a Transmission Queue Position Info. Leaving the 'U: queued transmission' state on reception of Transmission Granted message.	If the counter is less than the upper limit of C102, a new Transmission Queue Position Request message is sent and counter is incremented by 1. When the limit in C102 is reached, the transmission participant stops sending the Transmission Queue Position Request message.
T103 (Receive Media Request)	Configurable as specified in 3GPP TS 24.483 [6]. (NOTE 3)	When the transmission participant sends a Receive Media Request message.	Reception of Receive Media Response (Granted or Rejected) message.	If the counter is less than the upper limit of C103, a new Receive Media Request message is sent and counter is incremented by 1. When the limit in C105 is reached, the transmission participant stops sending the Receive Media Request message.

Timer	Timer value	Cause of start	Normal stop	On expiry
T104 (Receive Media Release)	Configurable as specified in 3GPP TS 24.483 [6]. (NOTE 4)	When the transmission participant sends a Media Reception End Request message.	Reception of Media Reception End Response message.	If the counter is less than the upper limit of C104, a new Media Reception End Request message is sent and counter is incremented by 1. When the limit in C104 is reached, the transmission participant stops sending the Media Reception End Request message.
NOTE 1: The total time during which the transmission participant retransmits Transmission Request messages should be less than 6 seconds. NOTE 2: The total time during which the transmission participant retransmits Transmission end request messages should be less than 6 seconds. NOTE 3: The total time during which the transmission participant retransmits Receive Media Request messages should be less than 6 seconds. NOTE 4: The total time during which the transmission participant retransmits Media Reception End Request messages should be less than 6 seconds.				

11.1.2 Timers in the off-network transmission participant

The table 11.1.2-1 recommends timer values, describes the reason for starting the timer, normal stop and the action on expiry for the off-network transmission participant procedures.

Table 11.1.2-1: Timers in the off-network transmission participant

Timer	Timer value	Cause of start	Normal stop	On expiry
T201 (Transmission Request)	Default value: 40 milliseconds Depends on the characteristic of the D2D. (D2D Side link period) Configurable. Set to the value of "/<x>/OffNetwork/Timers/T201" leaf node present in the UE initial configuration as specified in 3GPP TS 24.483 [6] T201 shall permit only a certain number of retransmissions of the Transmission Request message.	When the transmission participant sends a Transmission Request message	Reception of a Transmission Granted message or a Transmission Deny message or when the MCVideo user releases the transmission.	If the counter is less than the upper limit of C201, a new Transmission Request message is sent and counter is incremented by 1. When the limit in C201 is reached, the transmission participant stops sending the Transmission Request message.
T203 (End of RTP media)	Default value: 4 seconds. Configurable. Set to the value of "/<x>/OffNetwork/Timers/T203" leaf node present in the UE initial configuration as specified in 3GPP TS 24.483 [6].	T203 is reset and started again every time an RTP media packet is received.	Reception of a Transmission Release message	When T203 expires the transmission participant concludes that the transmission from the associated transmission participant is lost.
T205 (Transmission Granted)	Default value: 80 milliseconds. Depends on the characteristic of the D2D. (D2D Sidelink period*2). Configurable. Set to the value of "/<x>/OffNetwork/Timers/T205" leaf node present in the UE initial configuration as specified in 3GPP TS 24.483 [6]. T205 shall permit only a certain number of retransmissions of the Transmission Granted message.	When the transmission arbitrator grants the permission to send media to a transmission participant.	Reception of an RTP media packet from granted transmission participant	If the counter is less than the upper limit of C205, a new Transmission Granted message is sent and counter is incremented by 1. When the limit in C205 is reached, the transmission arbitrator stops sending the Transmission Granted message.
Timer T206 (Stop talking warning)	Default value: 27 seconds. Configurable. Set to X-Y, where X is the value of "/<x>/OffNetwork/TransmitTimeout" and Y is the value "/<x>/OffNetwork/TransmissionWarning" of leaf nodes present in the UE service configuration as specified in 3GPP TS 24.483 [6].	When the MCVideo client starts sending the RTP media packets.	When the MCVideo user releases the transmission.	Start timer T207 (Stop talking)

Timer	Timer value	Cause of start	Normal stop	On expiry
Timer T207 (Stop talking)	Default value: 3 seconds. Configurable. Set to the value of "/<x>/OffNetwork/TransmissionWarning" leaf node present in the service configuration as specified in 3GPP TS 24.483 [6].	Expiry of timer T206 (Stop talking warning)	When the MCVideo user releases the transmission.	Release the transmission.
Timer T208 (Transmission Arbitration Release)	Default value: 3 seconds. Configurable.	When the transmission participant enters 'O: pending delegated' state.	-	If the counter is less than the upper limit of C208, a new Transmission Arbitration Release message is sent and counter is incremented by 1. When the limit in C208 is reached, the transmission arbitrator stops sending the Transmission Arbitration Release message message.
T230 (Inactivity)	Default value: 600 seconds. Configurable. For group calls: Set to the value of "/<x>/<x>/OffNetwork/HangTime" leaf node present in the group configuration as specified in 3GPP TS 24.483 [6]. For private calls: Set to the value of "/<x>/OffNetwork/PrivateCall/HangTime" leaf node present in the service configuration as specified in 3GPP TS 24.483 [6].	When the transmission participant enters 'O: silence' state.	A transmission control message or media is received.	The transmission control entity is released.

11.1.3 Timers in the transmission control server

The table 11.1.3-1 recommends timer values, describes the reason for starting the timer, normal stop and the action on expiry for the transmission control server procedures.

Table 11.1.3-1: Timers in the transmission control server.

