ETSI TS 124 581 V14.0.0 (2017-07)

LTE;
Mission Critical Video (MCVideo) media plane control;
Protocol specification
(3GPP TS 24.581 version 14.0.0 Release 14)

Reference
DTS/TSGC-0124581ve00

Keywords
LTE

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (https://ipr.etsi.org/).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under http://webapp.etsi.org/key/queryform.asp.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Contents

Intellectual Property Rights 2
Foreword 2
Modal verbs terminology 2
Foreword 11
1 Scope 12
2 References 12
3 Definitions, symbols and abbreviations 12
3.1 Definitions 12
3.2 Symbols 13
3.3 Abbreviations 13
4 General 13
4.1 MCVideo overview 13
5 Functional entities 13
6 On-network transmission control 13
6.1 General 13
6.2 Transmission participant procedures 13
6.2.1 Transmission participant procedures at MCVideo session initialization 13
6.2.2 Transmission participant procedures at MCVideo call release 14
6.2.3 Transmission participant procedures at MCVideo call modification 14
6.2.4 Transmission participant state transition diagram for basic transmission control operation 14
6.2.4.1 General 14
6.2.4.2 State: 'Start-stop' 15
6.2.4.2.1 General 15
6.2.4.2.2 MCVideo call initiated, originating MCVideo user 16
6.2.4.2.3 MCVideo call established, terminating MCVideo user 16
6.2.4.3 State: 'U: has no permission to transmit' 16
6.2.4.3.1 General 16
6.2.4.3.2 Send Transmit Media Request message (Click transmit media send button) 16
6.2.4.3.3 Receive Transmit Media Granted message (R: Transmit Media Granted) 17
6.2.4.3.4 Receive Media reception notification message (R: Media reception notification) 17
6.2.4.4 State: 'U: pending request to transmit' 17
6.2.4.4.1 General 17
6.2.4.4.2 Receive Transmit media rejected message (R: Transmit Media rejected) 17
6.2.4.4.3 Timer T101 (Transmit media request) expired 18
6.2.4.4.4 Timer T101 (Transmit Media Request) expired N times 18
6.2.4.4.5 Receive Queue Position Info message (R: Queue Position Info) 18
6.2.4.4.6 Receive Transmit Media Granted message (R: Transmit Media Granted) 18
6.2.4.5 State: 'U: has permission to transmit' 19
6.2.4.5.1 General 19
6.2.4.5.2 Send RTP media packets (S: RTP media) 19
6.2.4.5.3 Send Transmit media end message (Click transmit media end button) 19
6.2.4.5.4 Receive Transmit media end message (R: transmit media end request) 19
6.2.4.5.5 Receive Transmission Revoked message (R: Transmission Revoked) 19
6.2.5.5.6 Receive Media reception notification message (R: Media Reception notification) 20
6.2.4.6 State: 'U: pending release of transmission' 20
6.2.4.6.1 General 20
6.2.4.6.2 Timer T100 (Transmit Media Release) expired 20
6.2.4.6.3 Timer T100 (Transmit media release) expired N times 20
6.2.4.6.4 Receive Transmit Media End Response message (R: Transmit media end response) 20
6.2.4.6.5 Send Transmit Media End Response message (S: Transmit media end response) 21
6.2.4.7 In any state 21
6.2.4.7.1 General 21

6.2.4.7.2 Receive MCVideo call release – step 1 (R: MCVideo call release - 1) 21
6.2.4.8 State: 'Call releasing' 21
6.2.4.8.1 General 21
6.2.4.8.2 Receive MCVideo call release – step 2 (R: MCVideo call release - 2) 21
6.2.4.9 State: 'U: queued transmission' 22
6.2.4.9.1 General 22
6.2.4.9.2 Receive Queue Position Info message (R: Queue Position Info) 22
6.2.4.9.3 Send Queue Position Request message (S: Queue Position Request) 22
6.2.4.9.4 Send Transmit Media cancel request message (S: Transmit Media Cancel Request) 22
6.2.4.9.5 Recieve Transmit Media cancel response message (R: Transmit Media Cancel Response) 22
6.2.4.9.6 Recieve Transmit Media cancel request notify message (R: Transmit Media Cancel Request Notify) 23
6.2.4.9.7 Timer T104 (Queue Position Request) expired 23
6.2.4.9.8 Timer T104 (Queue Position Request) expired N times 23
6.2.4.9.9 Receive Transmit Media Granted message (R: Transmit Media Granted) 23
6.2.5 Transmission participant state transition diagram for basic reception control operation 24
6.2.5.1 General 24
6.2.5.2 State: 'Start-stop' 25
6.2.5.2.1 General 25
6.2.5.2.2 MCVideo call established, terminating MCVideo user 25
6.2.5.3 State: 'U: has no permission to receive' 25
6.2.5.3.1 General 25
6.2.5.3.2 Receive Media transmission notification (R: Media Transmission Notification) 25
6.2.5.3.3 Send Receive Media Request message (Click receive media button) 25
6.2.5.3.4 Receive Media transmission notification message (R: Media transmission notification) 26
6.2.5.4 State: 'U: pending request to receive' 26
6.2.5.4.1 General 26
6.2.5.4.2 Reception of Receive media response (rejected) message (R: RM response (rejected)) 26
6.2.5.4.3 Timer T1xx (Receive media request) expired 26
6.2.5.4.4 Timer T1xx (Receive Media Request) expired N times 27
6.2.5.4.5 Reception of Receive media response (granted) message (R: RM response (granted)) 27
6.2.5.5 State: 'U: has permission to receive' 27
6.2.5.5.1 General 27
6.2.5.5.2 Receive RTP media packets (R: RTP media) 27
6.2.5.5.3 Media reception end request message (Click receive media end button) 27
6.2.5.5.4 Receive Media reception override notify message (R: Media Rx override notify) 28
6.2.5.5.5 Receive Media reception end request message (R: MRE request) 28
6.2.5.5.6 Receive Media transmission notification message (R: Media transmission notification) 28
6.2.5.6 State: 'U: pending reception release' 28
6.2.5.6.1 General 28
6.2.5.6.2 Timer T1aa (Receive Media Release) expired 28
6.2.5.6.3 Timer T1aa (Receive media release) expired N times 29
6.2.5.6.4 Receive Media Reception End Response message (R: MRE response) 29
6.2.5.6.5 Send Media Reception End Response message (S: MRE response) 29
6.2.5.7 In any state 30
6.2.5.7.1 General 30
6.2.5.7.2 Receive MCVideo call release – step 1 (R: MCVideo call release - 1) 30
6.2.5.7.3 Receive Transmit media end notify message (R: Transmit media end notify) 30
6.3 Transmission control server procedures 30
6.3.1 General 30
6.3.2 Controlling MCVideo function procedures at MCVideo call initialization 30
6.3.2.1 General 30
6.3.2.2 Initial procedures 30
6.3.3 MCVideo transmission control procedures at MCVideo call release 31
6.3.4 Transmission control server state transition diagram for general transmission control operation 32
6.3.4.1 General 32
6.3.4.2 State: 'Start-stop' 34
6.3.4.2.1 General 34
6.3.4.2.2 MCVideo call initialization 34
6.3.4.3 State: 'G: Transmit Idle' 34
6.3.4.3.1 General 34
6.3.4.3.2 Enter the 'G: Transmit Idle' state 34

6.3.4.3.3 Receive Transmission Media Request message (R: Transmission Media Request)....35
6.3.4.3.4 Timer T7 (Transmit Idle) expired....35
6.3.4.3.5 Timer T4 (Inactivity) expired....36
6.3.4.3.6 Receive an implicit transmit media request (R: Implicit transmit media request)....36
6.3.4.4 State: 'G: Transmit Taken'....36
6.3.4.4.1 General....36
6.3.4.4.2 Enter the 'G: Transmit Taken' state....36
6.3.4.4.5 Receive RTP media packets (R: RTP media)....37
6.3.4.4.6 Receive Transmit Media End Request message (R: Transmit Media End Request)....37
6.3.4.4.7A Receive Transmission Media Request message without pre-emptive priority (R: Transmission Media Request)....38
6.3.4.4.7 Receive Transmission Media Request message with pre-emptive priority (R: pre-emptive Transmission Media Request)....38
6.3.4.4.8 Receive Floor request message from permitted transmission participant (R: Transmission Media Request)....39
6.3.4.4.9 Timer T20 (Transmit Media Grant) expired....39
6.3.4.4.10 Timer T20 (Transmit Media Grant) expired N times....39
6.3.4.4.11 Permitted MCVideo client release (R: client release)....39
6.3.4.4.12 Receive an implicit transmit media request (R: Implicit transmit media request)....39
6.3.4.5 State: 'G: pending Transmit Media Revoke'....40
6.3.4.5.1 General....40
6.3.4.5.2 Enter the 'G: pending Transmit Media Revoke' state....40
6.3.4.5.3 Receive RTP media packets (R: RTP media)....40
6.3.4.5.4 Receive Transmit Media End Request message (R: Transmit Media End Request)....41
6.3.4.5.5 Timer T3 (Stop talking grace) expired....41
6.3.4.5.6 Timer T1 (End of RTP media) expired....41
6.3.4.6 In any state....42
6.3.4.6.1 General....42
6.3.4.6.2 Receive MCVideo call release - 1....42
6.3.4.7 State: 'Releasing'....42
6.3.4.7.1 General....42
6.3.4.7.2 Receive MCVideo call release - 2....42
6.3.5 Transmission control server state transition diagram for basic transmission control operation towards the transmission participant....42
6.3.5.1 General....42
6.3.5.2 State: 'Start-stop'....44
6.3.5.2.1 General....44
6.3.5.2.2 SIP Session initiated....44
6.3.5.3 State: 'U: not permitted and Transmit Idle'....47
6.3.5.3.1 General....47
6.3.5.3.2 Enter state 'U: not permitted and Transmit Idle'....48
6.3.5.3.3 Send Media Transmission Notify message (S: Media Transmission Notify)....48
6.3.5.3.4 Receive Transmission Media Request message (R: Transmission Media Request)....48
6.3.5.3.5 Send Transmit Media Grant message (S: Transmit Media Grant)....49
6.3.5.3.6 Send Transmit Media Reject message (S: Transmit Media Reject)....49
6.3.5.3.7 Receive Transmit Media End Request message (R: Transmit Media End Request)....49
6.3.5.3.8 Receive RTP media packets (R: media)....50
6.3.5.3.9 Receive an implicit transmit media request (R: Implicit transmit media request)....50
6.3.5.3.10 Send Transmit Idle message (S: Transmit Idle)....50
6.3.5.4 State 'U: not permitted and transmit taken'....50
6.3.5.4.1 General....50
6.3.5.4.2 Enter state 'U: not permitted and Transmit Taken'....51
6.3.5.4.3 Send Transmit Idle message (S: Transmit Idle)....51
6.3.5.4.4 Receive Transmission Media Request message (R: Transmission Media Request)....51
6.3.5.4.5 Receive Transmit Media End Request message (R: Transmit Media End Request)....54
6.3.5.4.6 Receive RTP media packets (R: media)....56
6.3.5.4.7 Send Floor Queue Position Info message (R: Floor Queue Position Request)....56
6.3.5.4.8 Receive an implicit transmit media request (R: Implicit transmit media request)....56
6.3.5.4.9 Send Transmit Media Grant message (S: Transmit Media Grant)....57
6.3.5.4.10 Send Media Transmission Notify message (S: Media Transmission Notify)....57
6.3.5.5 State: 'U: permitted'....57
6.3.5.5.1 General....57

6.3.5.5.2 Enter state 'U: permitted' 57
6.3.5.5.3 Receive Transmit Media End Request message (R: Transmit Media End Request) 57
6.3.5.5.4 Send Transmit Idle message (S: Transmit Idle) 58
6.3.5.5.5 Send Transmit Media Revoke message (S: Transmit Media Revoke) 58
6.3.5.5.6 Receive RTP media packets (R: media) 58
6.3.5.5.7 Receive Transmission Media Request message (R: Transmission Media Request) 58
6.3.5.5.8 Send RTP Media (S: media) 58
6.3.5.5.9 Send Media Transmission Notify message (S: Media Transmission Notify) 58
6.3.5.6 State: 'U: pending Transmit Revoke' 59
6.3.5.6.1 General 59
6.3.5.6.2 Enter state 'U pending Transmit Revoke' 59
6.3.5.6.3 Timer T8 (media Revoke) expired 59
6.3.5.6.4 Receive RTP media packets (R: media) 59
6.3.5.6.5 Receive Transmit Media End Request message (R: Transmit Media End Request) 59
6.3.5.6.6 Send Transmit Idle message (S: Transmit Idle) 60
6.3.5.6.7 Send Media Transmission Notify message (S: Media Transmission Notify) 60
6.3.5.7 State 'U: not permitted but sends media' 60
6.3.5.7.1 General 60
6.3.5.7.2 Enter state 'U: not permitted but sends media' 60
6.3.5.7.3 Timer T8 (Transmit Media Revoke) expired 61
6.3.5.7.4 Receive Transmit Media End Request message (R: Transmit Media End Request) 61
6.3.5.8 In any state 62
6.3.5.8.1 General 62
6.3.5.8.2 Receive MCVideo call release – 1 62
6.3.5.9 State: 'Releasing' 62
6.3.5.9.1 General 62
6.3.5.9.2 Receive MCVideo call release - 2 62
6.3.6 Transmission control server state transition for general reception control 62
6.3.6.1 General 62
6.3.6.2 State: 'Start-stop' 63
6.3.6.2.1 General 63
6.3.6.2.2 MCVideo call initialization 63
6.3.6.3 State: 'Gr: Reception Idle' 64
6.3.6.3.1 General 64
6.3.6.3.2 Enter the 'Gr: Reception Idle' state 64
6.3.6.3.3 Receive Media Transmission Notify message (R: Media Transmission Notify) 64
6.3.6.3.4 Timer Tr7 (Reception Idle) expired 64
6.3.6.3.5 Timer Tr4 (Inactivity) expired 65
6.3.6.3.6 Reception of Receive Media Request message (R: Receive Media Request) 65
6.3.6.3.7 Receive RTP media (R: RTP media) 65
6.3.6.4 State: 'Gr: Reception accepted' 66
6.3.6.4.1 General 66
6.3.6.4.2 Enter the 'Gr: Reception Accepted' state 66
6.3.6.4.3 Reception of Receive Media Request message (R: Receive Media Request) 66
6.3.6.4.4 Reception of Receive Media End Request message (R: Receive Media End Request) 66
6.3.6.4.5 Reception of Receive Media End Response (Granted) message (R: Receive Media End Response) 67
6.3.6.4.6 Reception of Receive Media End Response (Rejected) message (R: Receive Media End Response) 67
6.3.6.4.7 Receive RTP media (R: RTP media) 67
6.3.6.4.8 Timer Trn1 (Reception Granted) expires 67
6.3.6.4.9 Timer Trn1 (Reception Granted) expired N times 68
6.3.6.5 State: 'Gr: Any state' 68
6.3.6.5.1 General 68
6.3.6.5.2 Receive MCVideo call release - 1 68
6.3.6.6 State: 'Gr: Releasing' 68
6.3.6.6.1 General 68
6.3.4.6.2 Receive MCVideo call release - 2 68
6.3.7 Transmission control server state transition for basic reception control operations towards the transmission participant 68
6.3.7.1 General 68
6.3.7.2 State: 'Start-stop' 71

6.3.7.2.1 General 71
6.3.7.2.2 SIP Session initiated 71
6.3.7.3 State: 'U: not permitted to receive' 72
6.3.7.3.1 General 72
6.3.7.3.2 Enter state 'U: not permitted to receive' 72
6.3.7.3.3 Send Media Transmission Notification message (S: Media Transmission Notification) 72
6.3.7.3.4 Reception of Receive Media Request message (R: Receive Media Request) 72
6.3.7.3.5 Receive Media Reception End Response message (R: Media Reception End Resonse) 73
6.3.7.3.6 Send Receive Media Response (Granted) message (S: Receive Media Response (Granted)) 73
6.3.7.4 State: 'U: permitted to receive' 73
6.3.7.4.1 General 73
6.3.7.4.2 Enter state 'U: permitted to receive' 73
6.3.7.4.3 Send RTP media packets (S: RTP media) 73
6.3.7.4.4 Receive Media Reception End Request message (R: Media Reception End Request) 73
6.3.7.4.5 Send Media Transmission Notification message (S: Media Transmission Notification) 74
6.3.7.4.6 Send Media Reception Override Notify message (S: Media Reception Override Notify) 74
6.3.7.4.7 Send Transmit End Notify message (S: Transmit End Notify) 74
6.3.7.4.8 Send Media Reception End Request message (S: Media Reception End Request) 74
6.3.7.4.9 Send Media Reception End Response message (S: Media Reception End Response) 74
6.4 Participating MCVideo function transmission control procedures 75
6.4.1 General 75
6.4.2 Receive transmission control messages 75
6.4.3 Receive RTP media packets (R: RTP Media) 75
6.4.4 Release of session 76

