



PoC User Plane

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1. Scope

This document describes the User Plane signaling procedures for the Push to Talk over Cellular (PoC) service over the POC-3 and the POC-4 reference points as defined in [OMA-POC-AD].

When necessary, interworking between the Control Plane [OMA-POC-CP] and the User Plane is described in this document.

This specification does not specify the underlying SIP / IP Core, its features and functions. However, some parts of the specification may place requirements on the implementation of SIP / IP Core.

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3. Terminology and conventions

3.1 Conventions

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as specified in [RFC2119].

All subclause, clauses and appendixes, except “Scope” and “Introduction”, are normative, unless they are explicitly indicated to be informative.

3.2 Definitions

1-1 PoC Session	A feature enabling a PoC User to establish a PoC Session with another PoC User.
1-many-1 Session	A PoC Group Session for a Pre-arranged PoC Group in which one Participant is a Distinguished Participant and all other Participants are Ordinary Participants.
Active PoC Session	An Active PoC Session is a PoC Session that carries both RTP and Talk Burst Control Protocol based packets to the user. If the user has multiple PoC Sessions, at most only one may be active at any given time.
Ad-hoc PoC Group	An Ad-hoc PoC Group Session is a PoC Session for multiple PoC Users that does not involve the use or definition of a Pre-arranged or Chat Group.
Answer Mode	The Answer Mode Indication is the current Answer Mode PoC service setting of the PoC Client.
Automatic Answer Mode	Automatic Answer Mode is a PoC Client mode of operation in which the PoC Client accepts a PoC Session establishment request without manual intervention from the user; Media is immediately played when received.
Chat PoC Group	A Chat PoC Group is a persistent Group in which each member individually joins the PoC Session, i.e., the establishment of a PoC Session to a Chat PoC group does not result in other members of the Chat PoC Group being invited.
Chat PoC Group Session	A Chat PoC Group Session is a PoC Session established to a Chat PoC Group.
Control Plane	The Control Plane is the specification of the signalling between the PoC Client and PoC Server, and between PoC Servers for the Push to talk over Cellular (PoC) service.
Controlling PoC Function	The Controlling PoC Function is implemented in a PoC Server and provides centralized PoC Session handling, which includes RTP Media distribution, Talk Burst Control, policy enforcement for participation in Group Sessions, and the Participant information.
Conversation	A Conversation is a series of Talk Bursts within a PoC Session in which the inter-arrival spacing of the Talk Bursts is less than a defined time interval; typically, the Talk Bursts are associated to a logical exchange between two or more users.
Distinguished Participant	The Distinguished Participant is a Participant in a 1-many-1 Session that sends RTP Media to all Ordinary Participants, and that receives RTP Media from any Ordinary Participant.
Dormant PoC Session	A Dormant PoC Session is a PoC Session in which the user receives TBCP and no RTP Media. If the user has multiple PoC Sessions, all except at most one PoC Session are dormant.
Group	A Group is a predefined set of PoC Users that is identified by a SIP URI. A PoC Client uses the Group to establish PoC Sessions and to define PoC Session access policy.
Home PoC Network	The Home PoC Network is a network comprising a SIP/IP Core and PoC Server, both operated by the user's PoC service provider. The Home PoC Network is the same as the Home Network defined in 3GPP/3GPP2 IMS specifications.
Home PoC Server	The Home PoC Server is the PoC Server owned by service provider that provides PoC service to the user.
Invited PoC Client	An Invited PoC Client is a PoC Client that is invited to a PoC Session.
Inviting PoC Client	An Inviting PoC Client is a PoC Client that invites other PoC User(s) to a PoC Session.
Nick Name	A user-friendly display name that might be associated to a PoC User or a PoC Group. The Nick Name

can either be provided as a "display-name" in a SIP header or in the <display-name> child element of the <entry> element for the PoC User or for the PoC Group as specified in [OMA-POC-XDMS].

Media Parameters	Media Parameters are SIP/SDP based information exchanged between the PoC Server and the PoC Client that specify the characteristics of the media for a PoC Session being established or that already exists.
On-demand Session	An On-Demand Session is a PoC Session set-up mechanism in which all Media Parameters are negotiated at PoC Session establishment.
Ordinary Participant	An Ordinary Participant is a Participant in a 1-many-1 Session that is only able to send media to the Distinguished Participant, and that likewise is only able to receive media from the Distinguished Participant.
Participant	A Participant is a PoC User in a PoC Session.
Participating PoC Function	The Participating PoC Function is implemented in a PoC Server, and provides PoC Session handling, which includes policy enforcement for incoming PoC Sessions and relays Talk Burst Control messages between the PoC Client and the PoC Server performing the Controlling PoC Function. The Participating PoC Function may also relay RTP Media between the PoC Client and the PoC Server performing the Controlling PoC Function.
PoC Address	A PoC Address identifies a PoC User. The PoC Address can be used by one PoC User to request communication with other PoC Users.
PoC Client	A PoC Client is a PoC functional entity that resides on the PoC User Equipment that supports the PoC service.
PoC Group	A PoC Group is a predefined set of PoC Users together with its attributes. A PoC Group is identified by a SIP URI.
PoC Group Identity	The PoC Group Identity is a SIP URI of the Pre-arranged PoC Group or Chat PoC Group.
PoC Group Name	Indicates the name of the PoC group that can be presented to the PoC User.
PoC Group Session	A PoC Group Session is a Pre-arranged PoC Group, Ad-hoc PoC Group or Chat PoC Group Session.
PoC Server	The PoC Server implements the 3GPP/3GPP2 IMS application level network functionality for the PoC service. A PoC Server may perform the role of the Controlling PoC Function or Participating PoC Function, or both at the same time.
PoC Session	A PoC Session is a SIP Session established by the procedures in [OMA-POC-CP]. The following types of PoC Sessions are supported: 1-1 PoC, Ad-hoc PoC Group, Pre-arranged PoC Group, or Chat PoC Group Session.
PoC Session Identity	SIP URI received by the PoC Client during the PoC Session establishment in the Contact header and/or in the TBCP Connect message in case of using Pre-established Session.
PoC User	A PoC User is a user of the PoC service.
	NOTE: In [OMA-POC-RD] the term "PoC Subscriber" is sometimes used to mean the same as term "PoC User" in this specification, [OMA-POC-AD] and [OMA-POC-CP].
Pre-arranged PoC Group	A Pre-arranged PoC Group is a persistent PoC Session Identity that has an associated set of PoC members. The establishment of a PoC Session to a prearranged PoC Group results in all members being invited.
Pre-established Session	The Pre-established Session is a SIP Session established between the PoC Client and the PoC Server that performs the Participating PoC Function. The PoC Client establishes the Pre-established Session prior to making requests for PoC Sessions to other PoC Users. To establish a PoC Session based on a SIP request from the user, the PoC Server conferences other PoC Servers/Users to the Pre-established Session so as to create an end-to-end connection.
Primary PoC Session	The Primary PoC Session is a PoC Session that the PoC User selects in preference to other PoC Sessions. When the user has Simultaneous PoC Sessions, the Primary PoC Session has a priority over Secondary PoC Sessions.
RTP Media	RTP Media is the media carried in an RTP payload.
RTP Session	A RTP Session is considered as an association that allows exchange of RTP Media streams and RTCP messages among a set of PoC functional entities.

Secondary PoC Session	A Secondary PoC Session is a PoC Session for which the PoC User receives media when there is no media present on the Primary PoC Session.
Served PoC User	A PoC User that obtains a PoC service from a PoC Server located in the Home PoC Network.
Simultaneous PoC Session	When a PoC User is a Participant in more than one PoC Session simultaneously using the same PoC Client.
SIP Session	A SIP Session is a SIP dialog. From [RFC3261], a SIP dialog is defined as follows: A dialog is a peer-to-peer SIP relationship between two UAs that persists for some time. A dialog is established by SIP messages, such as a 2xx response to an INVITE request. A dialog is identified by a call identifier, local tag, and a remote tag. A dialog was formerly known as a call leg in [RFC2543].
SIP URI	From [RFC3261]: “A SIP or SIPS URI identifies a communications resource” and “follows the guidelines in [RFC2396]”. PoC uses SIP URIs to identify PoC Clients, PoC Servers, and PoC Sessions, resource lists that point to URI lists, etc.
SIP User Agent	A SIP User Agent is any SIP peer that performs SIP signaling [RFC3261].
Talk Burst	A Talk Burst is the flow of media from a PoC Client while that has the permission to send media.
Talk Burst Control	Talk Burst Control is a control mechanism that arbitrates requests from the PoC Clients, for the right to send media. NOTE: In [OMA-POC-RD] the term “Floor Control” is used to mean the same as term “Talk Burst Control” in this specification, [OMA-POC-AD] and [OMA-POC-CP].
Talk Burst Control Protocol	Talk Burst Control Protocol (TBCP) is a protocol for performing Talk Burst Control, and is defined in these specifications.
Talker Identification	Talker Identification is the procedure by which the current talker's identity is determined and made known to listeners on the PoC Session.
Unconfirmed Indication	The Unconfirmed Indication is an indication returned by the PoC Server to confirm that it is able to receive media and believes the PoC Client able to accept media; the PoC Server sends the Unconfirmed Indication prior to determining that all egress elements are ready or even able to receive media.
User	A User is any entity that uses the described features through the User Equipment.
User Equipment	User Equipment is a hardware device that supports a PoC Client e.g., a wireless phone.
User Plane	The User Plane includes the media and media control signaling (e.g., Talk Burst Control Protocol) between the PoC Client and PoC Server.