Timer	Timer value	Cause of start	Normal stop	On expiry
T1 (Inactivity)	Default value: 30 seconds. Configurable. For private calls: Obtained from the <hang-time> element of the <on-network> element in 3GPP TS 24.484 [13]. For group calls: Obtained from the <on-network-hang-timer> element of the <list-service> element in 3GPP TS 24.481 [12].	When the transmission control server enters the 'G: 'Transmit idle' state.	A transmission participant requests the permission to send media.	The MCVideo call is released.
T2 (Transmission Idle)	Depends on the characteristic of the radio access network. Configurable. Obtained from the <T2-transmission-idle> element of the <fc-timers-counters> element of the <on-network> element in 3GPP TS 24.484 [13].	The transmission of a Transmission Idle message to the transmission participants in the MCVideo call.	The stop can be supervised by a timer (out of scope of this specification).	When T7 expire the transmission control server sends another Transmission Idle message to the transmission participants.
T3 (Transmission Revoke)	Default value: 1 second. Configurable. Obtained from the <T3-transmission-revoke> element of the <fc-timers-counters> element of the <on-network> element in 3GPP TS 24.484 [13].	A Transmission Revoke message is sent to a transmission participant who has the permission to send media.	Reception of a Transmission Release message from the revoked transmission participant.	Send another Transmission Revoke message to the transmission participant and reset and start T3 again.
T4 (Transmission Granted)	Default value: 1 second. Configurable. Obtained from the <T4-transmission-granted> element of the <fc-timers-counters> element of the <on-network> element in 3GPP TS 24.484 [13]	When the transmission control server grants the permission to send media to a transmission participant, which was queued and which negotiated queueing. T4 is also started again when the transmission control server sends a Transmission Granted message upon T4 expiry.	Sending of an RTP Media packet or when the MCVideo client is losing its permission to send media.	When T4 expires, a new Transmission Granted message is sent.

T5 (Reception Inactivity)	Default value: 30 seconds. Configurable. For private calls: Obtained from the <reception-hang-time> element of the <on-network> element in 3GPP TS 24.484 [13]. For group calls: Obtained from the <on-network-reception-hang-timer> element of the <list-service> element in 3GPP TS 24.481 [12].	When the transmission control server enters the 'G: 'Reception idle' state.	A transmission participant requests the permission to receive media.	The MCVideo call is released.
T6 (Reception Granted)	Default value: 1 second. Configurable. Obtained from the <T6-reception-granted> element of the <fc-timers-counters> element of the <on-network> element in 3GPP TS 24.484 [13]	When the transmission control server grants the permission to receive media to a transmission participant, which was queued and which negotiated queueing. T6 is also started again when the transmission control server receives a Transmission Granted message upon T6 expiry.	Reception of an RTP Media packet or when the MCVideo client is losing its permission to receiving media.	When T6 expires, a new Reception Granted message is sent.

11.1.4 Timers in the participating MCVideo function

The table 11.1.4-1 recommends timer values, describes the reason for starting the timer, normal stop and the action on expiry.

Table 11.1.4-1 shows the timers used in the participating MCVideo function for MBMS channel control.

Table 11.1.4-1: Timers in the participating MCVideo function for MBMS channel control.

TIMER	TIMER VALUE	CAUSE OF START	NORMAL STOP	ON EXPIRY
T300 (Transmission)	Default value: 30 seconds. Configurable.	Transmission of Map Group To Bearer message. Restarted when an RTP packet or a transmission control message is sent.	Release of the call.	Send Unmap Group To Bearer message.
T301 (Map Group To Bearer)	Default value: 500 milliseconds. Configurable.	Transmission of Map Group To Bearer message.	Release of the call (or MBMS Subchannel).	Send Map Group To Bearer message.
T303 (Unmap Group To Bearer)	Default value: 200 milliseconds. Configurable.	Transmission of Unmap Group To Bearer message.	Release of the call.	Send Unmap Group To Bearer message.

Editor's Note: How these timers are configured, e.g. within TS 24.484 or 24.483 is FFS.

11.2 Counters

11.2.1 Counters in the on-network transmission participant

Table 11.2.1-1 enlists counters, their limits and the action on expiry.

Table 11.2.1-1: Counter used in the transmission participant for on-network transmission control

Counter	Limit	Associated timer	On reaching the limit
C100 (Transmission Request)	Default value: 3	T100 (Transmission Request)	Transmission Request message is no more repeated
C101 (Transmission End Request)	Default value: 3	T101 (Transmission End Request)	Transmission End Request message is no more repeated
C102 (Transmission Queue Position Request)	Default value: 3	T102 (Transmission Queue Position Request)	Transmission Queue Position Request message is no more repeated
C103 (Receive Media Request)	Default value: 3	T103 (Receive Media Request)	Receive Media Request message is no more repeated
C104 (Receive Media Release	Default value: 3	T104 (Receive Media Release)	Media Reception End Request message is no more repeated.

11.2.2 Counters in the off-network transmission participant

The table 11.2.2-1 lists the counters used by the off-network participant, their default upper limits and the action to take upon reaching the upper limit. The counters start at 1.

Table 11.2.2-1: Counter used in the transmission participant for off-network transmission control

Counter	Limit	Associated timer	On reaching the limit
C201 (Transmission Request)	Default value: 3. Configurable. Set to the value of "/<x>/OffNetwork/Counters/C201" leaf node present in the UE initial configuration as specified in 3GPP TS 24.483 [6].	T201 (Transmission Request)	Assume there is no transmission arbitrator and send Transmission Arbitration Taken message
C205 (Transmission Granted)	Default value: 4. Configurable. Set to the value of "/<x>/OffNetwork/Counters/C205" leaf node present in the UE initial configuration as specified in 3GPP TS 24.483 [6].	T205 (Transmission Granted)	Stop sending Transmission Granted message
C208 (Transmission Arbitration Release)	Default value: 4. Configurable. Set to the value of "/<x>/OffNetwork/Counters/C208" leaf node present in the UE initial configuration as specified in 3GPP TS 24.483 [6].	T208 (Transmission Arbitration Release)	Stop sending Transmission Arbitration Release message

11.2.3 Counters in the controlling MCVideo function

The table 11.2.3-1 enlists counters, their limits and the action on expiry for the 'general control operation' state machine in the controlling MCVideo function.

Table 11.2.3-1: Counters used in the 'general transmission control operation' state machine

Counter	Limit	Associated timer	On reaching the limit
C2 (Transmission Idle)	Default value: 10. Configurable. Obtained from the <C2-transmission-idle> element of the <fc-timers-counters> element of the <on-network> element in 3GPP TS 24.484 [13].	T2 (Transmission Idle)	The Transmission Idle message is no more re-send
C4 (Transmission Granted)	Default value: 3. Configurable. Obtained from the <C4-transmission-granted> element of the <fc-timers-counters> element of the <on-network> element in 3GPP TS 24.484 [13].	T4 (Transmission Granted)	The Transmission Granted message is no more re-send in case a queued transmission participant is granted the transmission.
C6 (Reception Granted)	Default value: 3. Configurable. Obtained from the <C6-reception-granted> element of the <fc-timers-counters> element of the <on-network> element in 3GPP TS 24.484 [13].	T6 (Reception Granted)	The Reception Granted message is no more re-send in case a queued transmission participant is granted the reception of media.
C7 (Reception Accepted)	Default value: 2 Configurable. Obtained from the <C7-reception-accepted> element of the <fc-timers-counters> element of the <on-network> element in 3GPP TS 24.484 [13].	-	Receive media requests from transmission participant is rejected.
NOTE: If a counter value is not configured the default value shall be used.			