7 Off-network MCVideo service media plane procedures 76
7.1 General 76
7.2 Transmission participant procedures for single arbitrator approach 77
7.2.1 Transmission participant procedures at MCVideo session initialisation 77
7.2.1.2 Determine off-network transmission priority 77
7.2.2 Transmission participant procedures at MCVideo call release 77
7.2.3 Transmission participant state diagram – basic operation 78
7.2.3.1 General 78
7.2.3.2 State: 'Start-stop' 79
7.2.3.2.1 General 79
7.2.3.2.2 MCVideo call established – originating MCVideo user 79
7.2.3.2.3 MCVideo group call established – terminating MCVideo user 79
7.2.3.2.4 MCVideo private call established – terminating MCVideo user 79
7.2.3.2.5 Send Transmission Request message (video transmission button pressed) 79
7.2.3.2.6 Receive Transmission Arbitration Taken message (R: Transmission Arbitration Taken) 80
7.2.3.2.7 Receive Transmission Granted message (R: Transmission Granted to other) 80
7.2.3.2.8 Receive RTP media (R: RTP media) 80
7.2.3.2.9 MCVideo broadcast call established – terminating MCVideo user 80
7.2.3.3 State: 'O: silence' 81
7.2.3.3.1 General 81
7.2.3.3.2 Send Transmission Request message (video transmission button pressed) 81
7.2.3.3.3 Receive RTP media (R: RTP media) 81
7.2.3.3.4 Receive Transmission Granted message (R: Transmission Granted to other) 81
7.2.3.3.5 Receive Transmission Request message (R: Transmission Request) 82
7.2.3.3.6 Receive Transmission Arbitration Taken message (R: Transmission Arbitration Taken) 82
7.2.3.3.7 Timer T230 (Inactivity) expired 82
7.2.3.4 State: 'O: has no permission' 82
7.2.3.4.1 General 82
7.2.3.4.2 Sending Transmission Request message (video transmission button pressed) 83
7.2.3.4.3 Receive Transmission Release message (R: Transmission Release) 83
7.2.3.4.4 Receive Transmission Arbitration Release message (R: Transmission Arbitration Release) 83
7.2.3.4.5 Timer T203 (End of RTP media) expired 83
7.2.3.4.6 Receive Transmission Granted message (R: Transmission Granted to other) 84
7.2.3.4.7 Receive RTP media (R: RTP media) 84
7.2.3.4.8 Receive Transmission Arbitration Taken message (R: Transmission Arbitration Taken) 84
7.2.3.4.9 Receive Transmission Revoked message (R: Transmission Revoked) 84
7.2.3.5 State: 'O: transmission arbitration' 85

7.2.3.5.1 General 85
7.2.3.5.2 Send RTP Media packets (S: RTP Media) 85
7.2.3.5.3 Receive Transmission Release message (R: Transmission Release) 85
7.2.3.5.4 Receive Transmission Request message (R: Transmission Request) 85
7.2.3.5.5 Send Transmission Arbitration Release message (video transmission button released with empty transmitter list) 86
7.2.3.5.6 Send Transmission Arbitration Release message (video transmission button released with non-empty talker list) 86
7.2.3.5.7 Receive Transmission Request message with pre-emption indication and revoking self (R: Transmission Request with pre-emption) 87
7.2.3.5.8 Receive Transmission Request message with pre-emption indication and revoking a transmitter (R: Transmission Request with pre-emption) 87
7.2.3.5.9 Transmission time limit warning (Timer T206 expires) 88
7.2.3.5.10 Transmission time limit reached with transmitter(s) in transmitter list (Timer T207 expires with transmitter(s)) 88
7.2.3.5.11 Transmission time limit reached with no transmitter in transmitter list (Timer T207 expires with no transmitter) 89
7.2.3.5.12 Receive RTP media (R: RTP media) 89
7.2.3.5.13 Timer T205 (Transmission Granted) expired (timer T205 expired) 89
7.2.3.5.14 Timer T205 (Transmission Granted) expired N times (Timer T205 expired N times) 90
7.2.3.5.15 Timer T203 (End of RTP media) expired 90
7.2.3.6 State: 'O: has permission' 90
7.2.3.6.1 General 90
7.2.3.6.2 Send RTP Media packets (S: RTP Media) 90
7.2.3.6.3 Receive Transmission Release message (R: Transmission Release) 90
7.2.3.6.4 Send Transmission Release message (video transmission button released) 90
7.2.3.6.5 Receive RTP media (R: RTP media) 91
7.2.3.6.6 Transmission time limit warning (Timer T206 expires) 91
7.2.3.6.7 Transmission time limit (Timer T207 expires) 91
7.2.3.6.8 Timer T203 (End of RTP media) expired 91
7.2.3.6.9 Receive Transmission Granted message (R: Transmission Granted to other) 92
7.2.3.6.10 Receive Transmission Arbitration Taken message (R: Transmission Arbitration Taken) 92
7.2.3.6.11 Receive Transmission Arbitration Release message with next arbitrator to me (R: Transmission Arbitration Release with next arbitrator to me) 92
7.2.3.6.12 Receive Transmission Revoked message (R: Transmission Revoked) 92
7.2.3.6.13 Receive Transmission Arbitration Release message with next arbitrator to other (R: Transmission Arbitration Release with next arbitrator to other) 93
7.2.3.7 State: 'O: pending request' 93
7.2.3.7.1 General 93
7.2.3.7.2 Receive RTP media (R: RTP media) 93
7.2.3.7.3 Receive Transmission Rejected message (R: Transmission Rejected) 93
7.2.3.7.4 Send Transmission Release message (video transmission button released with no talker) 94
7.2.3.7.5 Send Transmission Release message (video transmission button released with talker) 94
7.2.3.7.6 Send Transmission Arbitration Taken message (Timer T201 expired N times) 94
7.2.3.7.7 Receive Transmission Granted message (R: Transmission Granted to me) 95
7.2.3.7.8 Receive Transmission Granted message with next arbitrator (R: Transmission Granted with next arbitrator to me) 95
7.2.3.7.9 Receive Transmission Granted message (R: Transmission Granted to other) 95
7.2.3.7.10 Timer T201 (Transmission Request) expired (Timer T201 expired) 95
7.2.3.7.11 Receive Transmission Request message (R: Transmission request) 96
7.2.3.7.12 Receive Transmission Arbitration Taken message (R: Transmission Arbitration Taken) 96
7.2.3.7.13 Receive Transmission Release message (R: Transmission Release) 96
7.2.3.7.14 Receive Transmission Revoked message (R: Transmission Revoked) 96
7.2.3.8 State: 'O: pending delegated' 97
7.2.3.8.1 General 97
7.2.3.8.2 Receive RTP media (R: RTP Media) 97
7.2.3.8.3 Timer T205 (Transmission Granted) expired (timer T205 expired) 97
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) 98
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) 98
7.2.3.8.6 Video transmission button pressed 98

7.2.3.8.7 Receive Transmission Release message (R: Transmission Release) 98
7.2.3.8.8 Receive Transmission Request message (R: Transmission Request) 98
7.2.3.8.9 Receive Transmission Arbitration Taken message (R: Transmission Arbitration Taken) 99
7.2.3.8.10 Timer T208 (Transmission Arbitration Release) expired (timer T208 expired) 99
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) 99
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) 100
7.2.3.9 In any state 100
7.2.3.9.1 General 100
7.2.3.9.2 Receive MCVideo call release (R: MCVideo call release) 100

8 Communication release media plane procedures 100

9 Coding 101
9.1 Introduction 101
9.1.1 General 101
9.1.2 RTCP: APP message format 101
9.1.3 Application specific data field 102
9.1.4 Handling of unknown messages and fields 103
9.2 Transmission control 103
9.2.1 Introduction 103
9.2.2 Transmission control messages 103
9.2.2.1 General 103
9.2.3 Transmission control specific fields 105
9.2.3.1 Introduction 105
9.2.3.2 Transmission Priority field 105
9.2.3.3 Duration field 106
9.2.3.4 Reject Cause field 106
9.2.3.6 Granted Party's Identity field 107
9.2.3.7 Permission to Request the Transmission field 107
9.2.3.8 User ID field 108
9.2.3.9 Message Sequence Number field 108
9.2.3.10 Message Type field 108
9.2.3.11 Transmission Indicator field 109
9.2.4 Transmission Request message 110
9.2.5 Transmission Granted message 110
9.2.6 Transmission Rejected message 112
9.2.6.1 General 112
9.2.6.2 Rejection cause codes and rejection cause phrase 113
9.2.7 Transmission Released message 113
9.2.8 Transmission Arbitration Taken message 114
9.2.9 Transmission Arbitration Released message 115
9.2.10 Transmission Revoked message 116
9.2.10.1 General 116
9.2.10.2 Transmission revoked cause codes and revoked cause phrases 117
9.2.12 Queue Position Info message 118
9.2.13 Media transmission notification 119
9.2.14 Receive media request 120
9.2.15 Receive media response 122
9.2.15.1 General 122
9.2.6.2 Rejection cause codes and rejection cause phrase 123
9.2.16 Media reception notification 123
9.2.17 Transmit media cancel request 124
9.2.18 Transmit media cancel response 125
9.2.19 Transmit media cancel request notify 125
9.2.20 Transmit media end request 126
9.2.21 Transmit media end response 127
9.2.22 Remote transmit media request 127
9.2.23 Remote transmit media response 128
9.2.24 Remote transmit media cancel request 129
9.2.25 Remote transmit media cancel response 130

9.2.26 Media reception end request 131
9.2.27 Media reception end response 131
9.2.28 Media reception override notification 132
9.2.29 Transmit media end notify 133
10 Media plain handling for MBMS 134
Annex A (informative): Change history 135
History 136

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

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)".

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].

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].

4 General

4.1 MCVideo overview

5 Functional entities

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 transmit media request when an implicit transmit media request is negotiated; and
2. shall not be regarded as an implicit transmit media 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'.

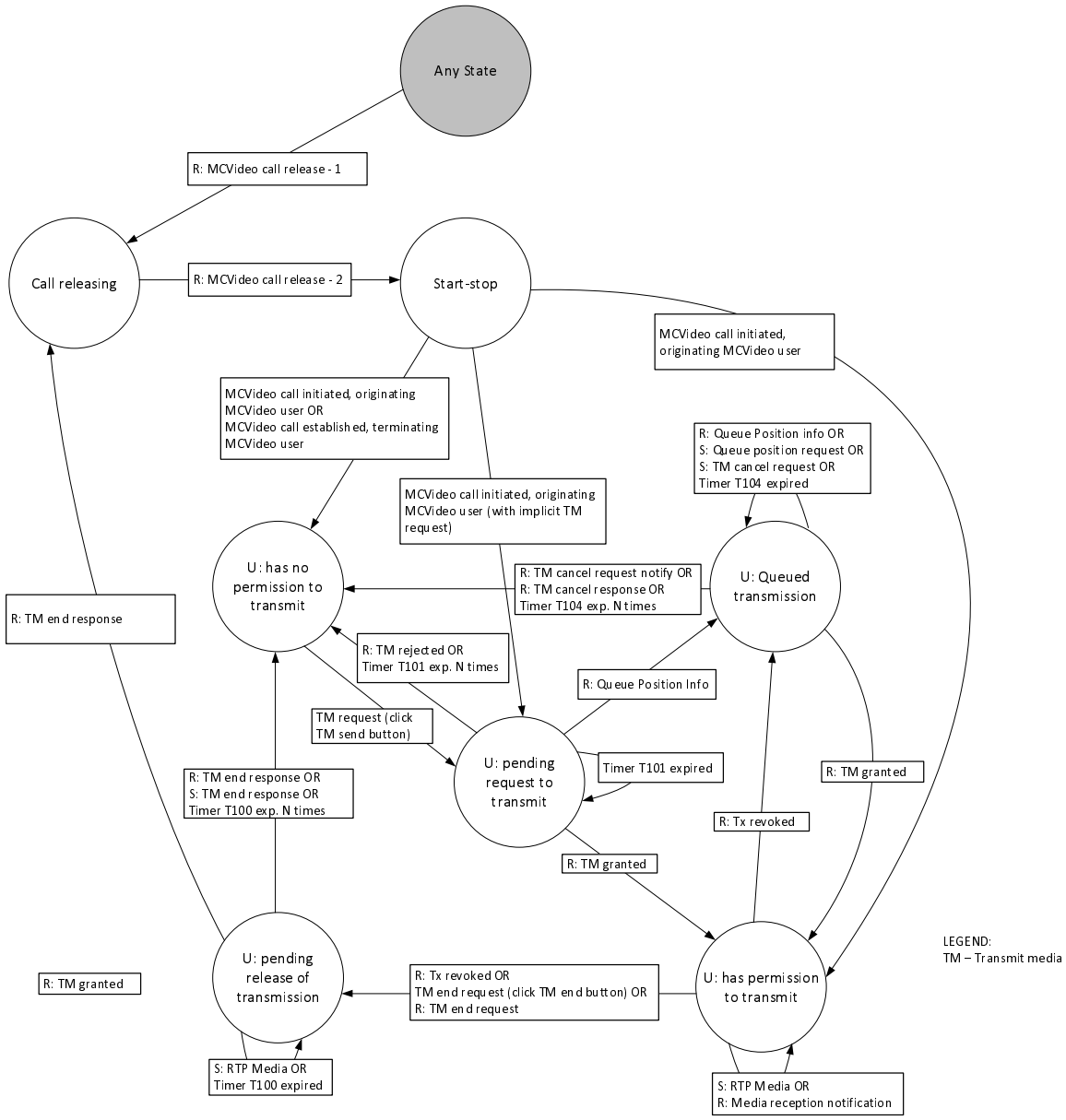


Figure 6.2.4.1-1: Transmission participant state transition diagram for basic transmission control operation.

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 transmit media 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 transmit media request:

   a. shall start timer T101 (Transmit Media Request) and initialise counter C101 (Transmit Media 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 Transmit Media Request message (Click transmit media 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 Transmit Media Request message toward the transmission control server; The Transmit Media 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 transmit 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 T101 (Transmit Media Request) and initialise counter C101 (Transmit Media Request) to 1; and

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

6.2.4.3.3 Receive Transmit Media Granted message (R: Transmit Media Granted)

Upon receiving a Transmit Media Granted message from the transmission control server due to remote transmit media request, the transmission participant:

1. if the first bit in the subtype of the Transmit Media Granted message is set to '1' (Acknowledgment is required) as described in subclause 8.3.2, shall send a Transmission control Ack message. The Transmission control Ack message:

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

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

2. shall provide transmit media granted notification to the user, if not already done;

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

6.2.4.3.4 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.

6.2.4.4 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 Transmit Media Request message.

In this state transmission control messages can be received.

Timer T101 (Transmit Media Request) is running in this state.

6.2.4.4.2 Receive Transmit media rejected message (R: Transmit Media rejected)

Upon receiving a Transmit media rejected message, the transmission participant:

1. if the first bit in the subtype of the Transmit media rejected message is set to '1' (Acknowledgment is required) as described in subclause 8.3.2, shall send a Transmission control Ack message. The Transmission control Ack message:

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

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

2. shall provide transmit media rejected notification to the user;
3. may display the transmit media rejected reason to the user using information in the Reject Cause field;
4. shall stop timer T101 (Transmit Media Request); and
5. shall enter the 'U: has no permission to transmit' state.