3.3 Abbreviations

APP	Application defined RTCP packet
CMR	Codec Mode Request
CNAME	Canonical name
GPS	Global Positioning System
ID	Identity
IETF	Internet Engineering Task Force
IP	Internet Protocol
NAME	User Name SDES Item
NTP	Network Time Protocol
OMA	Open Mobile Alliance
PoC	Push to Talk over cellular.
PT	Payload Type
RFC	Request For Comments (IETF specification)
RR	Receiver Report

RTCP	R TP Control Protocol
SCR	Static Conformance Requirement
RTP	Real-time Transport Protocol
SDES	Source Description RTCP Packet
SDP	Session Description Protocol
SIP	Session Initiation Protocol
SR	Sender Report
SSRC	Synchronization source
TB_Ack	TBCP Talk Burst Acknowledgement message
TB_Deny	TBCP Talk Burst Deny message
TB_Granted	TBCP Talk Burst Granted message
TB_Idle	TBCP Talk Burst Idle message
TB_Queued	TBCP Talk Burst Request Queue Status Response message
TB_Release	TBCP Talk Burst Release message
TB_Request	TBCP Talk Burst Request message
TB_Revoke	TBCP Talk Burst Revoke message
TB_Taken	TBCP Talk Burst Taken message
TBCP	Talk Burst Control Protocol
UDP	User Datagram Protocol

4. Introduction

4.1 Overview

This document describes the User Plane aspect of the PoC service. The Control Plane is specified in [OMA-POC-CP].

The PoC Service uses a half duplex type of communication and only one PoC Client in a PoC Session can send media at the time.

The PoC Client does not send a continuous stream of RTP Media packets instead the media is sent in bursts, in this document referred to as a Talk Burst. A Talk Burst consists of one or more RTP Media packets and the Talk Burst starts when the PoC Client sends the first RTP Media packet and it ends when the PoC Client sends the last RTP Media packet.

A PoC Server (referred to as the Controlling PoC Function in the [OMA-POC-AD]) located between the PoC Clients communicating with each other acts as an arbitrator and controls the sending of Talk Burst using a Talk Burst Control Protocol (TBCP). In many of the PoC Service scenarios also a PoC Server (referred to as the Participating PoC function in [OMA-POC-AD]) may be inserted in the media path.

Before a PoC Client can send a Talk Burst the PoC Client has to ask for permission from the PoC Server performing the Controlling PoC Function. Other PoC Clients in a PoC Session receive an indication about the identity of the PoC Client sending the Talk Burst.

PoC Clients are located on mobile devices hence the quality of the transmission may vary depending on access network and distance to the base station. This implies that the quality of sent Talk Burst needs to be controlled using RTCP and, when needed, Media Parameters are changed for improving the PoC User's experience.

4.2 User Plane routing

Figure 1 “Entities in the User Plane” shows the entities active in the User Plane in a PoC Session and the relevant User Plane interfaces in between.

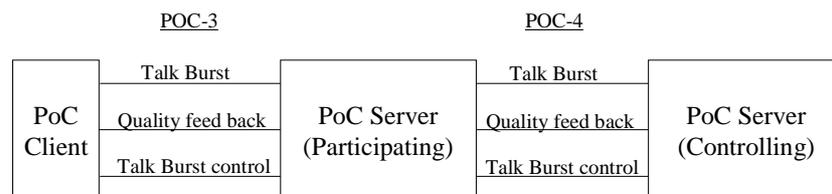


Figure 1: Entities in the User Plane

All RTP Media packets, RTCP packets and TBCP messages (RTCP APP or other negotiated TBCP) flow through the PoC Server performing the Participating PoC function (if inserted in the transport path) and are terminated in the PoC Server performing the Controlling PoC Function.

Talk Burst Control and RTP Media packet replication are Controlling PoC Functions. The transport path between the PoC Client and the PoC Server performing the Controlling PoC Function is established on a per PoC Session basis as specified in [OMA-POC-CP].

When the PoC Session is established, the PoC Server performing the Participating PoC Function normally includes itself into the transport path to relay the RTP Media packets, RTCP packets and TBCP messages between the PoC Client and the PoC Server performing the Controlling PoC Function and act as a translator according to [RFC3550].

Figure 2 “Transport Path Options” shows the 2 options for the transport path.

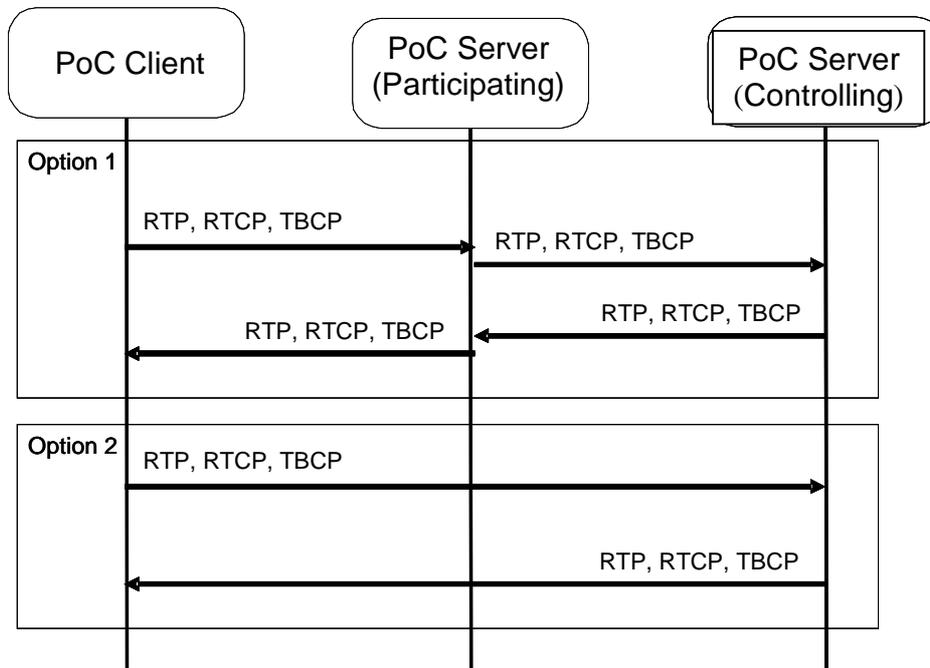


Figure 2: Transport Path Options

Option 1 is the case where a PoC Server performing the Participating PoC Function has inserted itself in the transport path. When the transport path includes the Participating PoC Function, the PoC Server performing the Participating PoC Function forwards RTP Media packets, RTCP packets and TBCP messages between the PoC Client and the PoC Server performing the Controlling PoC Function.

Examples of when the PoC Server performing the participating PoC Function is in the transport path (Option 1) are:

- The PoC Session is over a Pre-established Session;
- The PoC Client and that PoC Server support Simultaneous PoC Sessions;
- The PoC Server needs transport information to support charging;
- The operator has configured the Participating PoC Function to be in the transport path;
- The PoC Server is used for transcoding or other media translation;
- The PoC Server is used to support lawful intercept; and,
- The PoC Server is used for Talk Burst Control Protocol interworking.

In option 2, a PoC Server performing the Participating PoC Function has not inserted itself in the transport path. In this case the PoC Client and the PoC Server performing the Controlling PoC Function send RTP Media packet, RTCP packets and TBCP messages directly between them.