11.2.4 Counters in the participating MCVideo function

The table 11.2.4-1 enlists counters, their limits and the action on expiry for the 'Participating MCVideo function MBMS subchannel control state machine'.

Table 11.2.4-2: Counters used in the 'Participating MCVideo function MBMS subchannel control state machine'

Counter	Limit	Associated timer	On reaching the limit
C302 (Unmap Group To Bearer)	Default value: 3. Configurable.	T302 (Unmap Group To Bearer)	The Unmap Group To Bearer message is no more re-sent.

Editor's Note: How these counters are configured, e.g. within TS 24.484 or 24.483 is FFS.

12 Extensions within the present document

12.1 Session description types defined within the present document

12.1.1 General

This subclause contains definitions for SDP parameters that are specific to SDP usage with MCVideo and therefore are not described in an RFC.

12.1.2 SDP "fmtp" attribute for MCVideo

12.1.2.1 General

This subclause defines the structure and syntax of the SDP "fmtp" attribute, when used to negotiate an MCVideo media plane control channel. The MCVideo media plane control channel, and the protocols used on the control channel, is described in the present specification.

12.1.2.2 Semantics

In an SDP offer and answer, the "mc_queueing" fmtp attribute is used to indicate support of the Transmission Request message queueing mechanism, as defined in the present specification.

In an SDP offer, the "mc_priority" fmtp attribute indicates (using an integer value between '1' and '255') the maximum transmission priority that the offerer requests to be used with Transmission Request messages sent by the offerer. In an SDP answer, the attribute parameter indicates the maximum priority level that the answerer has granted to the offerer. The value must be equal or less than the value provided in the associated SDP offer.

NOTE 1: If the "mc_priority" fmtp attribute is not used within an SDP offer or answer, a default priority value is assumed.

In an SDP offer, the "mc_reception_priority" fmtp attribute indicates (using an integer value between '1' and '255') the maximum reception priority that the offerer requests to be used with Reception Request messages sent by the offerer. In an SDP answer, the attribute parameter indicates the maximum reception priority level that the answerer has granted to the offerer. The value must be equal or less than the value provided in the associated SDP offer.

NOTE 2: If the "mc_reception_priority" fmtp attribute is not used within an SDP offer or answer, a default reception priority value is assumed.

In an SDP offer, the "mc_granted" fmtp attribute parameter indicates that the offerer supports the procedure where the answerer indicates, using the fmtp attribute in the associated SDP answer, that the permission to transmit has been granted to the offerer.

NOTE 3: When the "mc_granted" fmtp attribute is used in an SDP offer, it does not indicate an actual request for the media transmission. The SDP "mc_implicit_request" fmtp attribute can be used to request the media transmission. In an SDP answer, the attribute indicates that the permission to Transmission has been granted to the offerer.

NOTE 4: Once the offerer has been granted the permission to Transmission, the offerer can perform media transmission until it receives a Transmission Revoked message, or until the offerer itself ends the media transmission by sending a Transmission end request message, as described in the present specification.

In an SDP offer, the "mc_implicit_request" fmtp attribute indicates that the offerer implicitly requests for media transmission (without the need to send a Transmission Request message). In an SDP answer, the attribute parameter indicates that the answerer has accepted the implicit Transmission Request. Once the answerer grants the permission to Transmission to the offerer, the answerer will send a Transmission Granted message.

NOTE 5: The usage of the "mc_implicit_request" fmtp attribute in an SDP answer does not mean that the answerer has granted the permission to Transmission to the offerer, only that the answerer has accepted the implicit Transmission Request.

12.1.2.3 Syntax

Table 12.1.2.3-1: SDP "fmtp" attribute for the MCVideo media plane control channel

```
fmtp-attr-mpcp      = "a=fmtp:" "MCVideo" SP attr-param-list
attr-param-list     =  attr-param *(COLON attr-param)
attr-param          =  mc_queueing / mc_priority / mc_reception_priority / mc_granted /
mc_implicit_request
mc_queueing          =  "mc_queueing"
mc_priority         =  "mc_priority=" 1*2(DIGIT)
mc_reception_priority = "mc_reception_priority=" 1*2(DIGIT)
mc_granted          =  "mc_granted"
mc_implicit_request =  "mc_implicit_request"
```

Editor's Note: IANA registration may be required.

13 Media plane security

13.1 General

Media plane security provides integrity and confidentiality protection of individual media streams and media plane control messages in MCVideo sessions.

The media plane security is based on 3GPP MCVideo security solution including key management and end-to-end media and transmission control and reception control messages protection as defined in 3GPP TS 33.180 [8].

Various keys and associated key identifiers protect:

1. RTP transported media;
2. RTCP transported media control messages (i.e. RTCP SR packets, RTCP RR packets, RTCP SDES packets); and
3. RTCP APP transported transmission control and reception control messages.

In an on-network group call of an MCVideo group which is not a constituent MCVideo group of a temporary MCVideo group:

1. if protection of media is negotiated, the GMK and the GMK-ID of the MCVideo group protect the media sent and received by an MCVideo clients;
2. if protection of transmission control and reception control messages sent using unicast between the MCVideo client and the participating MCVideo function serving the the MCVideo client is negotiated, the CSK and the CSK-ID protect the transmission control messages sent and received using unicast by the MCVideo client and by a participating MCVideo function;
3. if protection of transmission control messages sent over the MBMS subchannel from the participating MCVideo function to the served MCVideo clients is required:

A) if a MuSiK and a MuSiK-ID are associated with the on-network group call, the MuSiK and the MuSiK-ID associated with the on-network group call protect the transmission control messages sent over the MBMS subchannel from the participating MCVideo function to the served MCVideo clients; and

B) if a MuSiK and a MuSiK-ID are not associated with the on-network group call, the MKFC and the MKFC-ID of the MCVideo group protect the transmission control messages sent over the MBMS subchannel from the participating MCVideo function to the served MCVideo clients;

NOTE 1: If protection of transmission control messages sent over the MBMS subchannel from the participating MCVideo function to the served MCVideo clients is required and the participating MCVideo function is compliant to Release 15 of the present document, a MuSiK and a MuSiK-ID are always associated with the on-network group call.