6.2.4.4.3 Timer T101 (Transmit media request) expired

On expiry of timer T101 (Transmit Media Request) less than the upper limit of counter C101 (Transmit Media Request) times the timer is allowed to expire, the transmission participant:

1. shall send a Transmit Media Request message towards the transmission control server. The Transmit Media 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 transmit media request is a broadcast group call, system call, emergency call or an imminent peril call, shall include a Floor Indicator field indicating the relevant call types;
2. shall restart timer T101 (Transmit media request) and increment counter C101 (Transmit Media Request) by 1; and
3. shall remain in the 'U: pending request to transmit' state.

6.2.4.4.4 Timer T101 (Transmit Media Request) expired N times

When timer T101 (Transmit Media Request) expires by the upper limit of counter C101 (Transmit Media Request), the transmission participant:

1. shall provide a transmit media 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 8.3.2, 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 transmit media 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 Transmit Media Granted message (R: Transmit Media Granted)

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

1. if the first bit in the subtype of the Transmit Media Granted message is set to '1' (Acknowledgment is required) as described in subclause 8.3.2, shall send a Transmission control Ack message. The Transmission control Ack message:
   a. shall include the Message Type field set to '1' (Floor Granted); and

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

2. shall provide transmit media granted notification to the user, if not already done;

3. shall stop timer T101 (Transmit Media Request); and

4. 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 Transmit media end message (Click transmit media end button)

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

1. shall send a Transmit media end message towards the transmission control server The Transmit media end 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); and

2. shall start timer T100 (Transmit Media Release) and initialize counter C100 (Transmit Media Release) to 1; and

3. shall enter the 'U: pending release of transmission' state.

6.2.4.5.4 Receive Transmit media end message (R: transmit media end request)

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

1. shall send a Transmit media end message towards the transmission control server The Transmit media end 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); and

2. may provide a Transmission end notification to the MCVideo user;

3. shall start timer T100 (Transmit Media Release) and initialize counter C100 (Transmit Media Release) to 1; and

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

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;
5. shall start timer T100 (Transmit Media Release) and initialize counter C100 (Transmit Media Release) to 1; and
6. if the revoke reason is:
    a. terminate the RTP stream, shall enter the 'U: pending transmission release' state; or

b. queue the transmission, shall enter the 'U: queued transmission' state.6.2.5.5.6 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 release 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 Transmit media end message.

Timer T100 (Transmit Media Release) is running or can be running in this state.

6.2.4.6.2 Timer T100 (Transmit Media Release) expired

On expiry of timer T100 (Transmit Media Release) less than the configurable number of the upper limit of counter C100 (Transmit Media Release) times, the transmission participant:

1. shall send a Transmit media end request message towards the transmission control server;
2. shall restart timer T100 (Transmit Media Release) and increment counter C100 (Floor Release) by 1; and
3. shall remain in state 'U: pending release of transmission'.

6.2.4.6.3 Timer T100 (Transmit media release) expired N times

When timer T100 (Transmit media Release) expires by the upper limit of counter C100 (Transmit Media Release) times, the transmission participant:

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

6.2.4.6.4 Receive Transmit Media End Response message (R: Transmit media end response)

Upon receiving a Transmit media end response message, the transmission participant:

1. if the first bit in the subtype of the Floor Idle message to '1' (Acknowledgment is required) as described in subclause 8.3.2, shall send a Transmission control Ack message. The Transmission control Ack message:
    a. shall include the Message Type field set to '5' (Transmit media end); 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 Transmit 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 T100 (Transmit Media Release);
5. if the session is not a broadcast group call or if the A-bit in the Transmit Media 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 Send Transmit Media End Response message (S: Transmit media end response)

Upon sending a Transmit media end response message, the transmission participant:

1. if the first bit in the subtype of the Floor Idle message to '1' (Acknowledgment is required) as described in subclause 8.3.2, shall send a Transmission control Ack message. The Transmission control Ack message:
   a. shall include the Message Type field set to '5' (Transmit media end); and
   b. shall include the Source field set to '0' (the transmission participant is the source);
2. shall stop timer T100 (Transmit Media Release); and
3. shall enter the 'U: has no permission to transmit' state.

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 Floor Granted message.

The timer T104 (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 8.3.2, 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 T104 (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 T104 (Queue Position Request) and initialize counter C104 (Queue Position Request) to 1; and
3. remain in the 'U: queued' state.

6.2.4.9.4 Send Transmit Media cancel request message (S: Transmit Media 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 Transmit Media Cancel Request message to the transmission control server; and
2. remain in the 'U: queued' state.

6.2.4.9.5 Recieve Transmit Media cancel response message (R: Transmit Media Cancel Response)

Upon receiving a Transmit Media cancel response message, the transmission participant:

1. if the first bit in the subtype of the Transmit Media cancel response message is set to '1' (Acknowledgment is required) as described in subclause 8.3.2, shall send a Transmission control Ack message. The Transmission control Ack message:

a. shall include the Message Type field set to 'X' (Transmit Media 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 Recieve Transmit Media cancel request notify message (R: Transmit Media Cancel Request Notify)

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

1. if the first bit in the subtype of the Transmit Media cancel request notify message is set to '1' (Acknowledgment is required) as described in subclause 8.3.2, shall send a Transmission control Ack message. The Transmission control Ack message:

   a. shall include the Message Type field set to 'X' (Transmit Media 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 T104 (Queue Position Request) expired

On expiry of timer T104 (Queue Position Request) less than the upper limit of C104 (Queue Position Request) times, the transmission participant:

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

2. shall restart timer T104 (Queue Position Request) and increment counter C104 (Queue Position Request) by 1; and

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

6.2.4.9.8 Timer T104 (Queue Position Request) expired N times

When timer T104 (Queue Position Request) expires by the upper limit of counter C104 (Queue Position Request) times, the transmission participant:

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

2. send the Transmit Media End message to the transmission control server;

3. shall enter the 'U: pending transmission release' state.

6.2.4.9.9 Receive Transmit Media Granted message (R: Transmit Media Granted)

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

1. if the first bit in the subtype of the Transmit Media Granted message is set to '1' (Acknowledgment is required) as described in subclause 8.3.2, shall send a Transmission control Ack message. The Transmission control Ack message:

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

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

2. shall provide transmit media granted notification to the user, if not already done;

3. shall stop timer T104 (Queue position request); and

4. 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'.

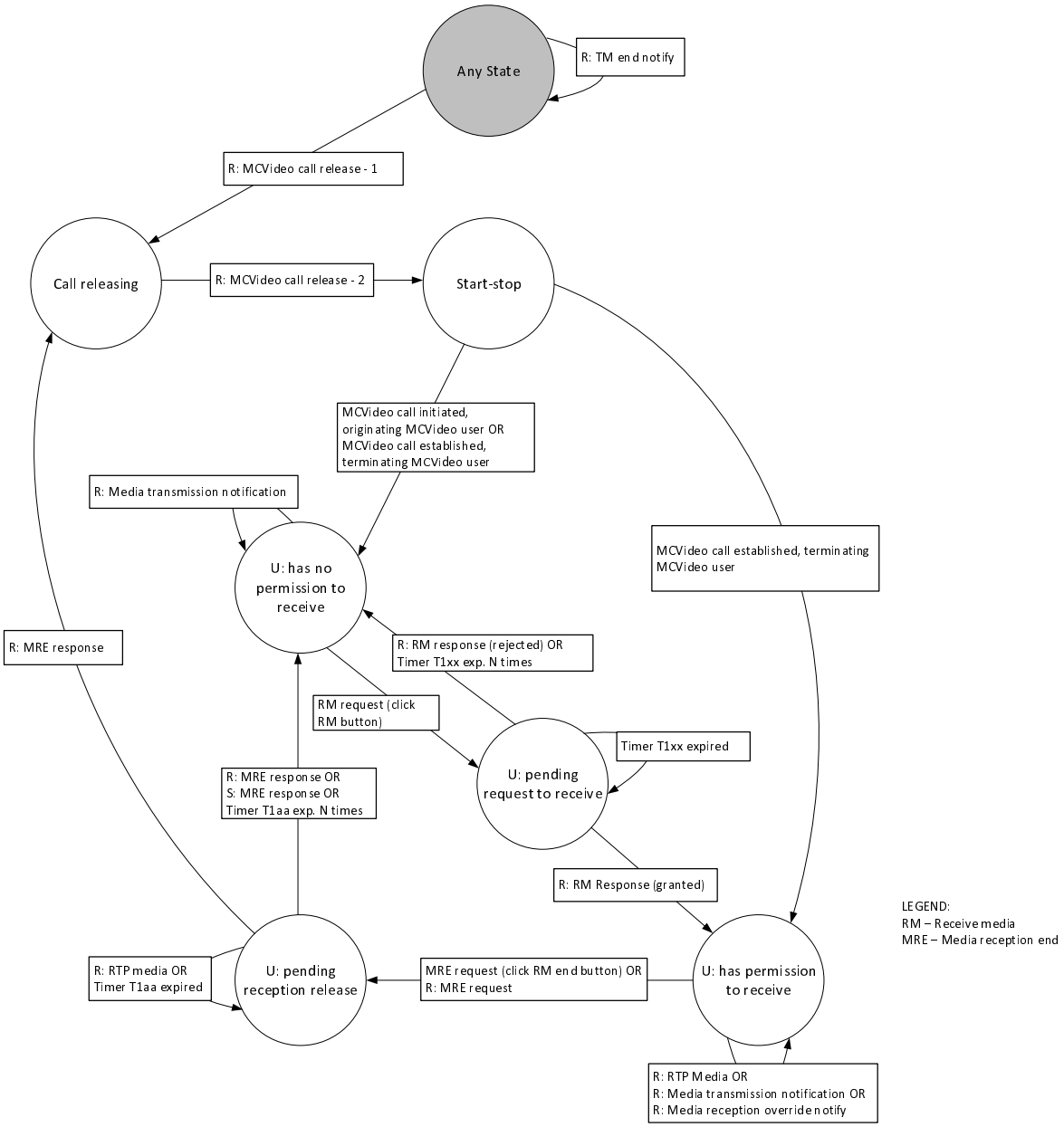


Figure 6.2.5.1-1: Transmission participant state transition diagram for basic reception control operation.

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 (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 8.3.2, shall send a Reception control Ack message. The Reception 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. may display the details of the incoming media to the user; and
4. shall enter the 'U: has no permission to receive' state.

6.2.5.3.3 Send Receive Media Request message (Click receive media 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 Reception Indicator field indicating the relevant call types;

3. shall start timer T1xx (Receive Media Request) and initialise counter C1xx (Receive Media Request) to 1; and

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

6.2.5.3.4 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 'U: has no permission to receive' state.

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 T1xx (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 8.3.2, shall send a Reception control Ack message. The Reception 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 T1xx (Receive Media Request); and

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

6.2.5.4.3 Timer T1xx (Receive media request) expired

On expiry of timer T1xx (Receive Media Request) less than the upper limit of counter C1xx (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 Reception Indicator field indicating the relevant call types;

2. shall restart timer T1xx (Receive media request) and increment counter C1xx (Receive Media Request) by 1; and

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

6.2.5.4.4 Timer T1xx (Receive Media Request) expired N times

When timer T1xx (Receive Media Request) expires by the upper limit of counter C1xx (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 8.3.2, shall send a Reception control Ack message. The Reception 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 T1xx (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:

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 receive media 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 Reception Indicator with the A-bit set to '1' (Normal call); and

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 T1aa (Receive Media Release) and initialize counter C1aa (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. if override indicator is mandatory:
   a. shall send a Media reception end request message towards the transmission control server;
   b. shall start timer T1aa (Receive Media Release) and initialize counter C1aa (Receive Media Release) to 1;
   c. shall enter the 'U: pending reception release' state; and
4. if override indicator is not mandatory, shall remain in the 'U: has permission to receive' 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. shall inform the user that the receiving RTP media is being ended;
2. may give information to the user about the reason for ending the received RTP media;
3. shall request the MCVideo client to discard any remaining buffered RTP media packets and stop displaying to user;
5. shall start timer T1aa (Receive Media Release) and initialize counter C1aa (Receive Media Release) to 1; and
6. shall enter the 'U: pending reception release' state.

6.2.5.5.6 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 'U: has permission to receive' state.

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 T1aa (Receive Media Release) is running or can be running in this state.

6.2.5.6.2 Timer T1aa (Receive Media Release) expired

On expiry of timer T1aa (Receive Media Release) less than the configurable number of the upper limit of counter C1aa (Receive Media Release) times, the transmission participant:

1. shall send a MRE request message towards the transmission control server;
2. shall restart timer T1aa (Receive Media Release) and increment counter C1aa (Receive Media Release) by 1; and
3. shall remain in state 'U: pending reception release'.

6.2.5.6.3 Timer T1aa (Receive media release) expired N times

When timer T1aa (Receive media Release) expires by the upper limit of counter C1aa (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 Floor Idle message 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 '5' (Media reception end); 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 T110 (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 Send Media Reception End Response message (S: MRE response)

Upon sending a MRE response message, the transmission participant:

1. if the first bit in the subtype of the Floor Idle message 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 '5' (Media reception end); 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 T1aa (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;

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 Transmit media end notify message (R: Transmit media end notify)

Upon receiving a Transmit media 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.

6.3 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 transmit media 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 floor 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.

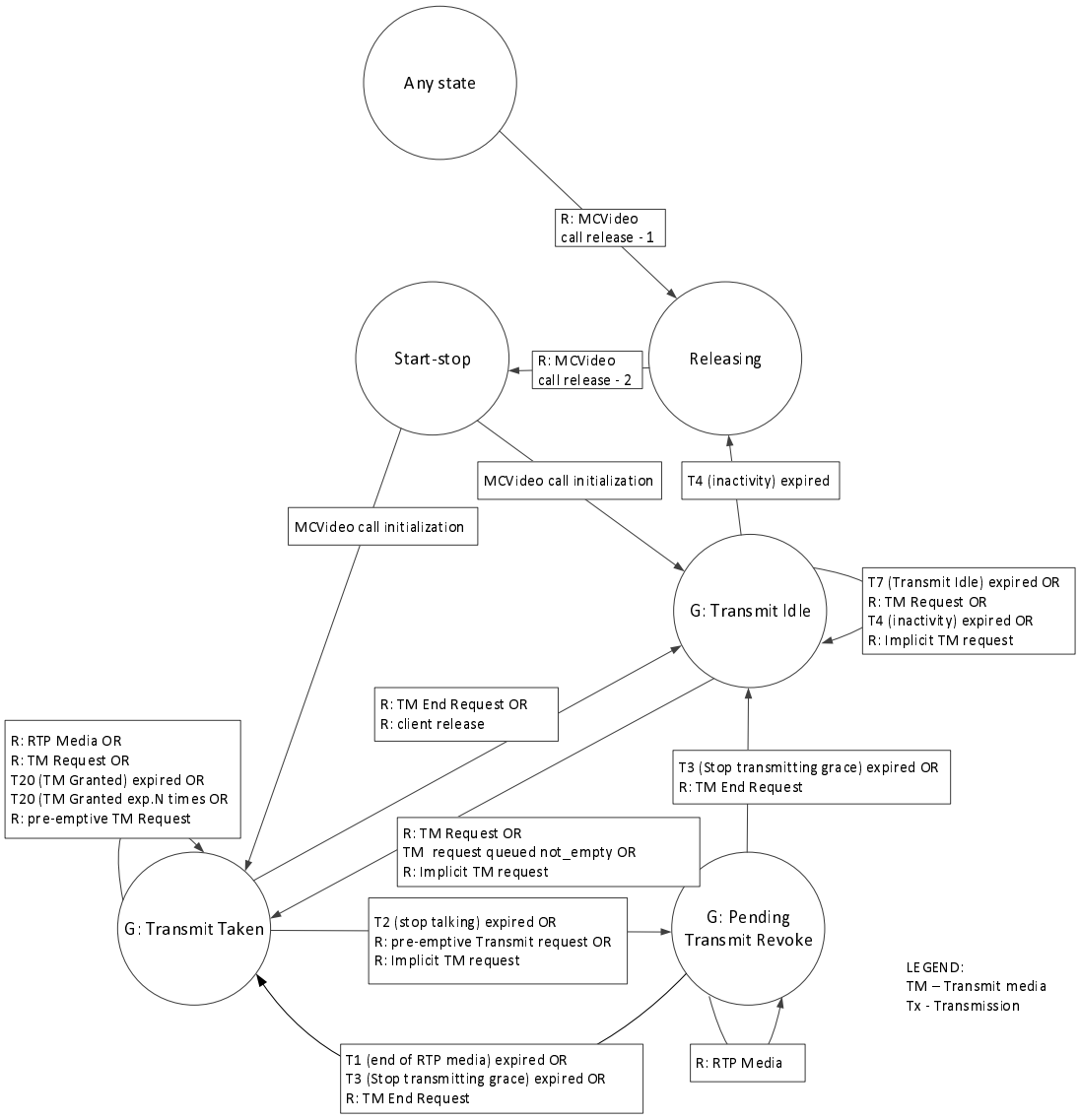


Figure 6.3.4.1-1: Transmission control server state transition diagram for 'general transmission control operation'

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 transmit media 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 transmit media 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; and

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 T4 (Inactivity) and timer T7 (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 transmit media requests as described in clause 14, the transmission control arbitration logic in the transmission control server:

1. if the active transmit media request queue is empty the transmission control server:
    a. shall send Transmit Idle message to all transmission participants. The Transmit 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 T7 (Transmit Idle) and initialise counter C7 (Transmit Idle) to 1;

c. shall start timer T4 (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 transmit media request queue is not empty the transmission control server:

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

b. shall remove that queued transmit media request from the active transmit media 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 transmit media request message (from a transmission participant that is permitted to make a transmit media 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 transmit media request is rejected the transmission control server:

a. shall send the Transmit Media Reject message. The Transmit Media 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 transmit media 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 transmit media request is granted the transmission control server:

a. shall stop timer T4 (Inactivity);

b. shall stop timer T7 (Transmit Idle);

c. shall store the SSRC of transmission participant granted the permission to send media until the transmission is released associated to that transmit media 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 T7 (Transmit Idle) expired

On expiry of timer T7 (Transmit Idle) the transmission control arbitration logic in the transmission control server:

1. shall restart timer T7 (Transmit Idle) and increment counter C7 (Transmit Idle) by 1 if counter C7 (Transmit Idle) has not reached its upper limit;

2. shall send a Transmit Idle message to all transmission participants in the MCVideo call if counter C7 (Transmit Idle) has not reached its upper limit. The Transmit 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 T4 (Inactivity) expired

On expiry of timer T4 (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 T4 (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 T4 (Inactivity) timer; and
   b. shall remain in the 'G: Transmit Idle' state.