5. Transport

5.1 Internet Protocol

The IP domain for the PoC User Plane for a PoC Client or a PoC Server SHALL be the same IP domain as the SIP/IP Core. (e.g., if the SIP/IP Core uses IPv4, the PoC Clients and PoC Servers in that network use IPv4 for the User Plane.)

NOTE: In case different domains have different IP versions, an IP protocol translator (e.g. NAT-PT) and an application level gateway (e.g. SIP-ALG) is needed, if PoC Servers do not support dual stack operation.

5.2 UDP

The User Datagram Protocol (UDP), as defined in **Error! Reference source not found.**, SHALL be used as transport protocol over the POC-3 and the POC-4 reference point.

5.2.1 Port Numbers

The UDP port numbers are used to identify the endpoints of the media packets, TBCP messages and RTCP packets and SHALL be exchanged during the SIP Session establishment phase.

If the PoC Server Performing the Participating PoC Function will be present in the media path, then it SHALL provide its port numbers for the User Plane to the PoC Client and the PoC Server performing the Controlling PoC Function during the SIP Session establishment phase.

If the PoC Server performing the Participating PoC Function will not be present in the media path then, it SHALL forward to the PoC Server performing the Controlling PoC Function the port numbers that it received from the PoC Client and return to the PoC Client the port numbers that it receives from the PoC Server performing the Controlling PoC Function during the SIP Session establishment phase.

The PoC Server SHALL use the same UDP port number for sending and receiving media. The PoC Server SHALL use the same UDP port number for sending and receiving TBCP messages.

The PoC Client SHOULD use the same UDP port number for sending and receiving media. The PoC Client SHOULD use the same UDP port number for sending and receiving TBCP messages.

NOTE: The sending port is not carried in SDP. This may allow a threat of masquerading the sending PoC Client to be imposed by other PoC Client that has the same IPv4 address, though the sending port number may be different. This is possible because the PoC Server cannot associate the SSRC with the Contact address of the PoC Client. Thus the PoC Client is recommended to use the same port for sending and receiving media. The same applies to the TBCP message.

In case of Simultaneous PoC Sessions, the PoC Server performing the Participating PoC Function SHALL use unique UDP port number for media per PoC Session towards the PoC Client. The PoC Server performing the Participating PoC Function SHALL use unique UDP port number per PoC Session for TBCP messages towards the PoC Client using Simultaneous PoC Sessions. Unique port numbers identify the PoC Sessions.

5.3 RTP

The Real-time Transport Protocol (RTP), as defined in [RFC3550], provides means for sending real-time data over UDP. In PoC, media related to a voice communication over reference point POC-3 and POC-4 SHALL be transported by RTP/UDP/IP.

The media SHALL be encapsulated in the RTP packets with media specific RTP payload formats.

5.4 RTCP

The PoC Client, the PoC Server performing the Controlling PoC Function and the PoC Server performing the Participating PoC Function support the RTP Control Protocol (RTCP), according to rules and procedures as specified in [RFC3550], with the clarifications in this subclause.

Talk Burst Control Protocol (TBCP) messages SHALL be sent as RTCP APP packets and SHOULD be sent to the same UDP port as the other RTCP packets.

The PoC Client, the PoC Server performing the Controlling PoC function and the PoC Server performing the Participating PoC function:

- SHALL support the creation, modification and/or processing of the content in TBCP packets.

RTCP packets, other than those used for TBCP messages, SHALL be RTCP compound packets according to rules and procedures as specified in [RFC3550]. TBCP messages SHOULD NOT be formatted as RTCP compound packets.

NOTE 1: Since the TBCP messages are not formatted as compound packets in compliance with [RFC3550], the Talk Burst Control Protocol may be implemented separately from other standard RTCP message processing. By separating the TBCP messages, it is easier for the PoC Servers to forward these messages to the proper handling function.

The PoC Client,

- SHALL at the minimum support the reception of RTCP packets, other than those used for TBCP messages.

NOTE 2: If the PoC Client supports the minimum level of RTCP, it discards received RTCP packets.

- MAY support the creation and/or processing of the content in RTCP packets, other than those used for TBCP messages, to provide means for User Plane adaptation, feedback of the quality of the media transmission and give a persistent transport-level identifier for the RTP source.

The PoC Server performing the Controlling PoC Function and the PoC Server performing the Participating PoC Function:

- SHALL support the reception of RTCP packets, other than those used for TBCP messages.
- SHALL support forwarding of RTCP packets, other than those used for TBCP messages.
- MAY support the creation, modification and/or processing of the content in RTCP packets, other than those used for TBCP messages to provide means for User Plane adaptation and feedback of the quality of the RTP Media transmission.

NOTE 3: To reduce network load, it is beneficial if the RTCP compound packets created, modified or processed by the PoC Client and the PoC Server only contains the mandatory RTCP packets required for that RTCP compound packet as specified in [RFC3550].

To reduce potential degradation of the quality of the media transmission, the PoC Client and the PoC Server SHOULD NOT schedule transmission of RTCP packets during a Talk Burst.

The PoC Client SHOULD NOT send a RTCP BYE packet when the PoC Client leaves the PoC Session. The PoC Server performing the Controlling PoC Function and the PoC Server performing the Participating PoC Function SHOULD NOT send RTCP BYE packets when the PoC Session is released.

NOTE 4: The PoC service do not require control signalling in the RTP Session by RTCP to indicate which Participants that are leaving the PoC Session, and the PoC service entities do need to keep track of the number of Participants to calculate the transmission interval of RTCP. Therefore, it is recommended that the PoC Clients and PoC Servers do not send RTCP BYE packets.

6. Talk burst control

This subclause describes the Talk Burst Control Protocol (TBCP).

NOTE: Other protocols for handling Talk Burst Control may be used but they are not specified by this document.

6.1 General

Talk Burst Control SHALL use the ports (in the PoC Client and PoC Servers) negotiated at the SIP Session establishment.

The PoC Client and the PoC Server SHALL support the following basic Talk Burst Control Protocol messages:

- TBCP Talk Burst Request – is used by the PoC Client to request permission from the PoC Server to send a Talk Burst.
- TBCP Talk Burst Granted – is used by the PoC Server to notify the PoC Client that it has been granted permission to send a Talk Burst. The Controlling PoC Function includes information about the stop talking timer and can include the number of Participants in the PoC Session at the time that this message is sent.
- TBCP Talk Burst Deny – is used by the PoC Server to notify a PoC Client that it has been denied permission to send a Talk Burst.
- TBCP Talk Burst Release – is used by the PoC Client to notify the PoC Server that it has completed sending the Talk Burst.
- TBCP Talk Burst Idle – is used by the PoC Server to notify all PoC Clients that no one has the permission to send a Talk Burst at the moment and that it may accept the TBCP Talk Burst Request message.
- TBCP Talk Burst Taken – is used by the PoC Server to notify all PoC Clients, except the PoC Client that has been given permission to send a Talk Burst that another PoC Client has been given permission to send a Talk Burst.

NOTE 1: In the case of privacy the real identity of the PoC User, with the permission to send a Talk Burst, is replaced with an anonymous identity.

- TBCP Talk Burst Revoke - is used by the PoC Server to revoke the media resource from a PoC Client and can be used for preemption functionality, but is also be used by the system to prevent overly long use of the media resource.
- TBCP Talk Burst Acknowledgement – is used by the PoC Client, when acknowledgement is required in the received TBCP message.

If the PoC Server and the PoC Client support Pre-established Sessions, the PoC Client and the PoC Server SHALL support the following additional TBCP Control message:

- TBCP Disconnect – is used by the PoC Server to close the PoC Session using a Pre-established Session while maintaining the Pre-established Session.
- TBCP Connect - is used by the PoC Server to notify all PoC Clients using Pre-established Session, that PoC Session is connected.

A PoC Server performing the Controlling PoC Function and supporting queuing of TBCP Talk Burst Request messages, a PoC Client supporting queuing of the TBCP Talk Burst Request message and a PoC Server performing the Participating PoC Function inserted in the Media path SHALL support the following additional Talk Burst Control Protocol messages:

- TBCP Talk Burst Request Queue Status Request – is used by the PoC Client to request the current queue position of a queued TBCP Talk Burst Request message.

- TBCP Talk Burst Request Queue Status Response – is used by the PoC Server to notify the PoC Client that the TBCP Talk Burst Request has been queued and is used to respond to a Talk Burst Queue Status Request message from the PoC Client.

NOTE 2: The PoC Server performing the Participating PoC Function normally only has to transparently transport the TBCP message unless the PoC Server supports Pre-established Session or Simultaneous Sessions.