4. if protection of transmission control and reception control messages between the participating MCVideo function and the controlling MCVideo function is negotiated, the SPK and the SPK-ID protect the transmission control and reception control messages sent and received between the participating MCVideo function and the controlling MCVideo function;

5. if protection of media control messages sent using unicast between the MCVideo client and the participating MCVideo function serving the the MCVideo client is negotiated, the CSK and the CSK-ID protect the media control messages sent and received using unicast by the MCVideo client and by a participating MCVideo function; and

6. if protection of media control messages between the participating MCVideo function and the controlling MCVideo function is negotiated, the SPK and the SPK-ID protect the media control messages sent and received between the participating MCVideo function and the controlling MCVideo function.

In an on-network private call:

1. if protection of media is negotiated, the PCK and the PCK-ID protect media sent and received by the MCVideo clients;

2. if protection of transmission control and reception control messages sent using unicast between the MCVideo client and the participating MCVideo function serving the the MCVideo client is negotiated, the CSK and the CSK-ID protect the transmission control and reception control messages sent and received by the MCVideo client and by the participating MCVideo function;

3. if protection of transmission control and reception control messages between the participating MCVideo function and the controlling MCVideo function is negotiated, the SPK and the SPK-ID protect the transmission control messages sent and received between the participating MCVideo function and the controlling MCVideo function;

4. if protection of media control messages sent using unicast between the MCVideo client and the participating MCVideo function serving the the MCVideo client is negotiated, the CSK and the CSK-ID protect the media control messages sent and received using unicast by the MCVideo client and by a participating MCVideo function; and

5. if protection of media control messages between the participating MCVideo function and the controlling MCVideo function is negotiated, the SPK and the SPK-ID protect the media control messages sent and received between the participating MCVideo function and the controlling MCVideo function.

In an off-network group call of an MCVideo group:

1. if protection of media is announced, the GMK and the GMK-ID of the MCVideo group protect the media sent and received by an MCVideo client;

2. if protection of transmission control messages is announced, the GMK and the GMK-ID of the MCVideo group protect the transmission control messages sent and received by an MCVideo client; and

3. if protection of media control messages is announced, the GMK and the GMK-ID of the MCVideo group protect the media sent and received by an MCVideo client.

In an off-network private call:

1. if protection of media is negotiated, the PCK and the PCK-ID protect media sent and received by an MCVideo client;

2. if protection of transmission control and reception control messages is negotiated, the PCK and the PCK-ID protect transmission control and reception control messages sent and received by an MCVideo client; and

3. if protection of media control messages is negotiated, the PCK and the PCK-ID protect media control messages and received by an MCVideo client.

In an pre-established session, if the pre-established session call control messages between the MCVideo client and the participating MCVideo function serving the the MCVideo client are negotiated to be protected, the CSK and the CSK-ID protect the pre-established session call control messages sent and received by the MCVideo client and by the participating MCVideo function serving the MCVideo client.

The GMK and the GMK-ID are distributed to the MCVideo clients using the group document subscription and notification procedure specified in 3GPP TS 24.481 [5].

The CSK and the CSK-ID are generated by the MCVideo client and provided to the participating MCVideo function serving the MCVideo client using SIP signalling according to 3GPP TS 24.281 [2].

The MKFC and the MKFC-ID are distributed to the MCVideo clients using the group document subscription and notification procedure specified in 3GPP TS 24.481 [5]. The MKFC and the MKFC-ID are distributed to the controlling MCVideo function using the group document subscription and notification procedure specified in 3GPP TS 24.481 [5] and the controlling MCVideo function provides the MKFC and the MKFC-ID to the participating MCVideo function using SIP signalling according to 3GPP TS 24.281 [2].

The SPK and the SPK-ID are configured in the participating MCVideo function, the controlling MCVideo function and the non-controlling MCVideo function.

The PCK and the PCK-ID are generated by the MCVideo client initiating the private call and provided to the MCVideo client receiving the private call using SIP signalling according to 3GPP TS 24.281 [2], using Connect message described in subclause 8.3.4 or using MONP signalling according to 3GPP TS 24.281 [2].

13.2 Derivation of SRTP/SRTCP master keys

Each key (i.e. CSK, GMK, MKFC, PCK, SPK, MSCCK) and its associated key identifier (i.e. CSK-ID, GMK-ID, MKFC-ID, PCK-ID, SPK-ID, MSCCK-ID) described in subclause 13.1 are used to derive SRTP-MK, SRTP-MS and SRTP-MKI.

SRTP-MK, SRTP-MS and SRTP-MKI are used in encryption of media or transmission control and reception control messages in SRTP as specified in IETF RFC 3711 [4] and 3GPP TS 33.180 [8].

13.3 Media plane encryption and decryption

13.3.1 General

The subclause 13.3 provides the media plane encryption and decryption procedures at the participating MCVideo function, the MCVideo client and the controlling MCVideo function.

13.3.2 The participating MCVideo function

The participating MCVideo function:

1. if protection of media is negotiated, shall be transparent to RTP media streams and shall forward encrypted RTP media streams without decrypting the payload;

2. if protection of transmission control and reception control messages sent using unicast between the participating MCVideo function and the MCVideo client is negotiated and the CSK and the CSK-ID were received from the MCVideo client using SIP signalling according to 3GPP TS 24.281 [2]:

   A) shall encrypt transmission control and reception control messages sent using unicast to the served MCVideo client according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2; and

   B) shall decrypt transmission control and reception control messages received using unicast from the served MCVideo client according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2;

3. if protection of transmission control messages sent over the MBMS subchannel from the participating MCVideo function to the served MCVideo clients is required and a MuSiK and a MuSiK-ID are associated with the on-network group call of the transmission control messages:

   A) shall encrypt transmission control messages sent over the MBMS subchannel according to IETF RFC 3711 [16] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the MuSiK and MuSiK-ID as specified in subclause 13.2;

4. if protection of transmission control and reception control messages between the participating MCVideo function and the controlling MCVideo function is negotiated and the SPK and the SPK-ID are configured in the participating MCVideo function:

   A) shall encrypt transmission control and reception control messages sent to the controlling MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2; and

   B) shall decrypt transmission control and reception control messages received from the controlling MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2;

5. if protection of transmission control and reception control messages between the participating MCVideo function and the non-controlling MCVideo function is negotiated and the SPK and the SPK-ID are configured in the participating MCVideo function:

   A) shall encrypt transmission control and reception control messages sent to the non-controlling MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2; and

   B) shall decrypt transmission control and reception control messages received from the non-controlling MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2;