6.3.4.3.6 Receive an implicit transmit media request (R: Implicit transmit media request)

Upon receiving an implicit transmit media 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 transmit media request is rejected the transmission control server:
   a. shall send the Transmit Media Reject message. The Transmit Media 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 transmit media request in the <Reject Phrase> value; and
   b. shall remain in the 'G: Transmit Idle' state; and
3. if the transmit media request is granted the transmission control server:
   a. shall stop the timer T4 (Inactivity);
   b. shall stop the timer T7 (Transmit Idle);
   c. shall store the SSRC of transmission participant granted the permission to send media until the floor is released associated to that transmit media 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 T20 (Transmit Media Grant) is running to guarantee reliable delivery of the Transmit Media Grant message, if the granted transmit media 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 Transmit Media Grant message to the requesting transmission participant. The Transmit Media Grant message:

a. shall include the granted priority in the Floor priority field;

b. shall increment counter Cx (Simultaneous transmission video) by 1 if counter Cx (Simultaneous transmission video) has not reached its upper limit; and

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;

2. shall start timer T20 (Transmit Media Grant) if the transmit media request was queued and initialise the counter C20 (Transmit Media 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 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. shall initiate the ‘general reception control operation’ state machine.

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 T20 (Transmit Media 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 Transmit Media End Request message (R: Transmit Media End Request)

Upon receiving a Transmit Media 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 T20 (Granted re-send), if running;

4. 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 floor 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 transmit media 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;

1. 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 T20 (Transmit Media Grant), if running;
   c. shall include a Reject Cause field with the <Reject Cause> value set to #4 (Media Transmission pre-empted) in the Transmit Media Revoke message sent in subclause 6.3.4.5.2;
   d. shall enter the 'G: pending Floor Revoke' state as specified in the subclause 6.3.4.5.2;
   e. shall insert the transmission participant into the active transmit media 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 transmit media 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 transmit media requests as specified in clause 14. The Queue Position Info message:
      i. include the queue position and floor priority in the Queue Info field; and

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

Upon receiving a transmit media 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 Transmit Media Grant message to the previously granted transmission participant. The Transmit Media Grant message:

   a. shall include the value of timer T2 (Stop talking) in the Duration field;

   b. shall include the granted priority in the Floor priority field; and

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

6.3.4.4.9 Timer T20 (Transmit Media Grant) expired

On expiry of timer T20 (Transmit Media Grant), the transmission control arbitration logic in the transmission control server:

1. shall send a Transmit Media Grant message to the granted transmission participant if counter C20 (Transmit Media Grant) has not reached its upper limit: The Transmit Media Grant message:

   a. shall include the granted priority in the Floor 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 T20 (Transmit Media Grant) and increment counter C20 (Transmit Media Grant) by 1 if counter C20 (Transmit Media Grant) has not reached its upper limit; and

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

6.3.4.4.10 Timer T20 (Transmit Media Grant) expired N times

When timer T20 (Transmit Media Grant) expires and counter C20 (Transmit Media 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 transmit media request (R: Implicit transmit media request)

Upon receiving an implicit transmit media 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 T20 (Transmit Media Grant), if running;

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

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

e. shall insert the transmission participant into the active transmit media 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 transmit media request queue to the position in front of all other queued requests, if already inserted; and

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

   i. shall include the queue position and floor 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 Transmit Media Revoke'

6.3.4.5.1 General

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

Timer T3 (Stop talking grace) is running when the transmission control arbitration logic in the transmission control server is in this state.

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 Transmit Media Revoke' state

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

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

   a. shall include the reason for sending the Transmit Media 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;

2. shall start timer T3 (Stop talking grace); and

3. shall set the general state to 'G: pending Transmit Media 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 restart timer T1 (End of RTP media);

NOTE 1: If the upper limit for timer T3 (Stop talking grace) is less than the upper limit of timer T1 (End of RTP media) then timer T1 (End of RTP media) will not expire.

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

3. shall remain in the 'G: pending Transmit Media Revoke' state.

6.3.4.5.4 Receive Transmit Media End Request message (R: Transmit Media End Request)

Upon receiving a Transmit Media 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;
2. shall stop timer T1 (End of RTP media) , if running;
3. shall stop timer T3 (Stop talking grace); and
4. shall decrease Cx (Simultaneous transmission video) by 1 if Cx (Simultaneous transmission video) has not reached it lower limit;
5. 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.
6. if Cx (Simultaneous transmission video) has not reached lower limit and if the active transmit media request queue is not empty the transmission control server:
    a. shall select a queued transmit media request from the top of the active transmit media request queue;
    b. shall remove that queued transmit media request from the active transmit media 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 Timer T3 (Stop talking grace) expired

On expiry of timer T3 (Stop talking grace) the transmission control arbitration logic in the transmission control server:

1. shall indicate to the interface towards the MCVideo client that the general state machine is now 'G: Transmit Idle'; and
2. 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.
3. if Cx (Simultaneous transmission video) has not reached lower limit and if the active transmit media request queue is not empty the transmission control server:
    a. shall select a queued transmit media request from the top of the active transmit media request queue;
    b. shall remove that queued transmit media request from the active transmit media 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.

6.3.4.5.6 Timer T1 (End of RTP media) expired

On expiry of timer T1 (End of RTP media) the transmission control arbitration logic in the transmission control server:

1. shall stop timer T3 (Stop talking grace); and
2. 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.
3. if Cx (Simultaneous transmission video) has not reached lower limit and if the active transmit media request queue is not empty the transmission control server:
    a. shall select a queued transmit media request from the top of the active transmit media request queue;
    b. shall remove that queued transmit media request from the active transmit media 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.

6.3.4.6 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.

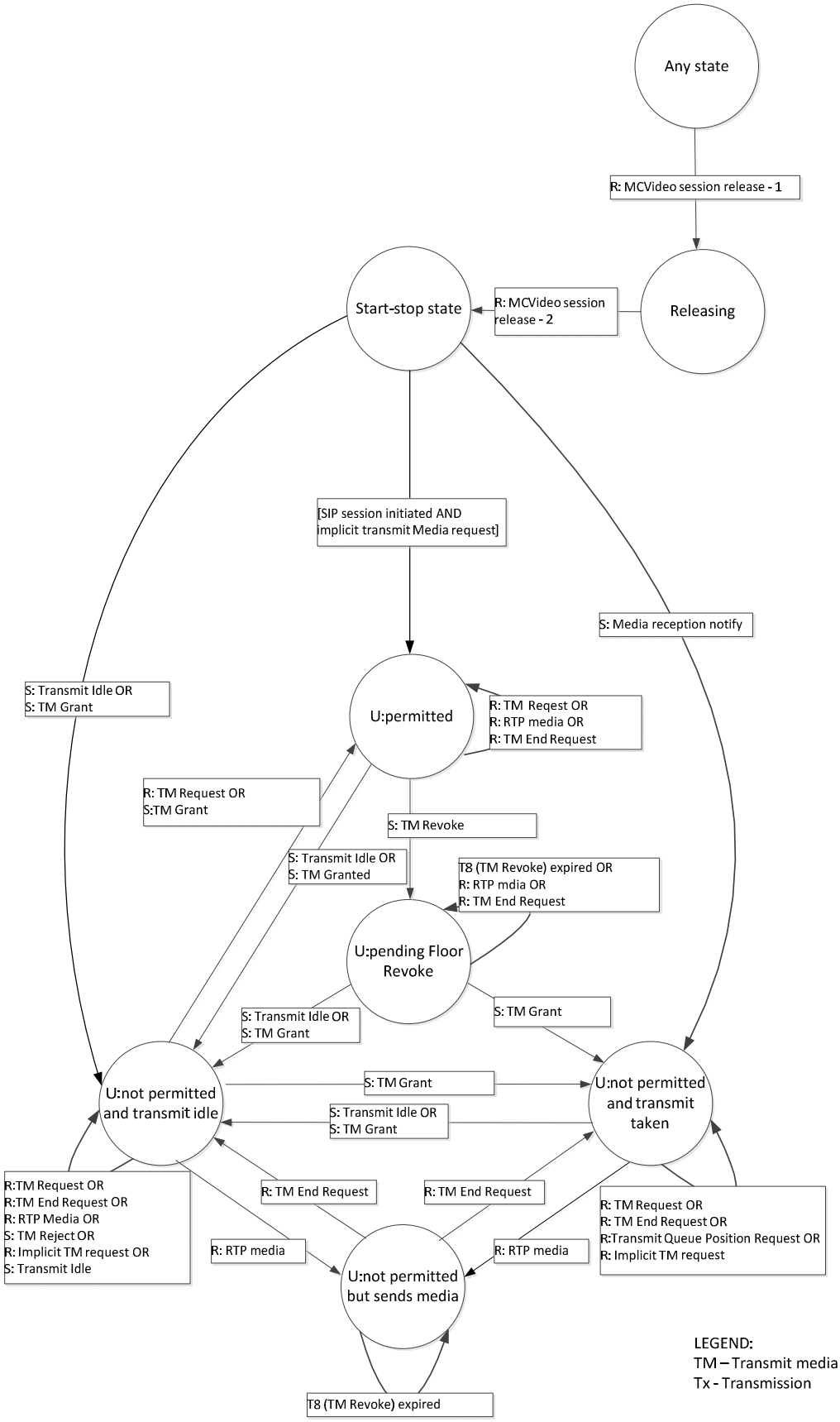


Figure 6.3.5.1-1: Transmission control server state transition diagram for basic transmission control operation towards the transmission participant

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. floor 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 transmit media 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 transmit media request or initiates or joins a chat group call without an implicit transmit media request or attempts to initiate an already existing MCVideo call without an implicit transmit media 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 Transmit Idle message to the MCVideo client. The Transmit 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 floor field set to '0';

         D. if the session is not a broadcast group call, may include the Permission to Request the floor 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 floor 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 transmit media 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 transmit media 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 transmit media 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 transmit media 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 transmit media 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 floor 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 transmit media 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 transmit media request with pre-emptive floor priority is required.

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

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

         A shall include the queue position and floor 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 Floor Queue Position Info message with the updated status to the MCVideo clients in the active transmit media request queue which negotiated queueing of transmit media requests as specified in clause 14, which have requested the queue status, whose queue position has been changed since the previous Floor Queue Position Info message and which is not the joining MCVideo client. The Floor Queue Position Info message:

         A shall include the queue position and floor 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 transmit media 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 floor field set to '0';

D. if the session is not a broadcast group call, may include the Permission to Request the floor 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 floor field set to '0';

D. if the session is not a broadcast group call, may include the Permission to Request the floor 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 Transmit Idle message to the MCVideo client. The Transmit 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 8.3.2, and

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

3. initiates a instance of ‘basic reception control operations towards the floor 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 transmit media request is an attempt to upgrade a group call to a broadcast group call. If the transmission control arbitration logic accepts the transmit media request, the ongoing group call will be upgraded accordingly by the Transmit Media 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 Transmit Media Reject message to the associated transmission participant. The Transmit Media 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 transmit media request in the <Reject Phrase> value;

   c. may set the first bit in the subtype of the Transmit Media Reject message to '1' (Acknowledgment is required) as described in subclause 8.3.2; and

NOTE 3: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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 Transmit Media Grant message (S: Transmit Media Grant)

When a Transmit Media 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 Transmit Media Grant messages to the associated transmission participant;
2. may set the first bit in the subtype of the Transmit Media Grant message to '1' (Acknowledgment is required) as described in subclause 8.3.2; and

NOTE: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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 Transmit Media Reject message (S: Transmit Media Reject)

When a Transmit Media 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 Transmit Media Reject messages to the associated transmission participant;
2. may set the first bit in the subtype of the Transmit Media Reject message to '1' (Acknowledgment is required) as described in subclause 8.3.2; and

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

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

6.3.5.3.7 Receive Transmit Media End Request message (R: Transmit Media End Request)

Upon receiving a Transmit Media 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 Transmit Media End Request message is set to '1' (Acknowledgment is required) as described in subclause 8.3.2, shall send a Transmit Ack message. The Transmit Ack message:
   a. shall include the Message Type field set to '4' (Transmit Media End Request); and
   b. shall include the Source field set to '2' (the controlling MCVideo function is the source);
2. shall send a Transmit Idle message to the associated transmission participant. The Transmit 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 Transmit Idle message to '1' (Acknowledgment is required) as described in subclause 8.3.2; and

NOTE: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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 Transmit Media End Request message to check if the transmission participant has a queued transmit media request;

4 if the transmission participant has a transmit media request in the queue, shall remove the queued transmit media 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 Transmit Media 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 Transmit Media Revoke message to the associated transmission participant. The Transmit Media 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 transmit media request (R: Implicit transmit media 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 transmit media 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 Transmit Idle message (S: Transmit Idle)

When receiving a Transmit 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 Transmit Idle message to the associated transmission participant;
2. may set the first bit in the subtype of the Transmit Idle message to '1' (Acknowledgment is required) as described in subclause 8.3.2; and

NOTE: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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 floor participant' state machine as specified in subclause 6.3.7.

6.3.5.4.3 Send Transmit Idle message (S: Transmit Idle)

When receiving a Transmit 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 Transmit Idle message to the associated transmission participant;
2. may set the first bit in the subtype of the Transmit Idle message to '1' (Acknowledgment is required) as described in subclause 8.3.2;

NOTE: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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 transmit media 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 Transmit Media Reject message to the associated transmission participant. The Transmit Media 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 transmit media 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 Transmit Media Reject message to '1' (Acknowledgment is required) as described in subclause 8.3.2; and

NOTE 1: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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 Transmit Media Reject message to the associated transmission participant. The Transmit Media 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 transmit media 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 Transmit Media Reject message to '1' (Acknowledgment is required) as described in subclause 8.3.2; and

NOTE 2: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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 transmit media requests or included a floor 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 floor priority shall be:

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

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

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

      iv. the default priority, if the MCVideo client did not negotiate floor 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 Transmit Media Reject message to the transmission participant. The Transmit Media 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 transmit media 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 transmit media request;

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

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

      i. shall include the queue position and floor 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 transmit media 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 transmit media 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 Transmit Media Reject message to the associated transmission participant. The Transmit Media 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 transmit media 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 Transmit Media Reject message to the associated transmission participant. The Transmit Media 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 transmit media 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 transmit media 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 transmit media request queue, if not inserted yet, or update the position of the MCVideo client in the active transmit media 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 Floor Queue Position Info message to the transmission participant. The Floor Queue Position Info message:

i. shall include the queue position and floor 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 Floor Queue Position message to '1' (Acknowledgment is required) as described in subclause 8.3.2.