A Participating PoC Server MAY support the TBCP Talk Burst Acknowledgment message.

The Talk Burst Control protocol reliability SHALL be ensured thru timer-based retransmissions. Timers are defined in subclause 9.1 “*Timers in the PoC Server performing the Controlling PoC Function*”, 9.2 “*Timers in the PoC Server performing the Participating PoC Function*” and in subclause 9.3 “*Timers in the PoC Client*”.

6.2 Procedures at the PoC Client

6.2.1 PoC Client procedures at PoC Session initialization

When a PoC Session is established for a PoC Client, a new instance of the ‘PoC Session control state machine – basic’ is created or ‘PoC Session control state machine – queuing’ is created.

This applies to all cases of PoC Session establishment, that is:

- PoC Sessions using On-demand Session signaling origination or termination, or,
- PoC Sessions using Pre-established Session where the PoC Client initiates the PoC Session by sending a SIP REFER request; or,
- PoC Sessions using Pre-established Session where the PoC Server performing the Participating PoC Function sends a TBCP Connect message.

The SIP INVITE request or the SIP REFER request sent by the PoC Client

- can be regarded an implicit TBCP Talk Burst Request message if a 1-1 PoC Session or an Ad-hoc PoC Group Session or a Pre-Arranged PoC Group Session is initiated; or,
- can not be regarded as an implicit TBCP Talk Burst Request message if a Chat PoC Group Session is initiated or in case of a rejoin to an already active PoC Session.

Based on the negotiations during PoC Session establishment either the basic or the optional queuing state machine is started.

The state machines are defined in subclauses 6.2.5 “*PoC Session control state diagram – basic*” and 6.2.9 “*PoC Session control state diagram – Queuing*”.

If Simultaneous PoC Sessions are supported, multiple instances of the PoC Session control state machine can be executing at the same time. For the purposes of this specification, each state machine operates independently and both the basic and the optional queuing state machine can be executing simultaneously. When the second PoC Session is created, within each PoC Session control state machine, basic or queuing, a sub-state machine is created for the ‘U: not permitted and TB_Taken’ state. This state machine is specified in subclause 6.2.8 “*PoC Session control state diagram – Simultaneous PoC Sessions*”.

Before the first RTP Media packet, RTCP packet or Talk Burst Control Protocol message is sent by a PoC Client in a PoC Session, the PoC Client SHALL assign itself a SSRC identifier for the PoC Session. A suitable algorithm to generate the SSRC identifier is described in [RFC3550]. The allocated SSRC identifier SHALL NOT be 1111...1 (all 32 bits 1’s), because this SSRC identifier is reserved for a special use.

The PoC Client may negotiate the use of prioritization of TBCP Talk Burst Request messages. In that case, the PoC Client can request to talk at a priority level that is either the same as or lower than the highest priority that was permitted to the Participant in the PoC Session initialization. If a PoC Client is authorized for pre-emptive priority in the PoC Session initialization it is good practise to always request to talk at a priority level that is lower than pre-emptive priority unless the Participant explicitly requests to pre-empt the current speaker.

6.2.2 PoC Client procedures at Pre-established Session initialization

When Pre-established Session is created, the PoC Client creates an instance of the PoC Session control state machine –Pre-established Session, as defined in subclause 6.2.6 “*PoC Session control state diagram –Pre-established Session*”. There is one instance of this state machine for each Pre-established Session. This does not cause an instance of a PoC Session control state machine to be created. It will be created when a PoC Session is initiated.

6.2.3 PoC Client procedures at PoC Session release

PoC Session release (whether it is initiated by the PoC Client or PoC Server) is a two-stage procedure.

In the first stage, the PoC Client stops sending TBCP messages and sending or playing RTP Media.

In the second stage, when the Control Plane has determined that the PoC Session has been released, the corresponding instance of the PoC Session control state machine is also terminated.

The User Plane may initiate the first stage, but the Control Plane always initiates the second stage.

If the PoC Session is established over a Pre-established Session, the normal case for PoC Session release is to receive a TBCP Disconnect message from the Participating PoC function. When the TBCP Disconnect message is received, the PoC Session control state machine initiates the PoC Session release.

If Simultaneous PoC Sessions are supported, each instance of the PoC Session control state machine will be terminated independently based on the state of the associated PoC Session.

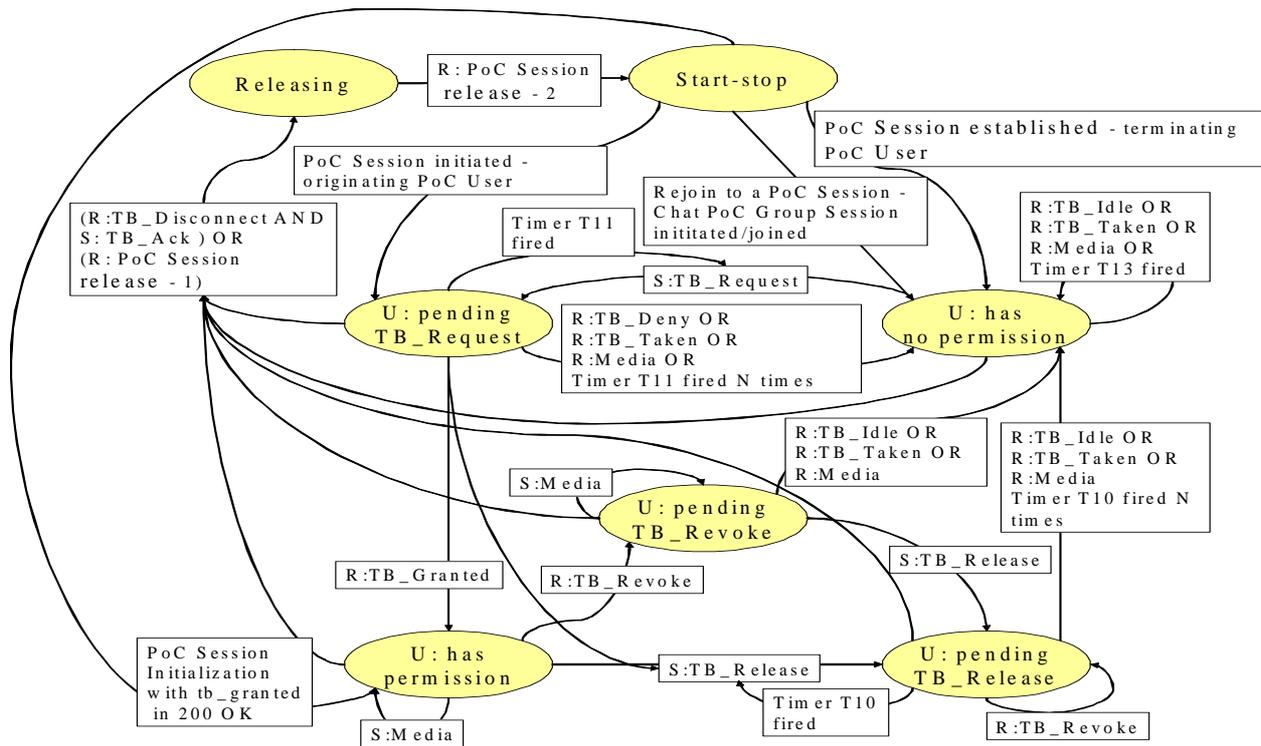
6.2.4 PoC Client procedures at Pre-established Session release

The User Plane resources for a Pre-established Session are released after the Control Plane has released the Pre-established Session. This means that any PoC Session over the Pre-established Session has been released before the Pre-established Session is released and so, there are no RTP Media packets or TBCP messages flowing at the time that the Pre-established Session is released. All that the PoC Client needs to do is to release any User Plane resources associated with the Pre-established Session.

6.2.5 PoC Session control state diagram – basic

The PoC Client SHALL support the state diagram and the state transitions specified in this subclause.

Figure 3 “*PoC Client state transition diagram for basic operation*” shows the state diagram.



NOTE: T10 is the ‘Talk Burst Release’ timer and T11 is the ‘Talk Burst Request’ timer.

Figure 3: PoC Client state transition diagram for basic operation

State details are explained in the following subclauses.

If a TBCP message or RTP Media packet arrives in any state and there is no procedure specified for it in the subclauses below the PoC Client SHALL discard the TBCP message or RTP Media packet and SHALL remain in the current state.

6.2.5.1 State ‘Start-stop’

In this state no PoC Session exists.