5. if protection of pre-established session call control messages between the participating MCVideo function and the MCVideo client is negotiated and the CSK and the CSK-ID were received from the MCVideo client using SIP signalling according to 3GPP TS 24.281 [2]:

   A) shall encrypt pre-established session call control messages sent to the served MCVideo client according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2; and

   B) shall decrypt pre-established session call control messages received from served MCVideo client according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2;

6. if protection of media control messages sent using unicast between the participating MCVideo function and the MCVideo client is negotiated between the participating MCVideo function and the MCVideo client and the CSK and the CSK-ID were received from the MCVideo client using SIP signalling according to 3GPP TS 24.281 [2];

   A) shall encrypt media control messages sent using unicast to the served MCVideo client according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2; and

   B) shall decrypt media control messages received using unicast from the served MCVideo client according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2;

7. if protection of media control messages between the participating MCVideo function and the controlling MCVideo function is negotiated and the SPK and the SPK-ID are configured in the participating MCVideo function:

   A) shall encrypt media control messages sent to the controlling MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2; and

B) shall decrypt media control messages received from the controlling MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2;

8. if protection of media control messages between the participating MCVideo function and the non-controlling MCVideo function is negotiated and the SPK and the SPK-ID are configured in the participating MCVideo function:

   A) shall encrypt media control messages sent to the non-controlling MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2; and

   B) shall decrypt media control messages received from the non-controlling MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2.

9. if protection of MBMS subchannel control messages sent over the general purpose MBMS subchannel of an MBMS bearer is required and the MSCCK and the MSCCK-ID associated with the MBMS bearer were sent to one or more served MCVideo clients using SIP signalling according to 3GPP TS 24.281 [11]:

   A) shall encrypt MBMS subchannel control messages specified in subclause 9.3 sent over the general purpose MBMS subchannel of the MBMS bearer according to IETF RFC 3711 [16] and 3GPP TS 33.180 [18] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the MSCCK and MSCCK-ID associated with the MBMS bearer as specified in subclause 13.2.

13.3.3 The MCVideo client

The MCVideo client:

1. in an on-network group call of an MCVideo group which is not a constituent MCVideo group of a temporary MCVideo group:

   A) if protection of media is negotiated and the GMK and the GMK-ID of the MCVideo group were received using the group document subscription and notification procedure specified in 3GPP TS 24.481 [5] for the MCVideo group:

      i) shall encrypt sent media according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the GMK and GMK-ID as specified in subclause 13.2; and

      ii) shall decrypt received media according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the GMK and GMK-ID as specified in subclause 13.2;

   B) if protection of transmission control and reception control messages sent using unicast is negotiated and the CSK and the CSK-ID were sent to the participating MCVideo function using SIP signalling according to 3GPP TS 24.281 [2]:

      i) shall encrypt transmission control and reception control messages sent using unicast according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2; and

      ii) shall decrypt transmission control and reception control messages received using unicast according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2;

   C) if protection of transmission control messages sent over the MBMS subchannel from the participating MCVideo function to the served MCVideo clients is required:

      i) if a MuSiK and a MuSiK-ID are associated with the on-network group call, shall decrypt transmission control messages received over the MBMS subchannel for transmission control messages according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the MuSiK and the MuSiK-ID associated with the on-network group call as specified in subclause 13.2; and

      ii) if a MuSiK and a MuSiK-ID are not associated with the on-network group call and the MKFC and the MKFC-ID of the MCVideo group were received using the group document subscription and notification

procedure specified in 3GPP TS 24.481 [12] for the MCVideo group, shall decrypt transmission control messages received over the MBMS subchannel for transmission control messages according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the MKFC and MKFC-ID as specified in subclause 13.2; and

D) if protection of media control messages sent using unicast between the participating MCVideo function and the MCVideo client is negotiated and the CSK and the CSK-ID were sent to the participating MCVideo function using SIP signalling according to 3GPP TS 24.281 [2]:

i) shall encrypt media control messages sent using unicast according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2; and

ii) shall decrypt media control messages received using unicast according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2;

2. in an on-network group call of an MCVideo group which is a constituent MCVideo group of a temporary MCVideo group:

A) if protection of media is negotiated and the GMK and the GMK-ID of the temporary MCVideo group were received using the group document subscription and notification procedure specified in 3GPP TS 24.481 [5] for the constituent MCVideo group:

i) shall encrypt sent media according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the GMK and GMK-ID of the temporary MCVideo group as specified in subclause 13.2; and

ii) shall decrypt received media according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the GMK and GMK-ID of the temporary MCVideo group as specified in subclause 13.2;

B) if protection of transmission control and reception control messages sent using unicast is negotiated and the CSK and the CSK-ID were sent to the participating MCVideo function using SIP signalling according to 3GPP TS 24.281 [2]:

i) shall encrypt transmission control and reception control messages sent using unicast according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2; and

ii) shall decrypt transmission control and reception control messages received using unicast according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2;

C) if protection of media media control messages sent using unicast between the participating MCVideo function and the MCVideo client is negotiated and the CSK and the CSK-ID were sent to the participating MCVideo function using SIP signalling according to 3GPP TS 24.281 [2]:

i) shall encrypt media control messages sent using unicast according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2;

ii) shall decrypt media control messages received using unicast according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2;

3. in an on-network private call:

A) if:

i) protection of media is negotiated in originating call and the PCK and the PCK-ID were sent to the remote MCVideo client using SIP signalling according to 3GPP TS 24.281 [2]; or

ii) protection of media is negotiated in terminating call and the PCK and the PCK-ID were received from the remote MCVideo client using SIP signalling according to 3GPP TS 24.281 [2];

then:

i) shall encrypt sent media according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the PCK and PCK-ID as specified in subclause 13.2; and

ii) shall decrypt received media according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the PCK and PCK-ID as specified in subclause 13.2;

B) if protection of transmission control and reception control messages is negotiated and the CSK and the CSK-ID were sent to the participating MCVideo function using SIP signalling according to 3GPP TS 24.281 [2]:

i) shall encrypt sent transmission control and reception control messages according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2; and

ii) shall decrypt received transmission control and reception control messages according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2; and

D) if protection of media media control messages sent using unicast between the participating MCVideo function and the MCVideo client is negotiated and the CSK and the CSK-ID were sent to the participating MCVideo function using SIP signalling according to 3GPP TS 24.281 [2]:

i) shall encrypt media control messages sent using unicast according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2; and

ii) shall decrypt media control messages received using unicast according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2;

4. in an off-network group call of an MCVideo group:

A) if protection of media is announced and the GMK and GMK-ID of the MCVideo group were received when on-network using the group document subscription and notification procedure specified in 3GPP TS 24.481 [5] for the MCVideo group:

i) shall encrypt sent media according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the GMK and GMK-ID as specified in subclause 13.2; and

ii) shall decrypt received media according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the GMK and GMK-ID as specified in subclause 13.2;

B) if protection of transmission control and reception control messages is announced and the GMK and the GMK-ID of the MCVideo group were received when on-network using the group document subscription and notification procedure specified in 3GPP TS 24.481 [5] for the MCVideo group:

i) shall encrypt sent transmission control and reception control messages according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the GMK and GMK-ID as specified in subclause 13.2; and

ii) shall decrypt received transmission control and reception control messages according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the GMK and GMK-ID as specified in subclause 13.2; and

C) if protection of media control messages is announced and the GMK and GMK-ID of the MCVideo group were received when on-network using the group document subscription and notification procedure specified in 3GPP TS 24.481 [5] for the MCVideo group:

i) shall encrypt sent sent media control messages according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the GMK and GMK-ID as specified in subclause 13.2; and

ii) shall decrypt received received media control messages according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the GMK and GMK-ID as specified in subclause 13.2;

5. in an off-network private call:

   A) if:

      i) protection of media is negotiated in originating call and the PCK and the PCK-ID were sent to the remote MCVideo client using MONP signalling according to 3GPP TS 24.281 [2]; or

      ii) protection of media is negotiated in terminating call and the PCK and the PCK-ID were received from the remote MCVideo client using MONP signalling according to 3GPP TS 24.281 [2];

      then:

      i) shall encrypt sent media according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the PCK and PCK-ID as specified in subclause 13.2; and

      ii) shall decrypt received media according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the PCK and PCK-ID as specified in subclause 13.2;

   B) if:

      i) protection of transmission control and reception control messages is negotiated in originating call and the PCK and the PCK-ID were sent to the remote MCVideo client using MONP signalling according to 3GPP TS 24.281 [2]; or

      ii) protection of transmission control and reception control messages is negotiated in terminating call and the PCK and the PCK-ID were received from the remote MCVideo client using MONP signalling according to 3GPP TS 24.281 [2].

      then:

      i) shall encrypt sent transmission control and reception control messages according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the PCK and PCK-ID as specified in subclause 13.2; and

      ii) shall decrypt received transmission control and reception control messages according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the PCK and PCK -ID as specified in subclause 13.2; and

   C) if:

      i) protection of media control messages is negotiated in originating call and the PCK and the PCK-ID were sent to the remote MCVideo client using MONP signalling according to 3GPP TS 24.281 [2]; or

      ii) protection of media control messages is negotiated in terminating call and the PCK and the PCK-ID were received from the remote MCVideo client using MONP signalling according to 3GPP TS 24.281 [2];

      then:

      i) shall encrypt sent sent media control messages according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the PCK and PCK-ID as specified in subclause 13.2; and

      ii) shall decrypt received received media control messages according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the PCK and PCK-ID as specified in subclause 13.2;

6. if protection of pre-established session control messages is negotiated and the CSK and the CSK-ID were sent to the participating MCVideo function using SIP signalling according to 3GPP TS 24.281 [2]:

   A) shall encrypt sent pre-established session call control messages according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2; and

   B) shall decrypt received pre-established session call control messages according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the CSK and CSK-ID as specified in subclause 13.2.

13.3.4 The controlling MCVideo function

The controlling MCVideo function:

1. if protection of media is negotiated, shall be transparent to RTP media streams and shall forward encrypted RTP media streams without decrypting the payload;

2. in an on-network group call of an MCVideo group which is not a constituent MCVideo group of a temporary MCVideo group:

   A) if protection of transmission control and reception control messages between the controlling MCVideo function and the participating MCVideo function is negotiated and the SPK and the SPK-ID are configured in the controlling MCVideo function:

      i) shall encrypt transmission control and reception control messages sent to the participating MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2; and

      ii) shall decrypt transmission control and reception control messages received from the participating MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2; and

   B) if protection of media control messages between the controlling MCVideo function and the participating MCVideo function is negotiated and the SPK and the SPK-ID are configured in the controlling MCVideo function:

      i) shall encrypt media control messages sent to the participating MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2; and

      ii) shall decrypt media control messages received from the participating MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2;

3. in an on-network group call of an MCVideo group which is a constituent MCVideo group of a temporary MCVideo group:

   A) if protection of transmission control and reception control messages between the controlling MCVideo function and the non-controlling MCVideo function is negotiated and the SPK and the SPK-ID are configured in the controlling MCVideo function:

      i) shall encrypt transmission control and reception control messages sent to the non-controlling MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2; and

      ii) shall decrypt transmission control and reception control messages received from the non-controlling MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2; and

   B) if protection of media control messages between the controlling MCVideo function and the non-controlling MCVideo function is negotiated and the SPK and the SPK-ID are configured in the controlling MCVideo function:

      i) shall encrypt media control messages sent to the non-controlling MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2; and

      ii) shall decrypt media control messages received from the non-controlling MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2; and

4. in an on-network private call:

A) if protection of transmission control and reception control messages between the controlling MCVideo function and the participating MCVideo function is negotiated and the SPK and the SPK-ID are configured in the controlling MCVideo function:

   i) shall encrypt transmission control and reception control messages sent to the participating MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2; and

   ii) shall decrypt transmission control and reception control messages received from the participating MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2; and

B) if protection of media control messages between the controlling MCVideo function and the participating MCVideo function is negotiated and the SPK and the SPK-ID are configured in the controlling MCVideo function:

   i) shall encrypt media control messages sent to the participating MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2;

   ii) shall decrypt media control messages received from the participating MCVideo function according to IETF RFC 3711 [4] and 3GPP TS 33.180 [8] using SRTP-MK, SRTP-MS and SRTP-MKI generated using the SPK and SPK-ID as specified in subclause 13.2.

14 SDP offer/ answer procedures

14.1 General

The capabilities described in subclause 4.3 are negotiated in the signalling and application plane using SDP offer / answer in SIP requests or SIP responses as specified in 3GPP TS 24.281 [2].

This clause describes the details of the SDP offer / answer procedures with regards to the MCVideo fmtp attribute in the "m=application" m-line.

14.2 Generating an SDP offer

14.2.1 General

When the offerer generates an SDP offer, in order to negotiate the establishment of a media plane control channel, the offerer shall include a media description ("m=" line) associated with the media plane control channel. In addition, the offerer may associate an SDP fmtp attribute with the media description.