NOTE 4: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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 Transmit Media End Request message (R: Transmit Media End Request)

Upon receiving a Transmit Media End Request message from the associated transmission participant and if the MCVideo client did not negotiate support of queueing of transmit media requests or included a floor 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 Transmit Media End Request message is set to '1' (Acknowledgment is required) as described in subclause 8.3.2, shall send a Transmit Ack message. The Transmit Ack message:

a. shall include the Message Type field set to '4' (Transmit Media 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 floor field set to '0', if the transmission participants are not allowed to request the floor;

   d. may set the first bit in the subtype of the Media Transmission Notify message to '1' (Acknowledgment is required) as described in subclause 8.3.2; and

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

   e. initiates a instance of ‘basic reception control operations towards the floor 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 Transmit Media End Request message from the associated transmission participant and if the MCVideo client negotiated support of queueing of transmit media 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 Transmit Media End Request message is set to '1' (Acknowledgment is required) as described in subclause 8.3.2, shall send a Transmit Ack message. The Transmit Ack message:

   a. shall include the Message Type field set to '4' (Transmit Media 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 Transmit Media End Request message, shall use the topmost <Participant Reference> value and the SSRC in the received Transmit Media End Request message to check if the transmission participant has a queued transmit media request; or

   b. if a Track Info field is not included in the Transmit Media End Request message, shall use the SSRC in the received Transmit Media End Request message to check if the transmission participant has a queued transmit media request;

3. shall remove the MCVideo client from the active transmit media request queue, if the MCVideo client was in the active transmit media 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 floor field set to '0';

   c. if the session is not a broadcast group call, may include the Permission to Request the floor 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 floor 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 8.3.2; and

NOTE 2: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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 Transmit Media Revoke message to the associated transmission participant. The Transmit Media 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 Floor Queue Position Info message (R: Floor Queue Position Request)

Upon receiving a Floor 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 Floor Queue Position Info message. The Floor Queue Position Info message:

   a. shall include the queue position and floor priority in the Queue Info field;

   b. may include the first bit in the subtype of the Floor Queue Position Info message set to '1' (Acknowledgment is required) as described in subclause 8.3.2; and

NOTE: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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 transmit media request (R: Implicit transmit media 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 transmit media 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 Transmit Media Grant message (S: Transmit Media Grant)

When a Transmit Media 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 Transmit Media Grant messages to the associated transmission participant;
2. may set the first bit in the subtype of the Transmit Media Grant message to '1' (Acknowledgment is required) as described in subclause 8.3.2;

NOTE 1: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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' (Dual floor) 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 8.3.2;

NOTE: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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 floor 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 Transmit Media End Request message (R: Transmit Media End Request)

Upon receiving a Transmit Media 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 Transmit Media End Request message is set to '1' (Acknowledgment is required) as described in subclause 8.3.2, shall send a Transmit Ack message. The Transmit Ack message:
   a. shall include the Message Type field set to '4' (Transmit Media End Request); and
   b. shall include the Source field set to '2' (the controlling MCVideo function is the source);

2. shall forward the Transmit Media 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 Transmit Media End Request message set to '0' (Acknowledgment is not required), if not already set; and

3. shall remain in the 'U: permitted' state.

6.3.5.5.4 Send Transmit Idle message (S: Transmit Idle)

Upon receiving the Transmit 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 Transmit Media Revoke message (S: Transmit Media Revoke)

When receiving the Transmit Media 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 Transmit Media 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' (Dual Floor), 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 floor 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 Transmit Media Revoke message.

In this state timer T8 (Transmit Media 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 T8 (Transmit Media Revoke); and
2. shall enter the state 'U: pending Transmit Revoke'.

6.3.5.6.3 Timer T8 (media Revoke) expired

On expiry of timer T8 (Transmit Media Revoke) the transmission control interface towards the MCVideo client in the transmission control server:

1. shall retransmit the Transmit Media Revoke message to the associated transmission participant. The Transmit Media Revoke message:
   a. shall include the same Rejection Cause field and the same Transmission Indicator field as in the previous sent Transmit Media Revoke message;
2. shall start timer T8 (Transmit Media Revoke); and
3. shall remain in the 'U: pending Transmit Revoke' state.

NOTE: The number of times the transmission control server retransmits the Transmit Media 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 Transmit Media End Request message (R: Transmit Media End Request)

Upon receiving a Transmit Media 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 Transmit Media End Request message is set to '1' (Acknowledgment is required) as described in subclause 8.3.2, shall send a Transmit Ack message. The Transmit Ack message:
   a. shall include the Message Type field set to '4' (Transmit Media End Request); and
   b. shall include the Source field set to '2' (the controlling MCVideo function is the source);
2. shall forward the Transmit Media End Request message to the transmission control server arbitration logic; and

b. shall remain in the state 'U: pending Transmit Revoke'.

6.3.5.6.6 Send Transmit Idle message (S: Transmit Idle)

Upon receiving a Transmit 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 Transmit Idle message is sent when timer T3 (Stop talking grace) expires expires and when there are no queued transmit media requests.

1. shall send the Transmit Idle message to the associated transmission participant;

2. may set the first bit in the subtype of the Transmit Idle message to '1' (Acknowledgment is required) as described in subclause 8.3.2; and

NOTE 2: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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 timer T3 (Stop talking grace) expires expires and if there are queued transmit media 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 8.3.2; and

NOTE 2: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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.

4. shall create 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 T8 (Transmit Media 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 T8 (Transmit Media 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 T8 (Transmit Media Revoke) expired

On expiry of timer T8 (Transmit Media Revoke), the transmission control interface towards the MCVideo client in the transmission control server:

1. shall send a Transmit Media Revoke message to the associated transmission participant. The Transmit Media 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 T8 (Transmit Media 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 Transmit Media 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 Transmit Media End Request message (R: Transmit Media End Request)

Upon receiving a Transmit Media 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 Transmit Media End Request message is set to '1' (Acknowledgment is required) as described in subclause 8.3.2, shall send a Transmit Ack message. The Transmit Ack message:

   a. shall include the Message Type field set to '4' (Transmit Media 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 Transmit Idle message. The Transmit 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 floor field set to '0';

      iii. if the session is not a broadcast group call, may include the Permission to Request the floor 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 8.3.2; and

NOTE: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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 floor 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.

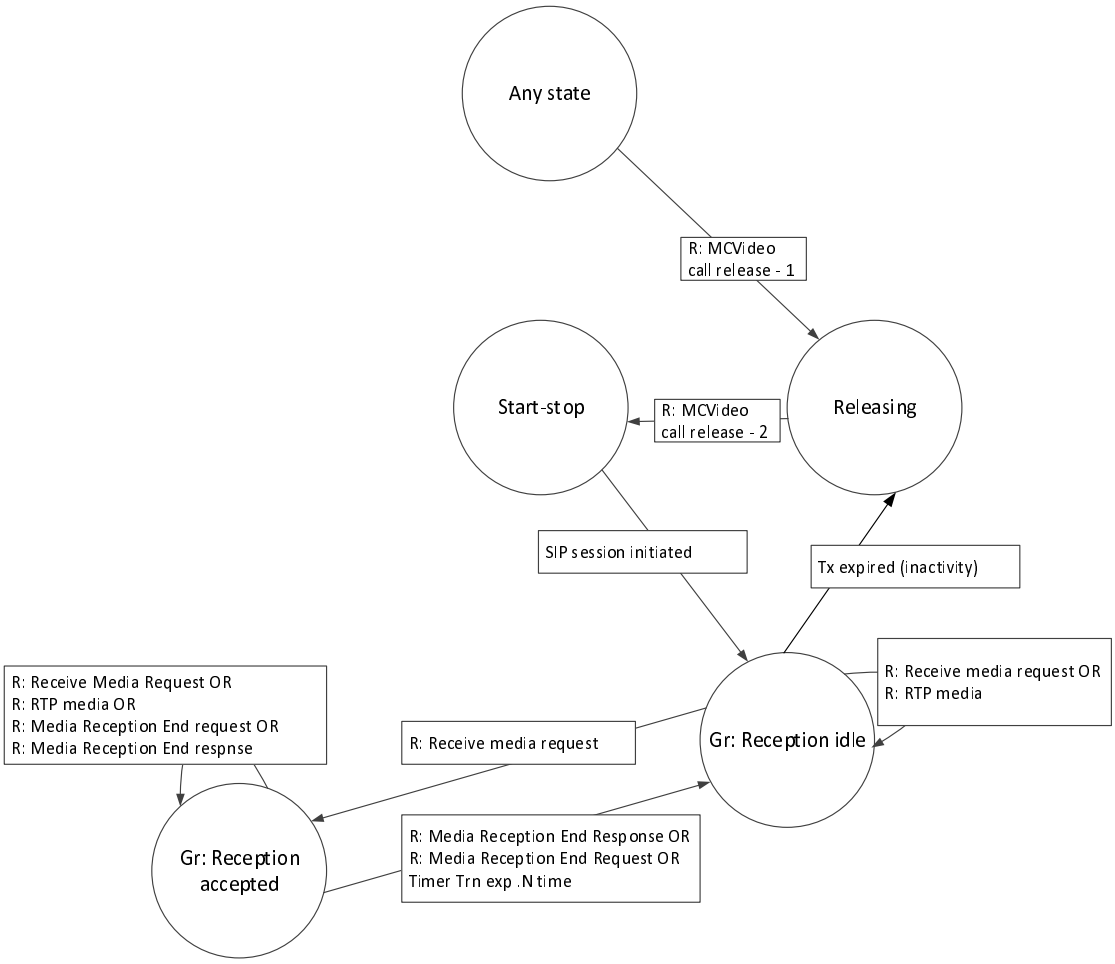


Figure 6.3.6.1-1: Transmission control server state transition diagram for 'general reception control operation'

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 Tr4 (Inactivity) and timer Tr7 (Reception Idle) 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 Tr7 (Reception Idle) and initialise counter Cr7 (Reception Idle) to 1;
2. shall start timer Tr4 (Inactivity);
3. shall initialise counter Crn2 (Reception Accepted) to 0;
4. 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 Timer Tr7 (Reception Idle) expired

On expiry of timer Tr7 (Reception Idle) the reception control arbitration logic in the transmission control server:

1. shall restart timer Tr7 (Reception Idle) and increment counter Cr7 (Reception Idle) by 1 if counter Cr7 (Reception Idle) has not reached its upper limit;
2. shall remain in the 'G: Reception Idle' state.

6.3.6.3.5 Timer Tr4 (Inactivity) expired

On expiry of timer Tr4 (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 Tr4 (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 Tr4 (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 8.3.2, shall send a Reception control Ack message.
      ii. shall include the Message Type field set to 'y' (Receive media granted);
   f. shall remain the 'Gr: Reception accepted' state.
2. if the Receive Media Request is granted:
   a. shall stop timer Tr4 (Inactivity);
   b. shall stop timer Tr7 (Reception Idle);
   c. shall store the SSRC of transmission participant requesting to receive media until the receiption is finished associated to that transmit media request;
   d. 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 8.3.2, shall send a Reception control Ack message.
      ii. shall include the Message Type field set to 'y' (Receive media granted);
   e. shall increase Crn2 (Reception Accepted) by 1 if it has not reach its upper limit;
   f. 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 Tr7 (Reception Idle);
2. shall stop timer Tr4 (Inactivity);
3. 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 8.3.2, shall send a Reception control Ack message.
      ii. shall include the Message Type field set to 'y' (Receive media granted);
   f. shall remain the 'Gr: Reception accepted' state.
2. if the Receive Media Request is granted:
   a. shall stop timer Tr4 (Inactivity);
   b. shall stop timer Tr7 (Reception Idle);
   c. shall store the SSRC of transmission participant requesting to receive media until the receiption is finished associated to that transmit media request;
   d. 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 8.3.2, shall send a Reception control Ack message.
      ii. shall include the Message Type field set to 'y' (Receive media granted);
   e. shall start timer Trn1 (Reception Granted);
   f. shall increase Crn2 (Reception Accepted) by 1 if it has not reach its upper limit;
   g. 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 8.3.2, shall send a Reception 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 8.3.2, shall send a Reception control Ack message.

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

b. shall stop timer Trn1 (Reception Granted);

c. shall decrease Crn2 (Reception Accepted) by 1 if it has not reach its lower limit;

d. if Crn2 has not reached it lower limit, shall remain the 'Gr: Reception accepted' state.

e. if Crn2 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 8.3.2, shall send a Reception control Ack message.

2. shall stop timer Trn1 (Reception Granted);

3. shall decrease Crn2 (Reception Accepted) by 1 if it has not reach its lower limit;

4. if Crn2 has not reached it lower limit, shall remain the 'Gr: Reception accepted' state.

5. if Crn2 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 8.3.2, shall send a Reception 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 MCPTT clients according to local policy; and

2. shall remain the 'Gr: Reception accepted' state.

6.3.6.4.8 Timer Trn1 (Reception Granted) expires

On expiry of timer Trn1 (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 Crn1 (Reception Granted) has not reached its upper limit.

2. shall start timer Trn1 (Reception Granted) and increment counter Crn1 (Reception Granted) by 1 if counter Crn1 (Reception Granted) has not reached its upper limit; and

3. shall remain in the 'G: Reception accepted' state.

6.3.6.4.9 Timer Trn1 (Reception Granted) expired N times

When timer Trn1 (Reception Granted) expires and counter Crn1 (Transmission Granted) reaches its upper limit, the reception control arbitration logic in the transmission control server:

1. shall remain in the 'G: Reception Accepted' state.6.3.6.5State: '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.

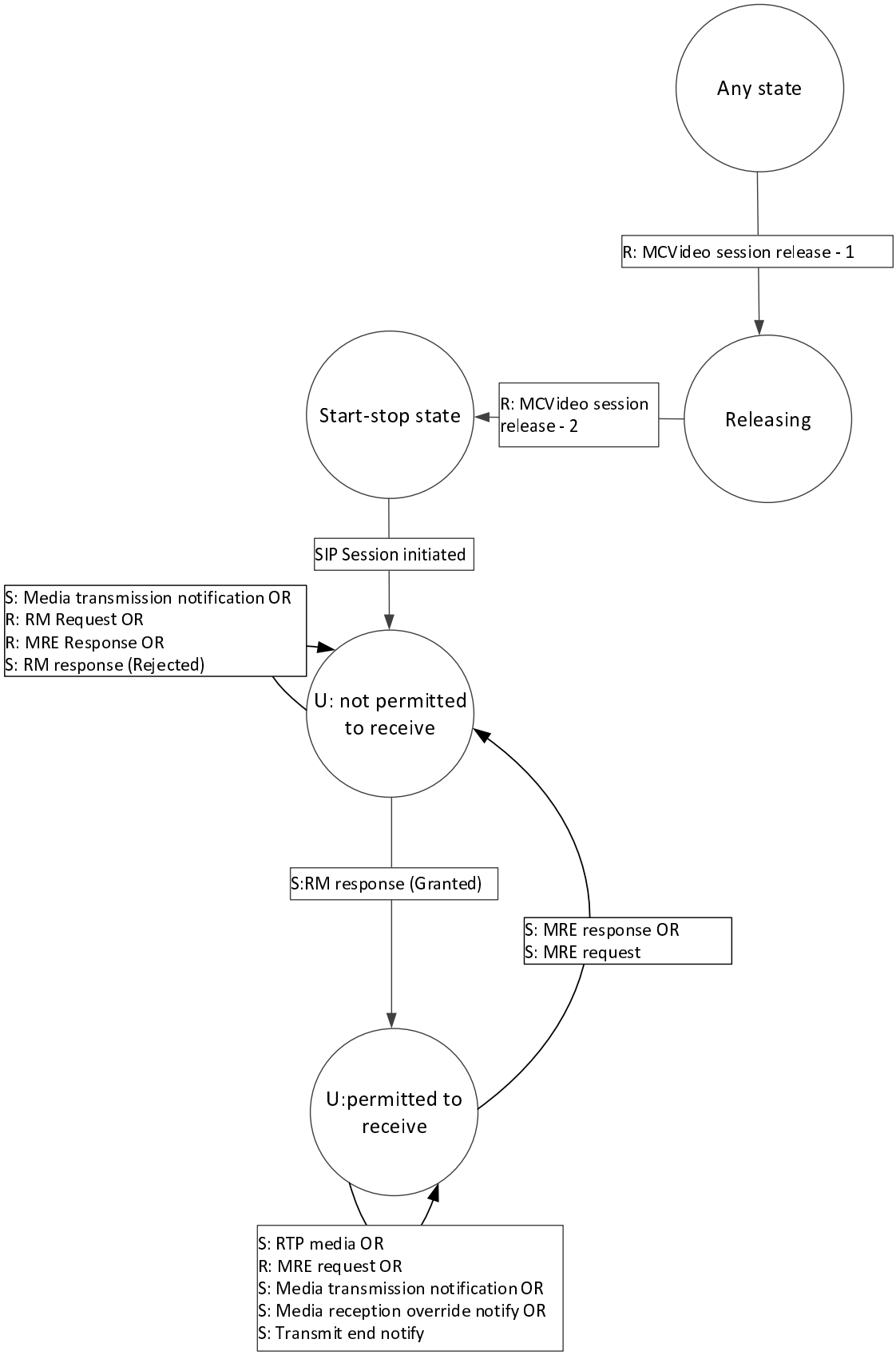


Figure 6.3.7.1-1: Transmission control server state transition diagram for basic reception control operation towards the transmission participant

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;

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 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. may set the first bit in the subtype of the Media Transmission Notification message to '1' (Acknowledgment is required) as described in subclause 8.3.2, and

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

3. initiates a instance of ‘basic reception control operations towards the floor participant’ state machine.