6.2.5.1.1 PoC Session initiated – originating PoC User

When a PoC Session is initiated as described in [OMA-POC-CP] “Using Pre-established session” or in [OMA-POC-CP] “Establishment of an On-demand Session” the originating PoC Client:

1. SHALL create an instance of the PoC User Talk Burst operation state machine; and,
2. if the originating PoC Client receives a TBCP message before it receives the SIP 200 “OK” response, the PoC Client SHALL store the TBCP message.

NOTE: The originating PoC Client might receive a TBCP message before the SIP 200 “OK” response, because of processing delays of the SIP 200 “OK” in the SIP/IP Core. Regardless the order the PoC Client receives the SIP 200 “OK” response and the TBCP message, the PoC Client must wait for SIP 200 “OK” before moving out from the Start-Stop state.

3. if the value of the Session Type uri parameter received in the Contact header of the SIP 200 “OK” response is “chat” the PoC Client:
 - a. SHALL enter the ‘U: has no permission state.
4. if the value of the Session Type uri parameter received in the Contact header of SIP 200 “OK” response is different from “chat” the PoC Client, ,
 - a. for an On-demand Session if tb_granted parameter is either not received or received with the value 0 in the SIP 200 “OK” response as specified in [OMA-POC-CP] “*Controlling PoC Function procedures*”; the PoC Client:
 - i. SHALL start timer T11 (Talk Burst Request); and,
 - ii. in case that the PoC Client has received and stored a TBCP message before the reception of the SIP 200 “OK” response, the PoC Client SHALL act as if the TBCP message was received in the ‘U: pending TB_Request’ state,
 - iii. SHALL enter the ‘U: pending TB_Request’ state.

or

 - b. for an On-demand Session if tb_granted parameter is received and set to 1 in the SIP 200 “OK” response as specified in [OMA-POC-CP] “*Controlling PoC Function procedures*“ the PoC Client:
 - i. SHOULD start the optional timer T22 (end of encoded Media); and,
 - ii. SHALL enter the ‘U: has permission’ state.

or

 - c. for a Pre-established Session, when sending a SIP REFER request, the PoC Client:
 - i. SHALL enter the ‘U: pending TB_Request’ state.

When the PoC Client is rejoining an ongoing PoC Session as described in [OMA-PoC-CP] “*PoC Client rejoining a PoC Session*” the PoC Client:

5. SHALL enter the ‘U: has no permission state’.

6.2.5.1.2 PoC Session established – terminating PoC User

When a PoC Session is established the terminating PoC Client:

1. SHALL create an instance of the user Talk Burst operation state machine; and,
2. SHALL enter the ‘U: has no permission’ state.

NOTE: From a PoC Client perspective the PoC Session is established when the PoC Client sends the SIP 200 “OK” response.

6.2.5.2 State: ‘U: has no permission’

The ‘U: has no permission’ state is a stable state and the PoC Client uses this state when the PoC Client is not sending RTP Media packets or is not waiting for a TBCP message response.

In this state the PoC Client may receive RTP Media packets or TBCP Talk Burst Control messages.

6.2.5.2.1 Receive TBCP Talk Burst Idle message (R: TB_Idle)

Upon receiving TBCP Talk Burst Idle message the PoC Client:

1. MAY provide Talk Burst idle notification to the PoC User, if it has not done so;
2. SHALL stop the optional timer T13 (end of RTP Media), if it is running; and,
3. SHALL remain in the 'U: has no permission' state.

6.2.5.2.2 Receive TBCP Talk Burst Taken message (R: TB_Taken)

Upon receiving of the TBCP Talk Burst Taken message the PoC Client:

1. SHALL send a TBCP Talk Burst Acknowledgement message if the TBCP Talk Burst Taken message expects an acknowledgement reply;
2. SHOULD perform the mapping between the SSRC of the PoC Client granted a permission to send a Talk Burst and the PoC Address and/or Nick Name, if they are included in the message;
3. SHALL provide a Talk Burst taken notification to the PoC User;
4. MAY display the PoC Address and Nick Name to the PoC User, if they are included in the message;
5. SHOULD start the optional timer T13 (end of RTP Media) for the Active PoC Session; and,
6. SHALL remain in the 'U: has no permission' state.

6.2.5.2.3 Receive RTP Media packets (R: Media)

Upon receiving RTP Media packets the PoC Client:

1. SHALL render the media;
2. MAY display the PoC Address and/or Nick Name based on SSRC of the sending PoC Client, if mapping between those exists in PoC Client;
3. SHOULD restart/start the optional timer T13 (end of RTP Media); and,
4. SHALL remain in the 'U: has no permission' state.

6.2.5.2.4 Send TBCP Talk Burst Request message (S: TB_Request)

Upon receiving an indication from the PoC User to request permission to speak and if timer T12 (Retry after) is not running the PoC Client:

1. SHALL send the TBCP Talk Burst Request message toward the PoC Server;
2. SHALL stop the optional timer T13 (end of RTP Media), if it is running;
3. SHALL start timer T11 (Talk Burst Request); and,
4. SHALL enter the 'U: pending TB_Request' state.

6.2.5.2.5 T13 (end of RTP Media) timer fired

On firing of T13 (end of RTP Media) timer, the PoC Client:

1. MAY provide Talk Burst idle notification to the PoC User; and,
2. SHALL remain in the 'U: has no permission' state.

6.2.5.3 State: 'U: pending TB request'

The 'U: pending TB_Request' state is a transition state, and the PoC Client uses this state when the PoC Client is waiting for response to a TBCP Talk Burst Request message.

In this state the PoC Client may receive RTP Media packets or TBCP Talk Burst Control messages.

Timer T11 (Talk Burst Request) is running in this state.

6.2.5.3.1 Receive TBCP Talk Burst Granted message (R: TB_Granted)

Upon receiving a TBCP Talk Burst Granted message from the PoC Server, the PoC Client:

1. SHALL provide Talk Burst granted notification to the PoC User if it has not already done so;

NOTE: Providing the Talk Burst granted notification to the PoC User prior to receiving the TBCP Talk Burst Granted message is an implementation option.

2. MAY provide information about the stop talking timer to the PoC User;
3. MAY provide notification of the number of Participants, receiving Talk Bursts in the PoC Session, to the PoC User, if included in the message;
4. SHALL stop timer T11 (Talk Burst Request); and,
5. SHOULD start the optional timer T22 (end of encoded Media); and,
6. SHALL enter the 'U: has permission' state.

6.2.5.3.2 Receive TBCP Talk Burst Taken message (R: TB_Taken)

Upon receiving a TBCP Talk Burst Taken message from the PoC Server, the PoC Client:

1. SHALL send a TBCP Talk Burst Acknowledgement message if the TBCP Talk Burst Taken message expects an acknowledgement reply;
2. SHOULD perform the mapping between the SSRC of the PoC Client granted a permission to send a Talk Burst and the PoC Address and/or Nick Name, if they are included in the message;
3. SHALL provide a Talk Burst taken notification to the PoC User;
4. MAY display the PoC Address and Nick Name to the PoC User, if they are included in the message;
5. SHALL stop timer T11 (Talk Burst Request);
6. SHOULD start the optional timer T13 (end of RTP Media); and,
7. SHALL enter the 'U: has no permission' state.

6.2.5.3.3 Receive TBCP Talk Burst Deny message (R: TB_Deny)

Upon receiving a TBCP Talk Burst Deny message from the PoC Server, the PoC Client:

1. SHALL provide Talk Burst deny notification to the PoC User;
2. MAY display the Talk Burst deny reason to the PoC User, if it is included in the message;
3. SHALL stop timer T11 (Talk Burst Request); and,
4. SHALL enter the 'U: has no permission' state.

6.2.5.3.4 T11 (Talk burst request) timer fired

On firing of timer T11 (Talk Burst Request), the PoC Client:

1. SHALL send a TBCP Talk Burst Request message towards the PoC Server.

2. SHALL restart timer T11 (Talk Burst Request); and,
3. SHALL remain in the 'U: pending TB_Request' state.

6.2.5.3.5 T11 (Talk burst request) timer fired N times

On the N:th firing of timer T11 (Talk Burst Request), the PoC Client:

1. MAY provide a Talk Burst request timeout notification to the PoC User; and,
2. SHALL enter the 'U: has no permission' state.

6.2.5.3.6 Receive RTP Media packets (R: Media)

Upon receiving RTP Media packets the PoC Client:

1. SHALL render the media;
2. MAY display the PoC Address and/or Nick Name based on SSRC of the sending PoC Client, if mapping between those exists in PoC Client;
3. SHALL stop timer T11 (Talk Burst Request);
4. SHOULD start the optional timer T13 (end of RTP Media); and,
5. SHALL enter the 'U: has no permission' state.