NOTE: "Initial offer" refers to the offer when the media plane control channel is initially negotiated. It might, or might not, be the initial offer within the session.

14.2.2 "mc_queueing" fmtp attribute

The MCVideo client shall include the "mc_queueing" fmtp attribute in SDP offers when queueing of Transmission request is supported.

The controlling MCVideo function shall include the "mc_queueing" fmtp attribute in SDP offers when queueing of Transmission request is supported.

The non-controlling MCVideo function shall include the "mc_queueing" fmtp attribute in SDP offers if the controlling MCVideo included the "mc_queueing" fmtp attribute in the SDP offer.

14.2.3 "mc_priority" fmtp attribute

The MCVideo client shall include the "mc_priority" fmtp attribute when a transmission priority different than the default priority is required. The MCVideo client should base transmission priority on the configured value in 3GPP TS 24.484 [13].

When inviting an MCVideo client or an MCVideo group to a pre-arranged group call, the controlling MCVideo function and the non-controlling MCVideo function shall include in the "mc_priority" fmtp attribute with the value of the <user-priority> element in the <entry> element specified in 3GPP TS 24.481 [12].

14.2.4 "mc_granted" fmtp attribute

The MCVideo client shall include the "mc_granted" fmtp attribute in the SDP offer of an initial SIP INVITE request when it is acceptable for the MCVideo client to receive a granted indication in the SIP 200 (OK) response to an initial INVITE request.

14.2.5 "mc_implicit_request" fmtp attribute

The MCVideo client shall include the "mc_implicit_request" fmtp attribute when a SIP request shall be interpreted as an implicit Transmission request. If not explicitly stated in procedures in the present document or in procedures in 3GPP TS 24.281 [2] that the "mc_implicit_request" fmtp attribute shall be included, the decision to include the "mc_implicit_request" fmtp attribute or not, is an implementation option.

14.2.6 "mc_reception_priority" fmtp attribute

The MCVideo client shall include the "mc_reception_priority" fmtp attribute when a reception priority different than the default reception priority is required. The MCVideo client should base reception priority on the configured value in 3GPP TS 24.484 [13].

14.3 Generating the SDP answer

14.3.1 General

When the answerer receives an SDP offer, which contains a media description for a media plane control channel, the answerer shall include a media description associated with the media plane control channel in the answer. In addition, the answerer may associate an SDP fmtp attribute with the media description. The SDP fmtp attribute shall not include parameters that were not present in the associated SDP offer.

14.3.2 "mc_queueing" fmtp attribute

The MCVideo client shall include the "mc_queueing" fmtp attribute in SDP answers when queueing of Transmission request is supported.

The controlling MCVideo function shall include the "mc_queueing" fmtp attribute in SDP answers when queueing of Transmission request is supported and the "mc_queueing" fmtp attribute was included in the SDP offer.

The non-controlling MCVideo function shall include the "mc_queueing" fmtp attribute in SDP answers if the controlling MCVideo function included the "mc_queueing" fmtp attribute in the SDP offer.

NOTE: For MCVideo clients connected to the non-controlling MCVideo function, the determination of if queueing is supported or not is determine case by case using the Track Info field for each individual transmission control participant.

14.3.3 "mc_priority" fmtp attribute

If the "mc_priority" fmtp attribute is included in an SDP offer, the controlling MCVideo function:

1. if the <on-network-recvonly> element is present in the <entry> element as specified in 3GPP TS 24.481 [12] for the MCVideo user identified by the <entry> element, shall not include a "mc_priority" fmtp attribute in the SDP answer;

2. if the <on-network-recvonly> element is not present in the <entry> element as specified in 3GPP TS 24.481 [12] for the MCVideo user identified by the <entry> element in the MCVideo group document:

   a. shall determine the priority value to include in "mc_priority" fmtp attribute of the SDP answer, by choosing the lowest value from the following inputs:

      i. the value of transmission priority in the "mc_priority" fmtp attribute included in the SDP offer;

ii. the value of the <user-priority> element in the MCVideo group document as specified in 3GPP TS 24.481 [12]; and

iii the value of the <num-levels-priority-hierarchy> element in the MCVideo service configuration document as specified in 3GPP TS 24.484 [13]; and

b. shall include the priority value determined above in step 2a, in the "mc_priority" fmtp attribute of the SDP answer.

If the "mc_priority" fmtp attribute is included in an SDP offer, the MCVideo client and the non-controlling MCVideo function shall return the value included in the SDP offer in the SDP answer.

14.3.4 "mc_granted" fmtp attribute

If the mc_granted" fmtp attribute is included in an SDP offer, the controlling MCVideo function:

1. if the MCVideo call is not a temporary group session, may use the SIP 200 (OK) response to indicate that the implicit Transmission request is granted; and

2. if the MCVideo call is a temporary group session, shall not indicate that the implicit Transmission request is granted.

NOTE: A MCVideo group call is a temporary group session when the <on-network-temporary> element is present in the <list-service> element as specified in 3GPP TS 24.481 [12].

If the controlling MCVideo function grants the implicit request and decide to use the SIPP 200 (OK) response to grant the implicit request, the controlling MCVideo function shall include the "mc_granted" fmtp attribute in the SDP answer.

If the controlling MCVideo function decides not to grant the implicit request, the controlling MCVideo function shall not include the "mc_granted" fmtp attribute in the SDP answer.

14.3.5 "mc_implicit_request" fmtp attribute

If the "mc_implicit_request" fmtp attribute is included in an SDP offer, the MCVideo server shall accept the initial INVITE request to be an implicit request for media transmission unless the MCVideo client is joining a chat group call or an ongoing pre-arranged call and include the "mc_implicit_request" fmtp attribute in responses to the SIP request.

14.3.6 "mc_reception_priority" fmtp attribute

If the "mc_reception_priority" fmtp attribute is included in an SDP offer, the controlling MCVideo function:

1. shall determine the reception priority value to include in "mc_reception_priority" fmtp attribute of the SDP answer, by choosing the lowest value from the following inputs:

   a. the value of reception priority in the "mc_reception_priority" fmtp attribute included in the SDP offer; and

   b. the value of the <user-reception-priority> element in the MCVideo group document as specified in 3GPP TS 24.481 [12].

14.4 Offerer processing of the SDP answer

When the offerer receives an SDP answer, if an SDP fmtp attribute is associated with the media description associated with the media plane control channel, and if the attribute contains attribute parameters that were not present in the associated offer, the offerer shall discard those attribute parameters.