4. 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 transmit media request in the <Reject Phrase> value;

   d. may set the first bit in the subtype of the Transmit Media Response (Rejected) message to '1' (Acknowledgment is required) as described in subclause 8.3.2; and

NOTE 3: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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 Reception Indicator field with appropriate indications; and

3. shall remain in the 'U: not permitted to receive' state.

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 8.3.2; and

NOTE: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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 floor participant’ state machine;
2. shall send the Media Transmission Notification message to the transmission participant; and
3. 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 Transmit End Notify message (S: Transmit 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 Transmit 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; and
3. 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 8.3.2; and

NOTE 3: It is an implementation option to handle the receipt of the Transmit Ack message and what action to take if the Transmit 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 conversation 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 conversation in the session the transmission control message is associated with:

   a. if

      i. the transmission control message is not a Transmit 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 Transmit 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 conversation 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 conversation 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 conversation 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

Editor's Note: Method is for further study

7.2.2 Transmission participant procedures at MCVideo call release

This subclause applies when an active transmission control session exists.

When the off-network group 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 (press video transmission button) or as end of video transmission (release video transmission button).

Figure 7.2.3.1-1 show the 'Transmission participant state diagram – basic operation'.

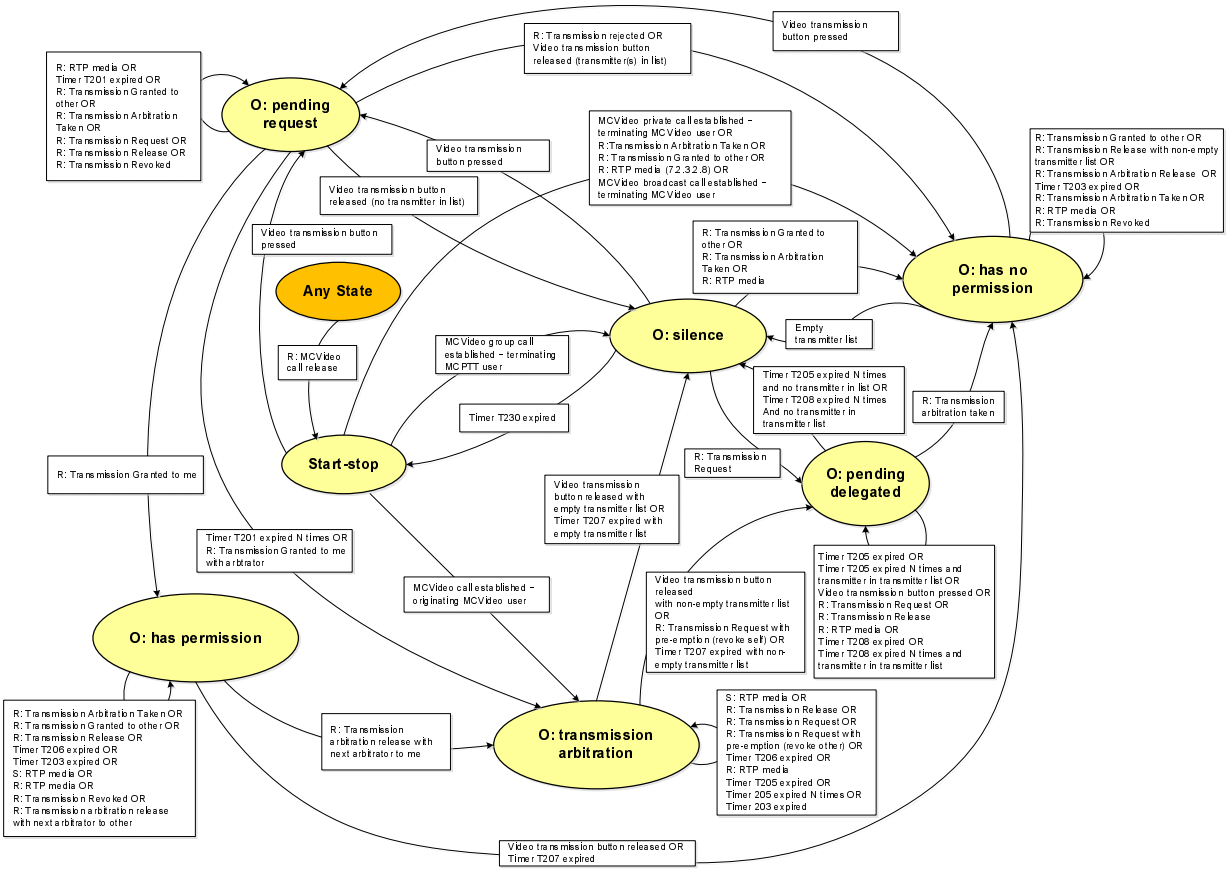


Figure 7.2.3.1-1: 'Transmission participant state diagram – basic operation'

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 (video transmission button pressed)

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 (video transmission button pressed)

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 (video transmission button pressed)

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 (Another MCVideo client has permission);

Editor's Note: Reject causes should be updated.

   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 (video transmission button released 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 (video transmission button released with non-empty talker 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:

Editor's Note: How to determine if a transmission request if pre-emptive is FFS.

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; and

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

Editor's Note: Reject causes should be updated.

   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;

   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:

Editor's Note: How to determine if a transmission request if pre-emptive and which transmitter to revoke is FFS.

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; and

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

Editor's Note: Reject causes should be updated.

   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;

   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 (video transmission button released)

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 (video transmission button released with no talker)

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 (video transmission button released with talker)

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 Video transmission button pressed

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 (Another MCVideo client has permission);

Editor's Note: Reject causes should be updated.

   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.

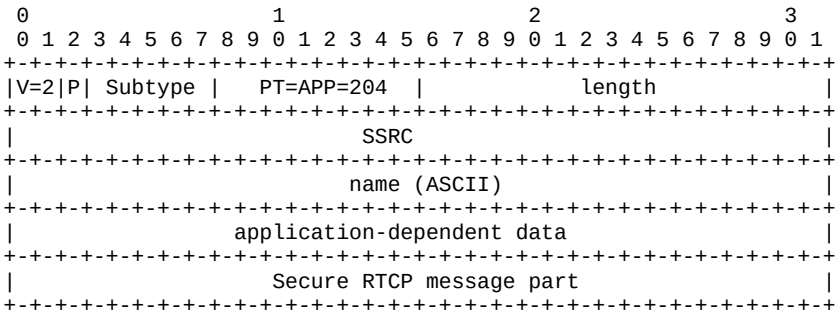
Outside tables, binary values are expressed with a decimal value with single quotation marks e.g. 00000000 is '0', 00000001 is '1', 00000010 is '2' and so on.

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": Table 9.2.2.1-1;
- Name field = "MCV1": Table 9.2.2.1-2; and
- Name field = "MCV2": Table 9.2.2.1-3.

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. Tansmission control messages sent by the transmission control server and transmission control participant): Table 9.2.2.1-2; and
- Name field = "MCV2" (i.e. Tansmission 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.

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.

Application-dependent data

The application-dependent data contains zero or more application specific data fields isspecified 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

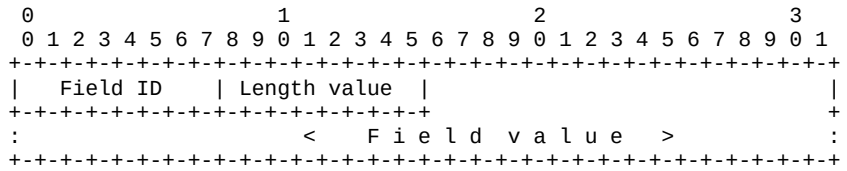
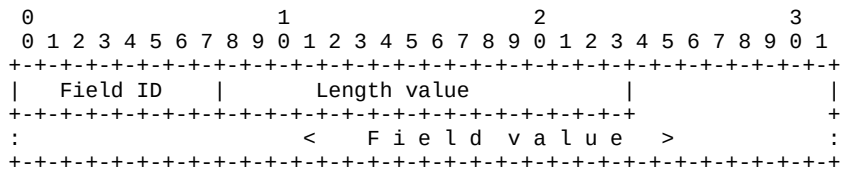


Table 9.1.3.-2: Application specific data field structure when the field ID is equal to or greater than 192



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: MCVD (Mission Critical Video).

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	00011	Subclause 9.2.11	Client → server
Receive media request	x0100	Subclause 9.2.14	Client → server
Transmit media cancel request	x0101	Subclause 9.2.17	Client → server
Transmit media end request	x0110	Subclause 9.2.20	Client → server
Remote transmit media request	x0111	Subclause 9.2.22	Client → server
Remote transmit media 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	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
Transmit media cancel response	x1001	Subclause 9.2.18	Server → client
Transmit media cancel request notify	x1010	Subclause 9.2.19	Server → client
Remote transmit media response	x1011	Subclause 9.2.23	Server → client
Remote transmit media cancel response	x1100	Subclause 9.2.25	Server → client
Media reception override notification	x1101	Subclause 9.2.28	Server → client
Transmit media end notify	x1110	Subclause 9.2.29	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
Transmit media end request	x0000	Subclause 9.2.20	Client → server and Server → client
Transmit media 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
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 clauses 6.

If an acknowledgment is required the Transmission 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
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
Message Sequence-Number	008	00001000	Subclause 9.2.3.9
Message Type	012	00001100	Subclause 9.2.3.10
Transmission Indicator	013	00001101	Subclause 9.2.3.11

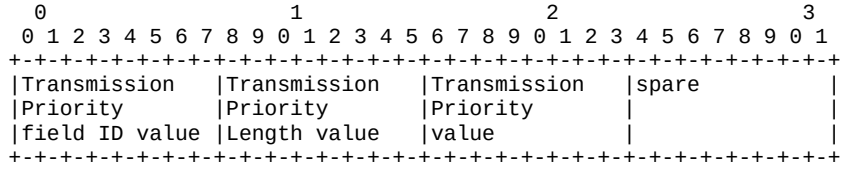
The following subclauses describe the coding of each field.

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.

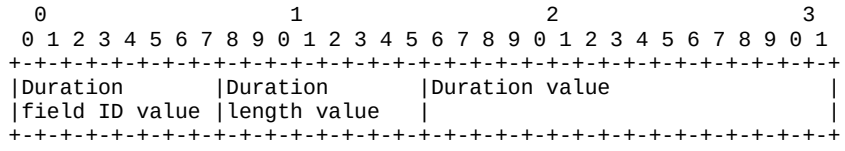
The spare bits are set to zero.

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.

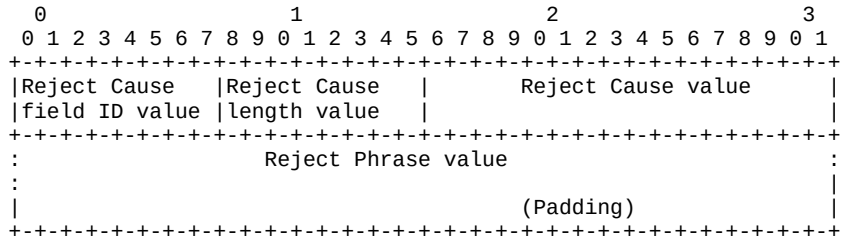
The <Duration> value is a binary value in seconds.

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 a multiple of 4 bytes, the Reject Cause field 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.

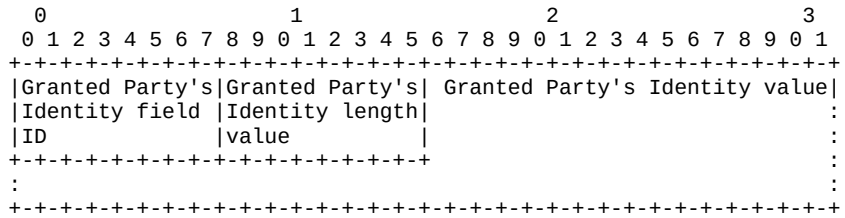
9.2.3.5 void

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.

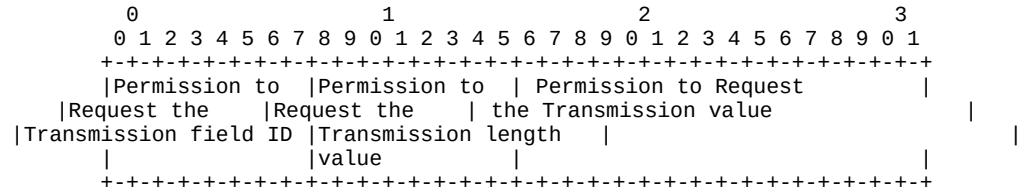
If the length of the <Granted Party's> value is not a multiple of 4 bytes, the Granted Party's Identity field shall be padded to a multiple of 4 bytes. The value of the padding bytes is set to zero. The padding bytes are ignored by the receiver.

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.

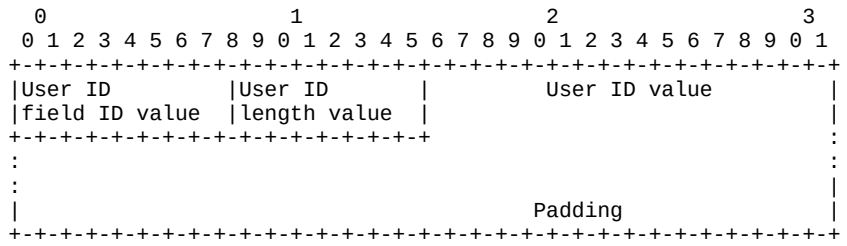
1 The receiver is permitted to request transmission.