6.2.5.3.7 Send TBCP Talk Burst Release message (S: TB_Release)

Upon receiving an indication from the PoC User to release permission to speak, the PoC Client:

1. SHALL send a TBCP Talk Burst Release message towards the PoC Server.

The TBCP Talk Burst Release message:

- a. SHALL set the sequence number ignore field to 1, because no RTP Media packets were sent.
2. SHALL start timer T10 (Talk Burst Release); and,
3. SHALL enter the 'U: pending TB_Release' state.

6.2.5.4 State: 'U: has permission'

The 'U: has permission' state is a stable state and the PoC Client uses this state when the PoC Client is permitted to send RTP Media packet. In this state the PoC Client is sending RTP Media packets and may receive TBCP Talk Burst Control messages.

In this state the timer T22 (end of encoded Media) can be running. The purpose with the T22 (end of encoded Media) timer is to supervise that encoded voice is received from the PoC User. If no encoded voice is received e.g. because the PS connection is suspended and the user is occupied in a CS call the T22 (end of encoded Media) expires.

6.2.5.4.1 Send RTP Media packets (S: Media)

Upon receiving encoded voice from the PoC User, the PoC Client:

1. SHALL restart the optional timer T22 (end of encoded Media) if the timer is running;
2. SHALL create and send an RTP Media packet toward the PoC Server.

The RTP Media packet SHALL include:

- a. The SSRC of the PoC Client; and,
 - b. Other media packets and payload attributes as defined in [RFC3550].
3. SHALL remain in the 'U: has permission' state.

6.2.5.4.2 Send TBCP Talk Burst Release message (S: TB_Release)

Upon receiving an indication from the PoC User to release permission to speak, the PoC Client:

1. SHALL stop the timer T22 (end of encoded Media) if the timer is running;
2. SHALL send a TBCP Talk Burst Release message towards the PoC Server.

The TBCP Talk Burst Release message:

- a. SHOULD include the sequence number of the last RTP Media packet that was sent, if at least 1 RTP media packet was sent; and,

NOTE: The PoC Client is expected to provide the sequence number in all cases when the PoC Client knows the sequence number of the RTP Media packets.

- b. SHALL set the sequence number ignore field to 1, if no RTP Media packets were sent or if the PoC Client is not capable of providing the correct sequence number.
3. SHALL start timer T10 (Talk Burst Release); and,
4. SHALL enter the 'U: pending TB_Release' state.

6.2.5.4.3 Receive TBCP Talk Burst Revoke message (R: TB_Revoke)

Upon receiving a TBCP Talk Burst Revoke message from the PoC Server, the PoC Client:

1. SHALL inform the PoC User that the permission to send a Talk Burst is being revoked;
2. MAY give information to the PoC User about the reason for revoking the permission to send a Talk Burst received in the Reason code field;
3. MAY inform the PoC User of the retry after time, if a retry after time is contained in the TBCP Talk Burst Revoke message;
4. SHALL stop receiving and encoding PoC User's voice,
5. SHOULD start the optional timer T12 (PoC Client retry-after), if a retry after time is contained in the TBCP Talk Burst Revoke message; and,

NOTE: The PoC Client does not take any action when T12 expires, but when T12 is running, the PoC Client does not send a TBCP Talk Burst Request message.

6. SHALL stop the timer T22 (end of encoded Media) if the timer is running;
7. SHALL enter the 'U: pending TB_Revoke' state.

6.2.5.4.4 Void

6.2.5.4.5 Void

6.2.5.4.6 T22 (end of encoded Media) expires

On firing of T22 (end of encoded Media) the PoC Client:

1. SHALL send a TBCP Talk Burst Release message towards the PoC Server.

The TBCP Talk Burst Release message:

- a. SHOULD include the sequence number of the last RTP Media packet that was sent, if at least 1 RTP media packet was sent; and,

NOTE: The PoC Client is expected to provide the sequence number in all cases when the PoC Client knows the sequence number of the RTP Media packets.

- b. SHALL set the sequence number ignore field to 1, if no RTP Media packets were sent or if the PoC Client is not capable of providing the correct sequence number.

2. SHALL start timer T10 (Talk Burst Release); and,
3. SHALL enter the 'U: pending TB_Release' state.

6.2.5.5 State: 'U: pending TB Release'

The 'U: pending TB_Release' state is a transition state and the PoC Client uses this state when the PoC Client is waiting for response to a TBCP Talk Burst Release message.

In this state the PoC Client may receive TBCP Talk Burst Control messages and RTP Media packets.

Timer T10 (Talk burst release) is running in this state.

6.2.5.5.1 T10 (Talk burst release) timer fired

On firing of timer T10 (Talk Burst Release), the PoC Client:

1. SHALL send a TBCP Talk Burst Release message towards the PoC Server.

The TBCP Talk Burst Release message:

- a. SHALL include the SSRC of the PoC Client;
- b. SHALL include the sequence number of the last RTP Media packet that was sent, if at least 1 RTP Media packet was sent;

NOTE: The PoC Client is expected to provide the sequence number in all cases when the PoC Client knows the sequence number of the RTP Media packets.

- c. SHALL set the sequence number ignore field to 1, if no RTP Media packets were sent or if the PoC Client is not capable of providing the correct sequence number.
2. SHALL restart timer T10 (Talk Burst Release); and,
3. SHALL remain in state 'U: pending TB_Release'.

6.2.5.5.2 T10 (Talk burst release) timer fired N times

On the N:th firing of timer T10 (Talk Burst Release), the PoC Client:

1. SHALL enter the 'U: has no permission' state.

6.2.5.5.3 Receive TBCP Talk Burst Idle (R: TB_Idle)

Upon receiving a TBCP Talk Burst Idle message the PoC Client:

1. SHALL provide Talk Burst idle notification to the PoC User;
2. SHALL stop timer T10 (Talk Burst Release); and,
3. SHALL enter the 'U: has no permission' state.

6.2.5.5.4 Receive TBCP Talk Burst Taken message (R: TB_Taken)

Upon receiving a TBCP Talk Burst Taken message the PoC Client:

1. SHALL send a TBCP Talk Burst Acknowledgement message if the TBCP Talk Burst Taken expects an acknowledgement reply;
2. SHOULD perform the mapping between the SSRC of the PoC Client granted a permission to send a Talk Burst and the PoC Address and/or Nick Name, if they are included in the message;
3. SHALL provide Talk Burst taken notification to the PoC User;
4. MAY display the PoC Address and Nick Name to the PoC User, if they are included in the message, or alternatively if the PoC Client has a mapping between SSRC of the PoC Client granted a permission to send a Talk Burst and the PoC Address and /or Nick Name;
5. SHOULD start the optional timer T13 (end of RTP Media);
6. SHALL stop timer T10 (Talk Burst Release); and,
7. SHALL enter the 'U: has no permission' state.

6.2.5.5.5 Receive RTP Media packets (R: Media)

Upon receiving RTP Media packets the PoC Client:

1. SHALL render the media;
2. MAY display the PoC Address and/or Nick Name based on SSRC of the sending PoC Client, if mapping between those exists in PoC Client;
3. SHOULD start the optional timer T13 (end of RTP Media);
4. SHALL stop timer T10 (Talk Burst Release); and,
5. SHALL enter the 'U: has no permission' state.

6.2.5.5.6 Receive TBCP Talk Burst Revoke message (R: TB_Revoke)

Upon receiving a TBCP Talk Burst Revoke message from the PoC Server, the PoC Client:

1. MAY give information to the PoC User that permission to send a Talk Burst is being revoked, if a retry after time is contained in the TBCP Talk Burst Revoke message;
2. MAY inform the PoC User of the reason contained in the Reason code field received in the TBCP Talk Burst Revoke message;
3. MAY inform the PoC User of the retry after time, if a retry after time is contained in the TBCP Talk Burst Revoke message;
4. SHOULD start the optional timer T12 (PoC Client retry-after), if a retry after time is contained in the TBCP Talk Burst Revoke message; and,

NOTE: The PoC Client does not take any action when T12 expires, but when T12 is running, the PoC Client SHALL not send a TBCP Talk Burst Request message.

5. SHALL remain in the 'U: pending TB_Release' state.

6.2.5.6 State: 'U: pending TB_Revoke'

The 'U: pending TB_Revoke' state is a transition state and the PoC Client uses this state when the PoC Client has received a TBCP Talk Burst Revoke message and is waiting for any remaining buffered media to be sent.