14.5 Modifying the media plane control channel

When an offerer generates a subsequent SDP offer, the offerer follows the rules for generating an initial offer, as described in subclause 14.2, with the exception that the offerer shall not include the 'mc_granted' SDP fmtp attribute parameter in a subsequent offer. No semantics has been defined for the 'mc_granted' attribute parameter in a subsequent offer.

For the 'mc_implicit_request' semantic is only defined for a subsequent SDP offer when upgrading from normal to an emergency call using an SIP re-INVITE request as specified in 3GPP TS 24.281 [2].

14.6 The use of SDP offer / answer procedures in off-network mode

14.6.1 General

The MCVideo client can negotiate the capabilities used in a private call using PRIVATE CALL SETUP REQUEST message and PRIVATE CALL ACCEPT message as specified in 3GPP TS 24.281 [2]. The PRIVATE CALL SETUP REQUEST message contains the SDP offer and the PRIVATE CALL ACCEPT message contains the SDP answer.

When initiating a group call or a broadcast group call using the GROUP CALL ANNOUNCEMENT message or GROUP CALL BROADCAST message as specified in 3GPP TS 24.281 [2] the capabilities to be used during the call cannot be negotiated.

14.6.2 fmtp attribute "mc_queueing"

When initiating a private call and if the MCVideo client supports queueing of Transmission requests, the MCVideo client shall include the fmtp attribute "mc_queueing" in the SDP offer.

When an MCVideo client accepting the invitation to the private call receives an SDP offer containing the fmtp attribute "mc_queueing" and if the MCVideo client supports queueing of Transmission requests, the MCVideo client shall include the fmtp attribute "mc_queueing" in the SDP answer.

When initiating a group call and if queueing of Transmission requests is supported, the MCVideo client shall include the fmtp attribute "mc_queueing" in the SDP offer.

NOTE: Participants in a group call where queueing is used acknowledge the support of queueing in the Transmission control Indicator field in the Transmission request message.

Annex A (informative): Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2017-01						Initial version.	0.0.0
2017-01						Implementing the following agreed P-CRs after CT1#101bis: C1-170281.	0.1.0
2017-04						Implementing the following agreed P-CRs after CT1#103: C1-171504.	0.2.0
2017-05						Implementing the following agreed P-CRs after CT1#104: C1-172173, C1-172174, C1-172369, C1-172521, C1-172524, C1-172527, C1-172529.	0.3.0
2017-06	CT-76	CP-171109				Version 1.0.0 created for presentation for information at CT76	1.0.0
2017-06	CT-76					Version 14.0.0 created after approval at CT76	14.0.0
2017-09	CT-77	CP-172104	0001	1	F	Proposal for subclause 2 on References	14.1.0
2017-09	CT-77	CP-172104	0002	1	F	Proposal for subclause 4 on General overview	14.1.0
2017-09	CT-77	CP-172104	0003	1	F	Proposal for subclause 5 on Entities	14.1.0
2017-09	CT-77	CP-172104	0004	1	F	Proposal for subclause 12 on Extensions	14.1.0
2017-09	CT-77	CP-172104	0005	1	F	Proposal for subclause 13 on media plane security	14.1.0
2017-09	CT-77	CP-172104	0006	1	F	Proposal for subclause 14 on SDP procedures	14.1.0
2017-09	CT-77	CP-172104	0007	1	F	Off-network call release	14.1.0
2017-12	CT-78	CP-173066	0008	4	F	Proposal for on-network timers and counters used in transmission control	14.2.0
2017-12	CT-78	CP-173066	0009		F	Corrections to transmission control messages	14.2.0
2017-12	CT-78	CP-173066	0010	3	F	Adding missing transmission control messages	14.2.0
2017-12	CT-78	CP-173066	0011		F	Addition of MCVideo transmission control Definitions and Abbreviations	14.2.0
2017-12	CT-78	CP-173066	0012	1	F	Corrections to instances of floor control usage in MCVideo	14.2.0
2017-12	CT-78	CP-173066	0013		F	Corrections to transmission control participant state machines	14.2.0
2017-12	CT-78	CP-173066	0014	1	F	Corrections to transmission control server state machines	14.2.0
2017-12	CT-78	CP-173066	0015	3	F	Effective priority	14.2.0
2017-12	CT-78	CP-173066	0016		F	Reject causes	14.2.0
2018-03	CT-79	CP-180074	0017		F	Correction to MCVideo transmission control message coding	14.3.0
2018-06	CT-80	CP-181055	0018	1	F	MCVideo message and field fixes	14.4.0
2018-06	CT-80	CP-181055	0019	1	F	Corrections on Transmission Idle and Transmission control Ack	14.4.0
2018-06	CT-80	CP-181055	0020	1	F	Corrections on Message Type and Subtype	14.4.0
2018-06	CT-80	CP-181055	0021	2	F	Corrections on Override Indicator	14.4.0
2018-06	CT-80	CP-181055	0023	1	F	Corrections on Reception Indicator	14.4.0
2018-06	CT-80	CP-181055	0024	1	F	Corrections on Reception Priority	14.4.0
2018-06	CT-80	CP-181055	0027	2	F	Corrections on Overriding ID and Overridden ID	14.4.0
2018-06	CT-80	CP-181055	0029	1	F	Corrections on Transmission Arbitration	14.4.0
2018-06	CT-80	CP-181055	0030	1	F	Corrections on Transmission Granted	14.4.0
2018-06	CT-80	CP-181055	0031		F	Corrections on Transmission revoked cause codes	14.4.0
2018-06	CT-80	CP-181055	0032	1	F	Corrections on Transmission Release	14.4.0
2018-06	CT-80	CP-181065	0025	4	B	Corrections on Media Reception	15.0.0
2018-06	CT-80	CP-181065	0028	3	B	Corrections on Receive Media Reception Notification	15.0.0
2018-06	CT-80	CP-181065	0033	2	B	Usage of MBMS for MCVideo – media plane	15.0.0
2018-09	CT-81	CP-182148	0036	1	B	Application Group Paging procedure	15.1.0
2018-09	CT-81	CP-182153	0037	2	B	MBMS bearer announcement over an MBMS bearer	15.1.0
2018-12	CT-82	CP-183057	0039	1	B	MBMS procedures for group dynamic data	15.2.0
2018-12	CT-82	CP-183046	0041		F	Correction on MCVideo Group Identity and SSRC field	15.2.0

History

Document history		
V15.0.0	June 2018	Publication
V15.1.0	September 2018	Publication
V15.2.0	April 2019	Publication