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
```

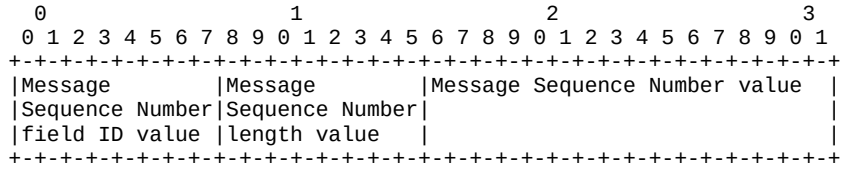
If the length of the <User ID> value is not a multiple of 4 bytes User ID field shall be padded to a multiple of 4 bytes. The value of the padding bytes is to zero. The padding bytes are ignored by the receiver.

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.

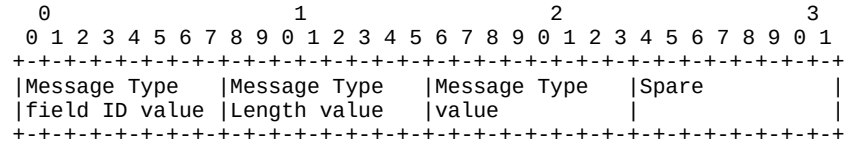
The <Message Sequence Number> value is a binary value. The <Message Sequence Number> value can be between '0' and '65535'. When the '65535' value is reached, the <Message Sequence Number> value starts from '0' again.

9.2.3.10 Message Type field

The Message Type field contains the transmission control message name 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 of the message type as coded in table 9.2.2.1-1 (including the first bit (used by some transmission control messages to indicate that a Transmission Ack message is requested) of the five bit subtype).

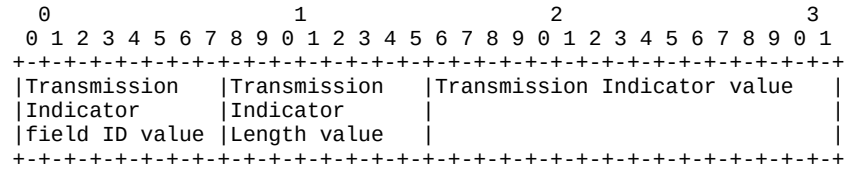
The spare bits are set to zero.

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

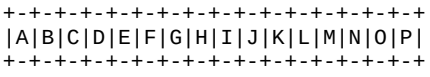


The <Transmission Indicator field ID> value is a binary value and is set according to table 9.2.3.1-1.

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.

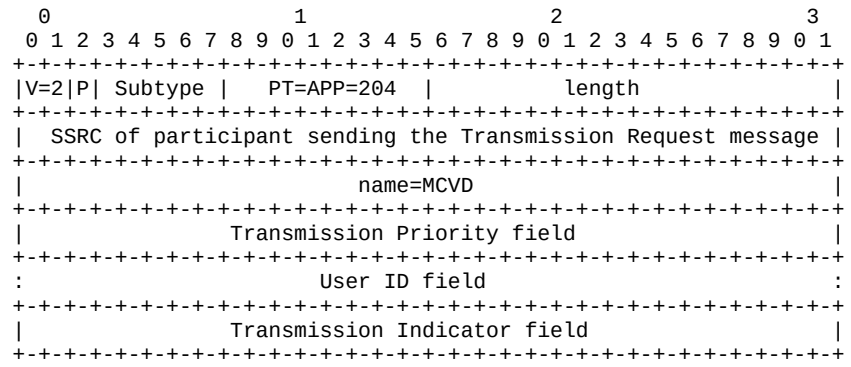
There can be more than one bit set to 1 at the same time. The local policy in the transmission control server decides which combinations are possible and the priority of the indications.

9.2.4 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.

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:

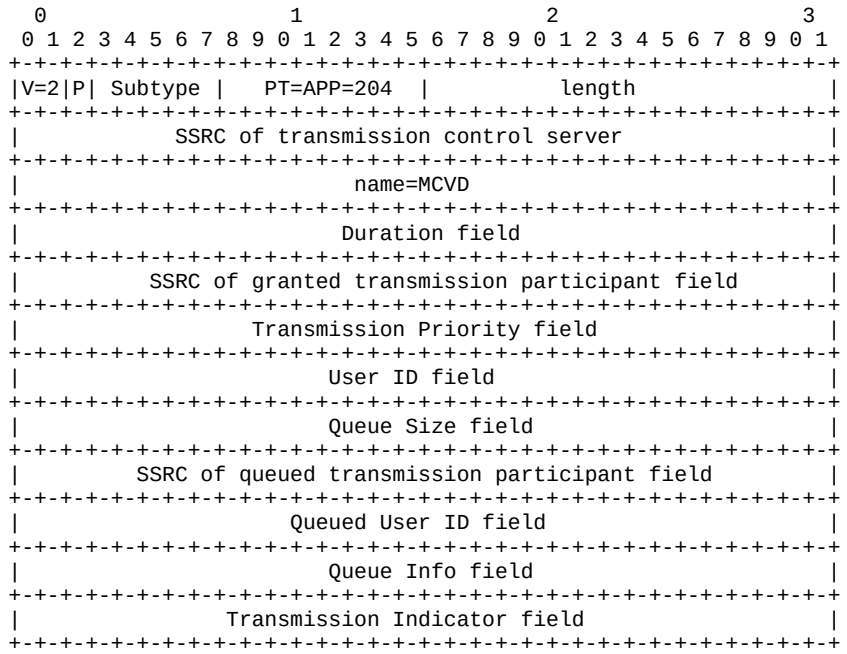
The Transmission Indicator field is coded as described in subclause 9.2.3.11.

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 9.2.2-2.

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.

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].

Transmission Indicator:

The Transmission Indicator field is coded as described in subclause 9.2.3.11.

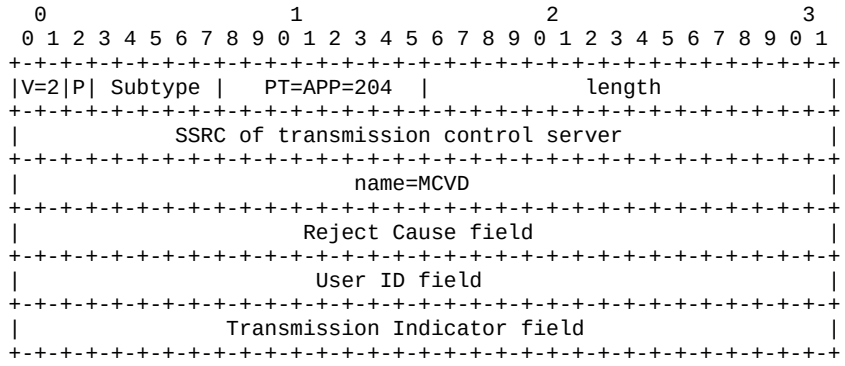
9.2.6 Transmission Rejected message

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 9.2.2-2.

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 #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.

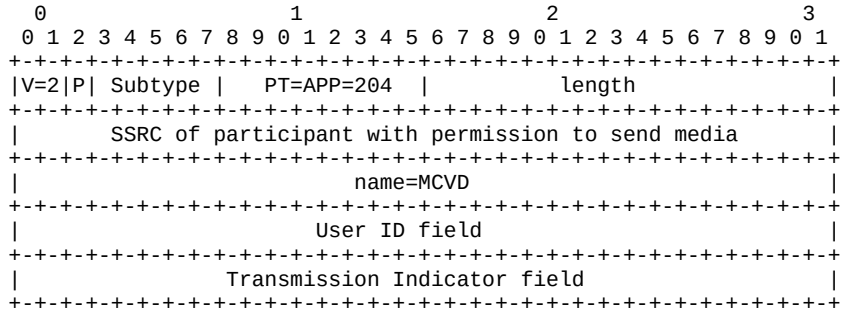
9.2.7 Transmission Released message

The Transmission Released 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 Released message can also be sent if the transmission participant has a request in the transmission request queue. In this case, the Transmission Released message is sent to cancel the transmission request in the queue.

Table 9.2.7-1 shows the content of the Transmission Released message.

Table 9.2.7-1: Transmission 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.

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 Released message.

The User ID field is coded as specified in subclause 9.2.3.8.

Transmission Indicator:

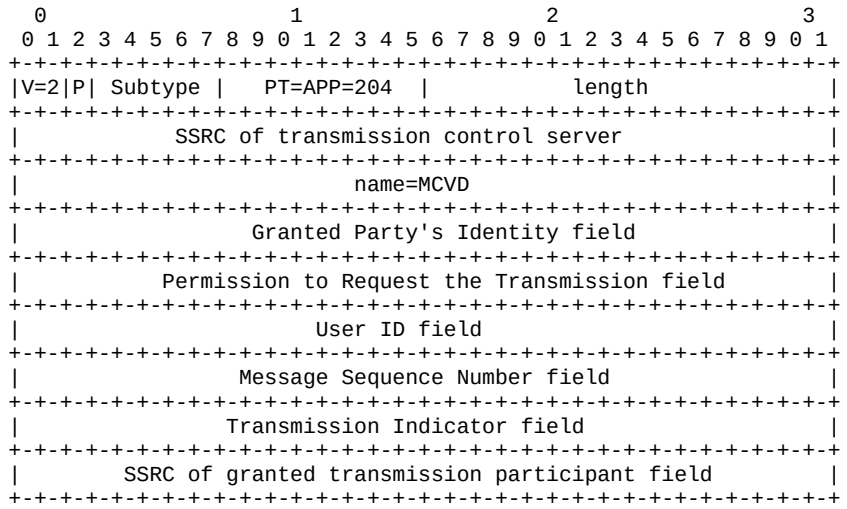
The Transmission Indicator field is coded as described in subclause 9.2.3.11.

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.

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 9.2.2-2.

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].

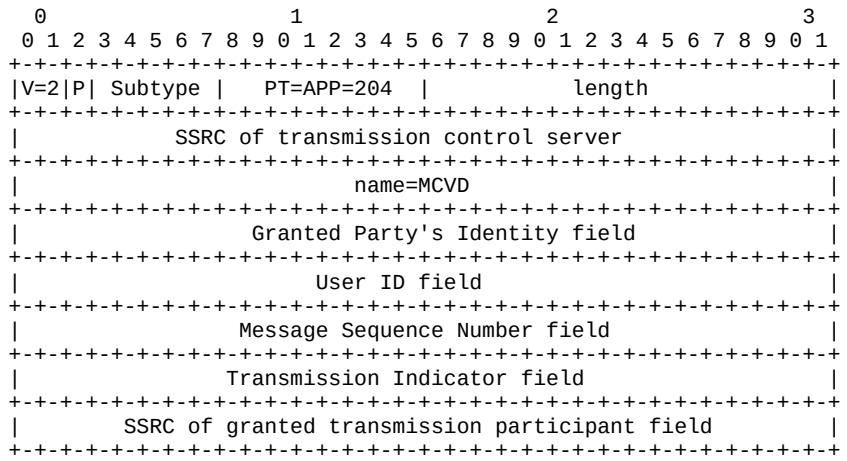
9.2.9 Transmission Arbitration Released message

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.

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 9.2.2-2.

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

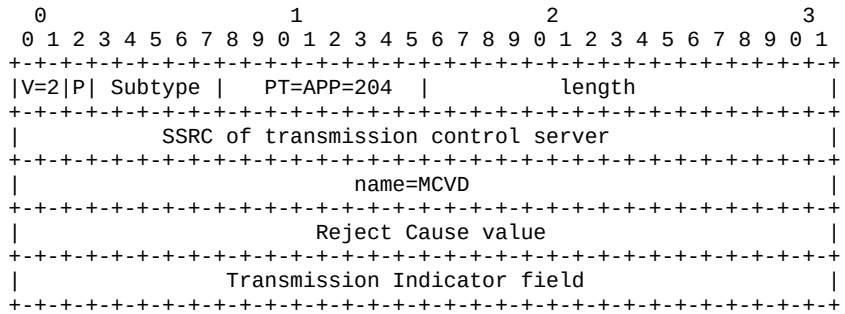
9.2.10.1 General

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 9.2.2-2.

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#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#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.

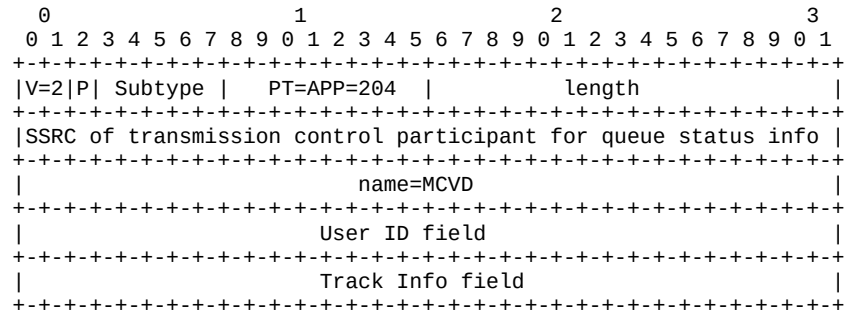
9.2.11 Queue Position Request message

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.

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 floor 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 MCPTT user ID of the floor 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.

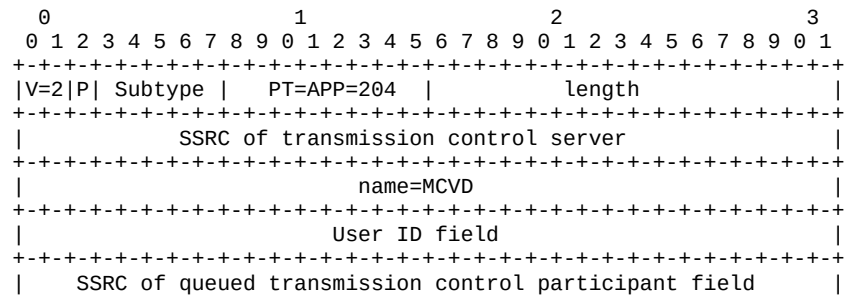
9.2.12 Queue Position Info message

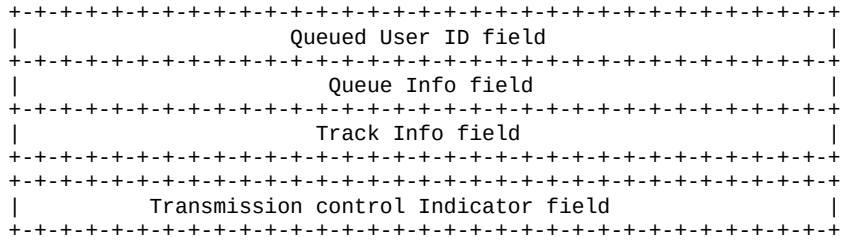
The Queue Position Info message is sent by the transmission control server to notify the transmission control participant of its position in the transmission control request queue.

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 9.2.2-2.

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 floor participant:

The SSRC of queued floor participant is only applicable in off-network and shall carry the SSRC of the queued floor 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.

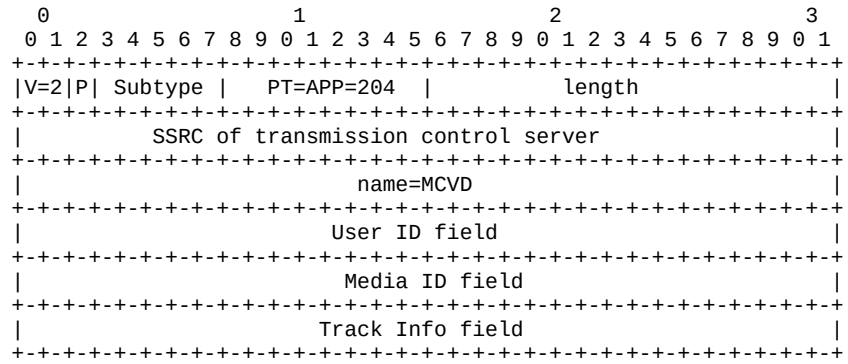
9.2.13 Media transmission notification

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 only used over the unicast 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 9.2.2-2.

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.

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:

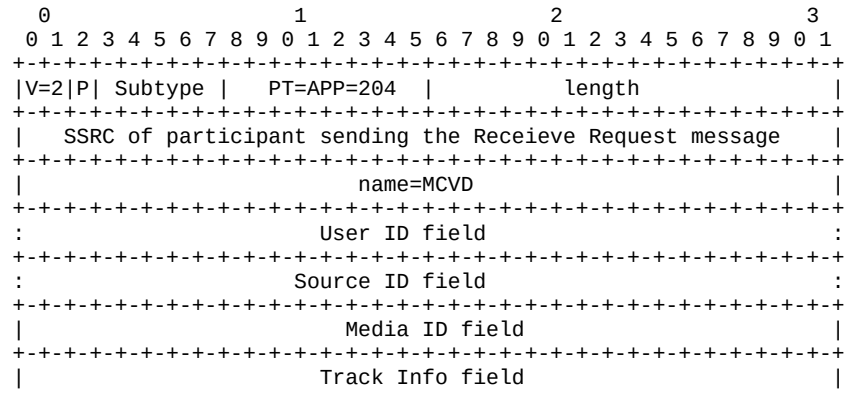
The Track Info field is included when an MCVideo call involves a non-controlling MCVideo function. The coding of the Track Info field is described in subclause 9.2.3.13.

9.2.14 Receive media request

The Receive 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 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.

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.

Source ID:

The Source ID field is used to carry the identity of the user who transmitting 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.

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.

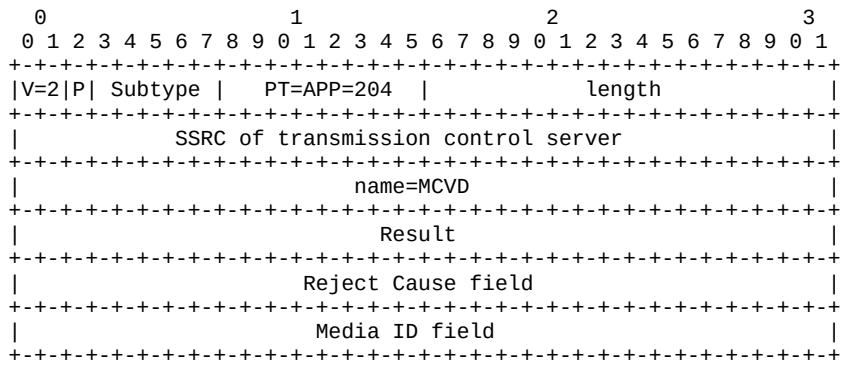