In this state the PoC Client is sending media and may receive TBCP Talk Burst Control messages.

6.2.5.6.1 Send RTP Media (S: Media)

If the PoC Client has PoC User's encoded voice remaining in the buffer, the PoC Client:

1. SHALL create and send an RTP Media packet toward the PoC Server.
The RTP Media packet SHALL include:
 - a. The SSRC of the PoC Client; and,
 - b. Other media and payload attributes as defined in [RFC3550].
2. If the sent RTP Media packet has not been the last packet from the PoC Client's buffer, the PoC Client SHALL remain in the 'U: pending TB_Revoke' state:
3. If the sent RTP Media packet has been the last packet from the PoC Client's buffer, the PoC Client SHALL perform the action in 6.2.5.6.5 "*Send TBCP Talk Burst Release message*".

6.2.5.6.2 Receive TBCP Talk Burst Idle message (R: TB_Idle)

Upon receiving a TBCP Talk Burst Idle message the PoC Client:

1. SHALL stop sending RTP Media packets;
2. SHALL provide Talk Burst idle notification to the PoC User; and,
3. SHALL enter the 'U: has no permission' state.

6.2.5.6.3 Receive TBCP Talk Burst Taken message (R: TB_Taken)

Upon receiving a TBCP Talk Burst Taken message the PoC Client:

1. SHALL send a TBCP Talk Burst Acknowledgement message if the TBCP Talk Burst Taken expects an acknowledgement reply;
2. SHALL stop sending RTP Media packets;
3. SHOULD perform the mapping between the SSRC of the PoC Client granted a permission to send a Talk Burst and the PoC Address and/or Nick Name , if they are included in the message;
4. SHALL provide a Talk Burst taken notification to the PoC User;
5. MAY display the PoC Address and Nick Name to the PoC User, if they are included in the message, or alternatively if the PoC Client has a mapping between SSRC of the PoC Client granted a permission to send a Talk Burst and the PoC Address and /or Nick Name ;
6. SHOULD start the optional timer T13 (end of RTP Media); and,
7. SHALL enter the 'U: has no permission' state.

6.2.5.6.4 Receive RTP Media (R: Media)

Upon receiving a RTP Media packets the PoC Client:

1. SHALL stop sending RTP Media packets;
2. SHALL render the media;
3. MAY display the PoC Address and/or Nick Name based on SSRC of the sending PoC Client, if mapping between those exists in PoC Client;
4. SHOULD start the optional timer T13 (end of RTP Media); and,
5. SHALL enter the 'U: has no permission' state.

6.2.5.6.5 Send TBCP Talk Burst Release message (S: TB_Release)

As soon as the PoC Client has sent all buffered voice packets, the PoC Client:

1. SHALL send a TBCP Talk Burst Release message towards the PoC Server.

The TBCP Talk Burst Release message:

- a. SHALL include the SSRC of the PoC Client; and,
- b. SHOULD include the sequence number of the last RTP Media packet that was sent.

NOTE: The PoC Client is expected to provide the sequence number in all cases where the PoC Client knows the sequence number that is being put into the RTP Media packets.

- c. SHALL set the sequence number validity ignore field to 1, if the PoC Client is not providing the correct sequence number.
2. SHALL start timer T10 (Talk Burst Release); and,
3. SHALL enter the 'U: pending TB_Release state.

6.2.5.7 State: Any state

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.

6.2.5.7.1 Receive TBCP Disconnect message (R: Disconnect)

Upon receiving a TBCP Disconnect message from the PoC Server in any state, the PoC Client:

1. SHALL update the status information of the PoC Session to indicate that the PoC Session within the Pre-established Session is released and the User Plane association between the PoC Session and the Pre-established Session is removed in the PoC Server performing the Participating Function;
2. SHALL send a TBCP Talk Burst Acknowledge message towards the PoC Server;
3. SHALL stop sending TBCP messages and RTP Media towards the PoC Server;
4. SHALL interact with the Control Plane according to the reference [OMA-POC-CP] "*PoC Client Leaving a PoC Session*"; and,
5. SHALL enter the 'Releasing' state.

6.2.5.7.2 Receive PoC Session release – 1 (R: PoC Session release - 1)

Upon receiving a PoC Session release stage 1 request from the Control Plane, the PoC Client:

1. SHALL stop sending TBCP messages and RTP Media towards the PoC Server; and,
2. SHALL enter the 'Releasing' state.

6.2.5.8 State: 'Releasing'

The 'Releasing' state is a transition state. The PoC Client uses this state while waiting for Control Plane to finalize the disconnection of a PoC Session.

6.2.5.8.1 Receive PoC Session release – 2 (R: PoC Session release - 2)

Upon receiving a PoC Session release stage 2 request from the Control Plane, the PoC Client:

1. SHALL release all resources including any running timers associated with the PoC Session; and,
2. SHALL enter the 'Start-stop' state and terminate the PoC Session control state machine.

NOTE: If this was a PoC Session using a Pre-established Session, the PoC Client maintains the Pre-established Session.

6.2.6 PoC Session control state diagram – Pre-established Session

If the PoC Client supports Pre-established Session, the PoC Client SHALL support the state diagram and the state transitions specified in this subclause.

NOTE: The PoC Client can only use Pre-established Sessions if supported by the Home PoC Server.

A Pre-established Session has two states: Pre-established Session_Not_in_use and Pre-established Session_In_use. The states are partly controlled on the Control Plane [OMA-POC-CP].

A PoC Client MAY have several Pre-established Sessions at a time.

Figure 4 "*PoC Client state transition diagram for Pre-established Session*" shows the Pre-established user states (U states) and the state transitions.

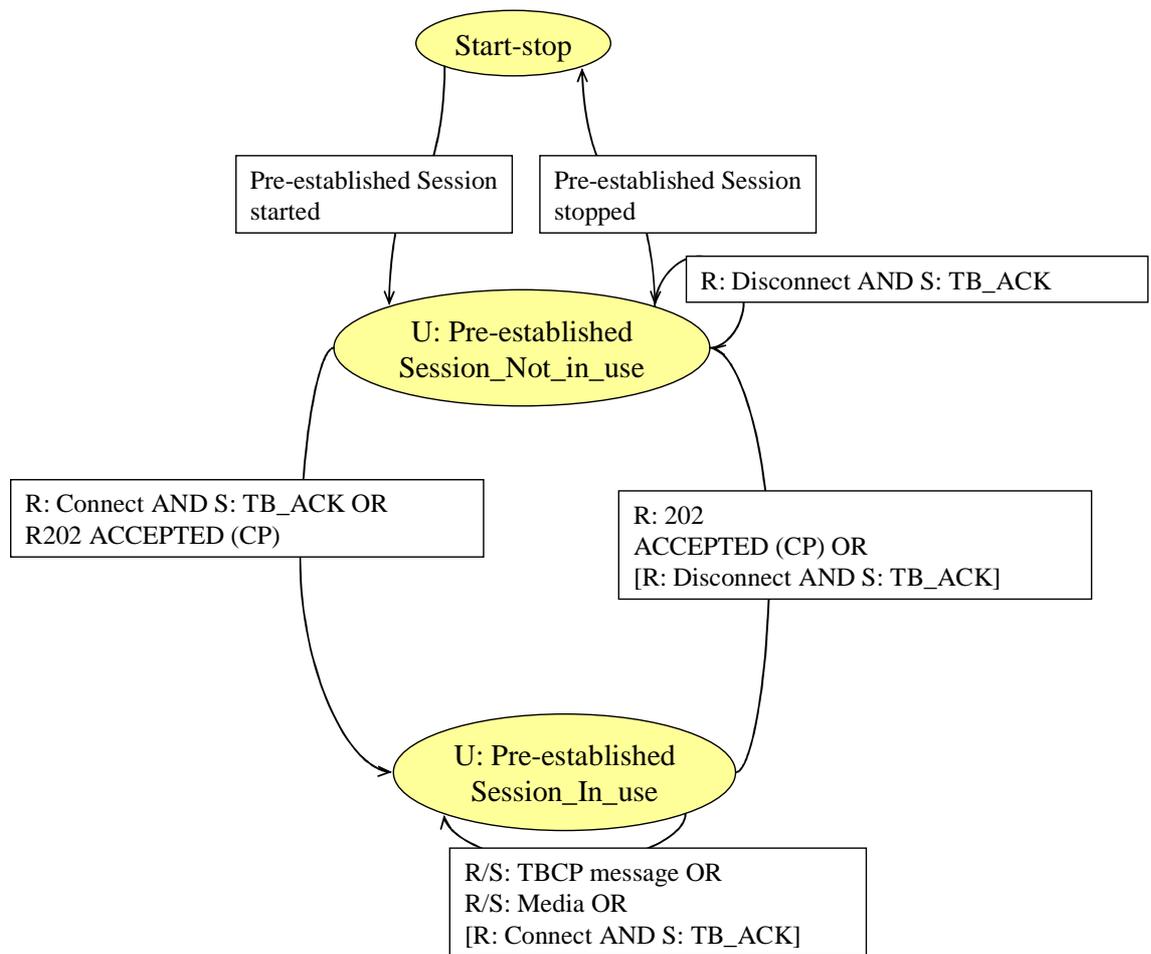


Figure 4: PoC Client state transition diagram for Pre-established Session

The PoC Client SHALL create one instance of the Pre-established Session state machine per Pre-established Session.