9.2.15 Receive media response

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 9.2.2-2.

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.

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.

9.2.6.2 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

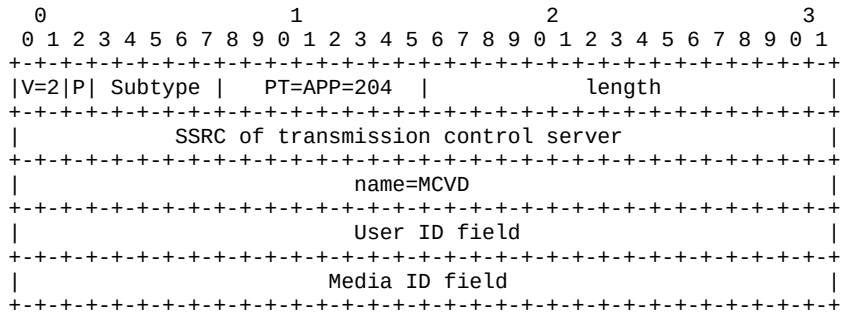
The <Reject cause> value set to '255' indicates that the transmission control server does not grant the receive media request due to the transmission control server local policy.

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 9.2.2-2.

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.

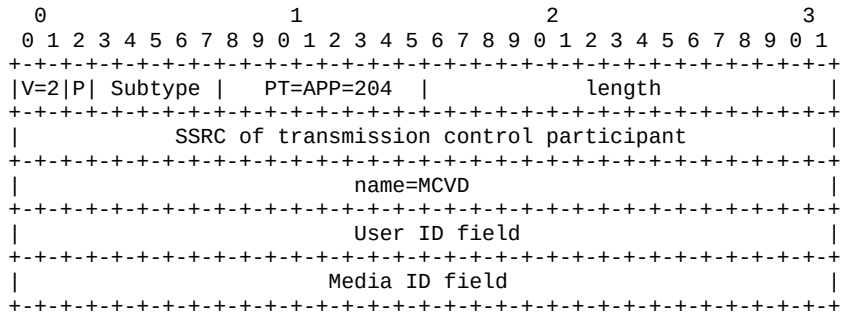
The Media ID value is coded as specified in subclause 9.2.3.x

9.2.17 Transmit media cancel request

The Transmit media 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 Transmit media cancel request message.

Table 9.2.17-1: Transmit media 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.

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.

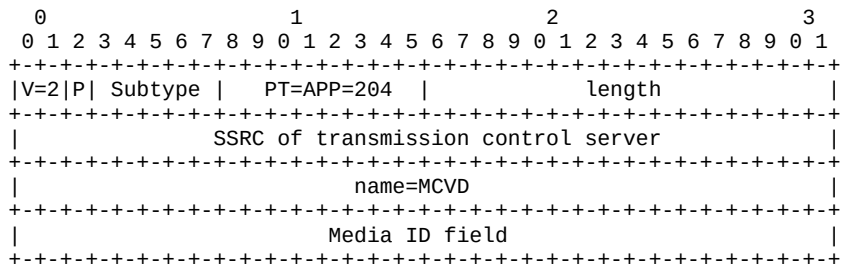
The Media ID value is coded as specified in subclause 9.2.3.x

9.2.18 Transmit media cancel response

The Transmit media 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 Transmit media cancel response message.

Table 9.2.18.1-1: Transmit media 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 9.2.2-2.

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.

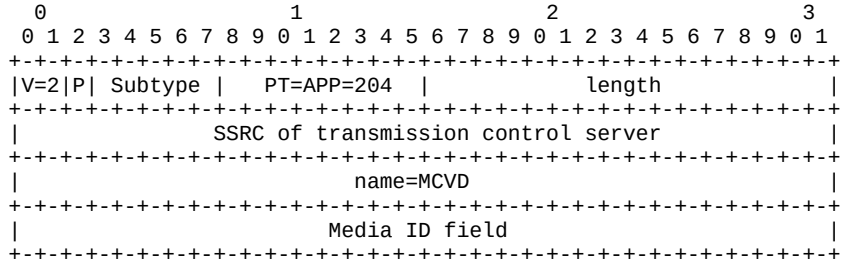
The Media ID value is coded as specified in subclause 9.2.3.x

9.2.19 Transmit media cancel request notify

The Transmit media 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 Transmit media cancel request notify message.

Table 9.2.19-1: Transmit media 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 9.2.2-2.

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.

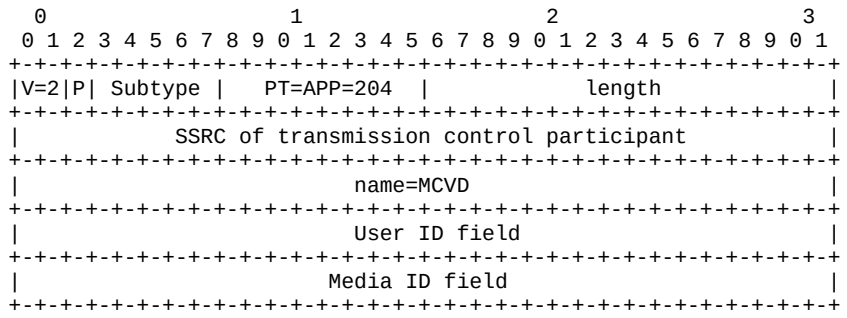
The Media ID value is coded as specified in subclause 9.2.3.x

9.2.20 Transmit media end request

The Transmit media 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 9.2.21.1-1 shows the content of the Transmit media end request message.

Table 9.2.21-1: Transmit media 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 9.2.2-3.

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 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.

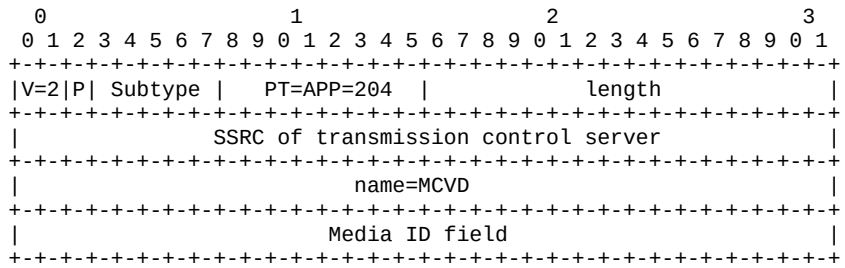
The Media ID value is coded as specified in subclause 9.2.3.x

9.2.21 Transmit media end response

The Transmit media 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 Transmit media end response message.

Table 9.2.21-1: Transmit media 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 9.2.2-3.

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].

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.

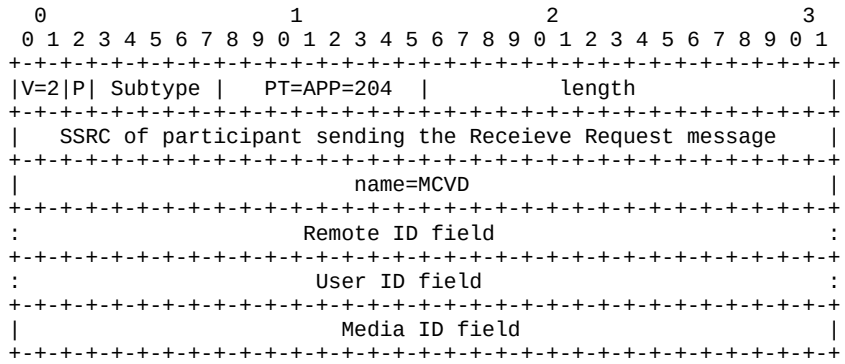
The Media ID value is coded as specified in subclause 9.2.3.x

9.2.22 Remote transmit media request

The Remote transmit media 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 transmit media request message.

Table 9.2.22-1: Receive 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.

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.

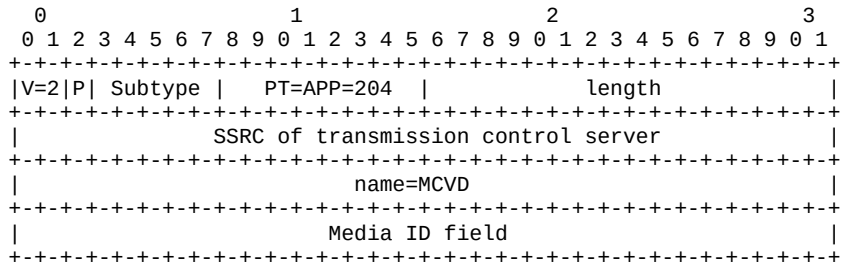
The Media ID value is coded as specified in subclause 9.2.3.x.

9.2.23 Remote transmit media response

The Remote transmit media 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 transmit media response message.

Table 9.2.23-1: Remote transmit 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 9.2.2-2.

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.

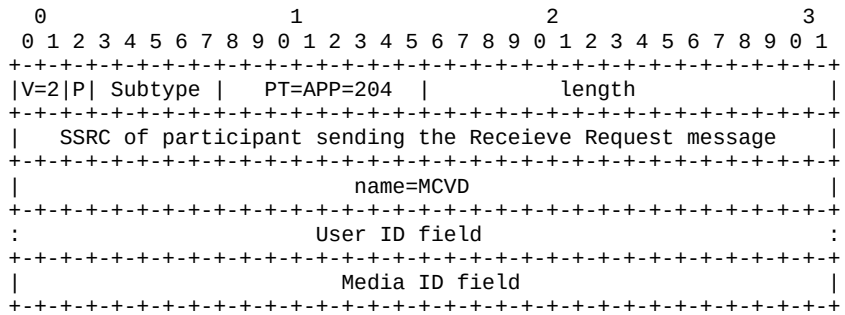
The Media ID value is coded as specified in subclause 9.2.3.x

9.2.24 Remote transmit media cancel request

The Remote transmit media 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 transmit media cancel request message.

Table 9.2.24-1: Remote transmit media 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.

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.

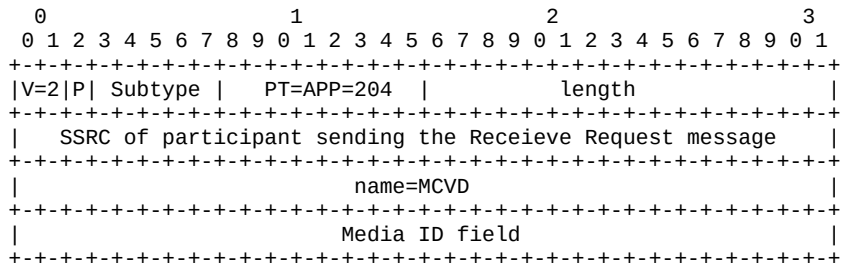
The Media ID value is coded as specified in subclause 9.2.3.x.

9.2.25 Remote transmit media cancel response

The Remote transmit media 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 transmit media cancel response message.

Table 9.2.25-1: Remote transmit media 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 9.2.2-2.

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.

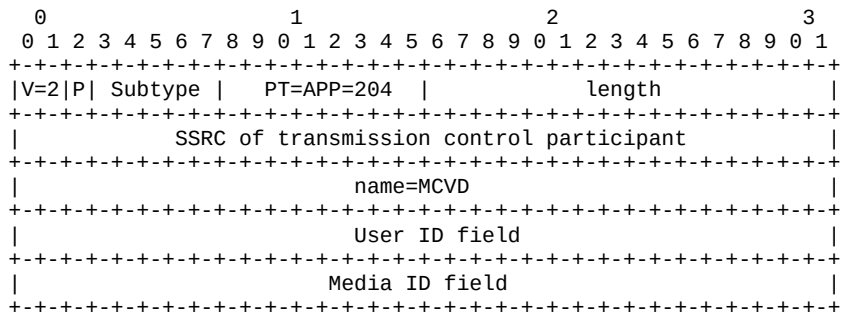
The Media ID value is coded as specified in subclause 9.2.3.x.

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 9.2.2-3.

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 receipt is requested for cancellation 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.

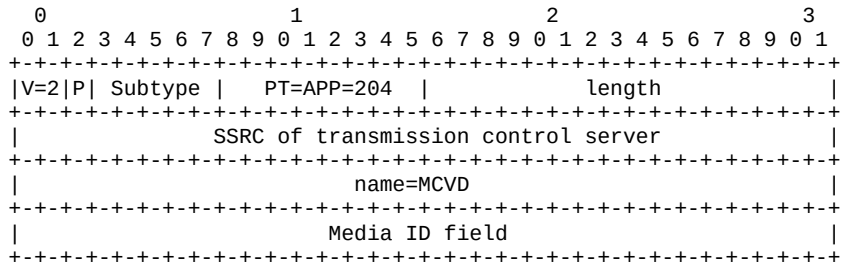
The Media ID value is coded as specified in subclause 9.2.3.x

9.2.27 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 9.2.2-3.

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].

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.

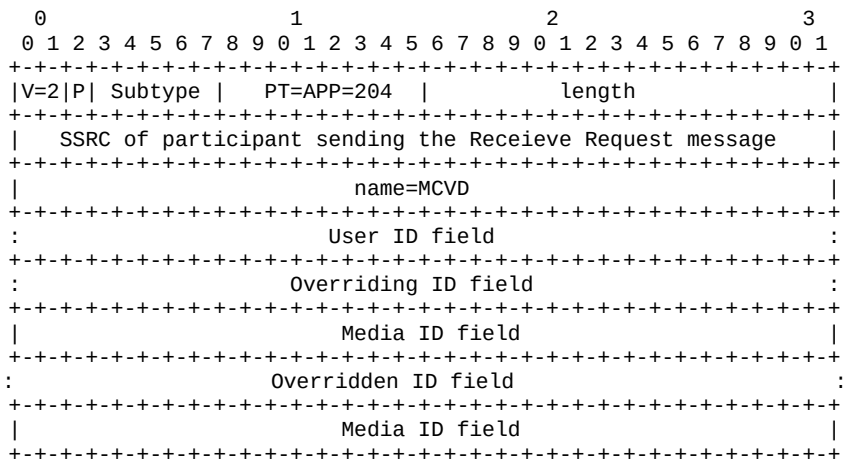
The Media ID value is coded as specified in subclause 9.2.3.x

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 9.2.2-2.

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.

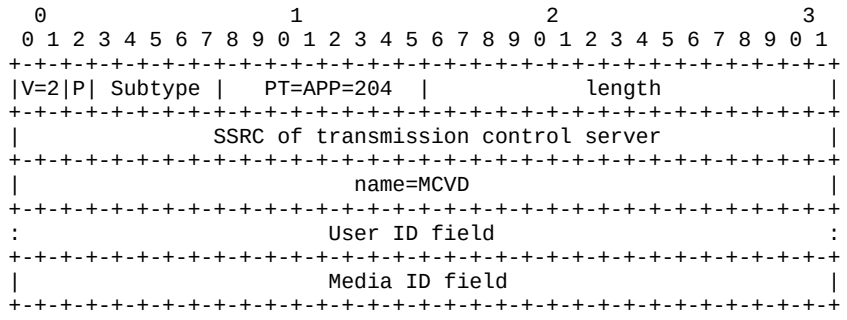
The Media ID value is coded as specified in subclause 9.2.3.x.

9.2.29 Transmit media end notify

The Transmit media 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 Transmit media end notify message.

Table 9.2.29-1: Transmit media 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 9.2.2-2.

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

10 Media plain handling for MBMS

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

History

Document history		
V14.0.0	July 2017	Publication