State details are explained in the following subclauses.

If a TBCP message, SIP request or RTP Media packet arrives in any state and there is no procedure specified for it in the subclauses below the PoC Client SHALL discard the TBCP message, SIP request or RTP Media packet and SHALL remain in the current state.

6.2.6.1 State 'Start-stop

In this state, no Pre-established Session exists.

6.2.6.1.1 Pre-established Session started

When a Pre-established Session is created between the PoC Server and a PoC Client, the PoC Client:

1. SHALL initialize any needed User Plane resources for the Pre-established Session; and,
2. SHALL enter the 'G: Pre-established Session_Not_in_use' state.

6.2.6.2 State 'U: Pre-established Session_Not_in_use'

The 'U: Pre-established Session_Not_in_use' state is a stable state. The PoC Client is in this state when Pre-established Session is established, but it is not used for PoC Session.

In this state the PoC Client may receive PoC Session initiation message or RTP Media packets.

6.2.6.2.1 Receive TBCP Connect message (R: Connect)

Upon receiving a TBCP Connect message the PoC Client:

1. SHALL create an instance of the PoC Session control state machine as defined in subclause 6.2.5 "*PoC Session control state diagram – basic*" or 6.2.9 "*PoC Session control state diagram – queuing*" if queuing of Talk Burst requests are used; and,
2. if the PoC Client accepts the incoming PoC Session the PoC Client:
 - a. SHALL send TBCP Talk Burst Acknowledgement message with the reason code "Accepted"; and,
 - b. SHALL enter the 'U: Pre-established Session_In_use' state.
3. Otherwise the PoC Client:
 - a. SHALL send TBCP Talk Burst Acknowledgement message with the reason code "Busy" or "Not accepted"; and,
 - b. SHALL remain in the 'U: Pre-established Session_Not_in_use' state.

6.2.6.2.2 Void

6.2.6.2.3 Receive SIP 202 "Accepted" response (R: 202 ACCEPT (CP))

Upon receiving SIP 202 "Accepted" response to the sent SIP REFER as specified in the [OMA-POC-CP] "*PoC Client initiates and Ad-hoc PoC Group and 1-1 PoC Session*", or "*PoC Client initiates a Pre-arranged Group Session or joining a Chat PoC Group*" or "*PoC Client rejoining a PoC Session*" the PoC Client:

1. SHALL create an instance of the PoC Session control state machine as defined in subclause 6.2.5 "*PoC Session control state diagram – basic*" or 6.2.9 "*PoC Session control state diagram – queuing*" if queuing of Talk Burst requests are used; and,
2. SHALL enter the 'U: Pre-established Session_In_use' state.

6.2.6.2.4 Pre-established Session stopped

When the Pre-established Session between the PoC Client and the PoC Server is stopped, the PoC Client:

1. SHALL release any User Plane resources including any running timers associated with the Pre-established Session; and,
2. SHALL enter the 'Start-stop' state.

6.2.6.2.5 Void

6.2.6.2.6 Receive TBCP Disconnect (R: Disconnect)

Upon receiving a TBCP Disconnect message the PoC Client:

1. SHALL send TBCP Talk Burst Acknowledgement message; and,
2. SHALL remain in the 'U: Pre-established Session_Not_in_use' state.

6.2.6.3 State 'U: Pre-established Session_In_use'

The 'U: Pre-established Session_In_use' state is a stable state. The PoC Client is in this state when Pre-established Session is established and it is used for PoC Session.

In this state the PoC Client may receive RTP Media packets, TBCP messages and indication of the PoC Session release.

6.2.6.3.1 Receive TBCP Connect message (R: Connect)

Upon receiving a TBCP Connect message the PoC Client:

1. SHALL send TBCP Talk Burst Acknowledgement message;
2. SHALL start T11 (Talk Burst Request) timer, if PoC Client has initiated this PoC Session; and,
3. SHALL remain in the 'U: Pre-established Session_In_use' state.

6.2.6.3.2 Receive other TBCP message (R: TBCP message)

Upon receiving a TBCP message the PoC Client:

1. SHALL act as specified in the subclause 6.2.5 "*PoC Session control state diagram – basic*" or 6.2.9 "*PoC Session control state diagram – queuing*" if queuing of Talk Burst requests are used.
2. SHALL remain in the 'Pre-established Session_In_use' state.

6.2.6.3.3 Receive RTP Media packets (R: Media)

Upon receiving RTP Media packets the PoC Client:

1. SHALL act as specified in the subclause 6.2.5 "*PoC Session control state diagram – basic*" or 6.2.9 "*PoC Session control state diagram – queuing*" if queuing of Talk Burst requests are used; and,
2. SHALL remain in the 'Pre-established Session_In_use' state.

6.2.6.3.4 Receive SIP 202 "Accepted" (R: 202 ACCEPTED (CP))

Upon receiving SIP 202 "Accepted" response to the sent SIP REFER request as described in [OMA-POC-CP] "*Leaving a PoC Session – Pre-established Session case*" when the PoC Session is released, but the Pre-established Session is kept alive the PoC Client:

1. SHALL enter the 'U: Pre-established Session_Not_in_use' state; and,
2. SHALL terminate the instance of the PoC Session control state machine as defined in subclause 6.2.5 "*PoC Session control state diagram – basic*" or 6.2.9 "*PoC Session control state diagram – queuing*" if queuing of Talk Burst requests are used.

6.2.6.3.5 Send TBCP message (S: TBCP message)

When sending a TBCP message the PoC Client:

1. SHALL act as specified in subclause 6.2.5 "*PoC Session control state diagram – basic*" or 6.2.9 "*PoC Session control state diagram – queuing*" if queuing of Talk Burst requests are used; and,
2. SHALL remain in the 'Pre-established Session_In_use' state.

6.2.6.3.6 Send RTP media packets (S: Media)

When sending RTP Media packets the PoC Client:

1. SHALL act as specified in subclause 6.2.5.4.1 "*Send RTP Media packets (S: Media)*"; and,

2. SHALL remain in the 'Pre-established Session_In_use' state.

6.2.6.3.7 Receive TBCP Disconnect (R: Disconnect)

Upon receiving a TBCP Disconnect message the PoC Client:

1. SHALL send TBCP Talk Burst Acknowledgement message;
2. SHALL enter the 'U: Pre-established Session_Not_in_use' state; and,
3. SHALL terminate the instance of the PoC Session control state machine as defined in subclause 6.2.5 "PoC Session control state diagram – basic" or 6.2.9 "PoC Session control state diagram – queuing" if queuing of Talk Burst requests are used.

6.2.7 PoC Session control state diagram – Simultaneous per PoC Client

In the case PoC Client has Simultaneous PoC Sessions the PoC Client SHALL follow for each PoC Session the PoC Session specific state diagrams and state transitions specified in the subclause 6.2.5 "PoC Session control state diagram – basic" or 6.2.9 "PoC Session control state diagram – queuing" if queuing of Talk Burst requests are used.

The PoC Client may have more than one PoC Sessions established at a time.

For the overall handling of Simultaneous PoC Sessions the PoC Client SHALL support the state diagram and the state transitions specified in this subclause.

Transitions between different PoC Sessions are dictated by actions of the PoC User and changes in the Simultaneous Session states. The changes of the states are partly controlled on the Control Plane [OMA-POC-CP].

Figure 5 "*Simultaneous PoC Sessions state diagram – per PoC Client.*" shows the Simultaneous Sessions PoC Client states (C states) per PoC Client and the state transitions.

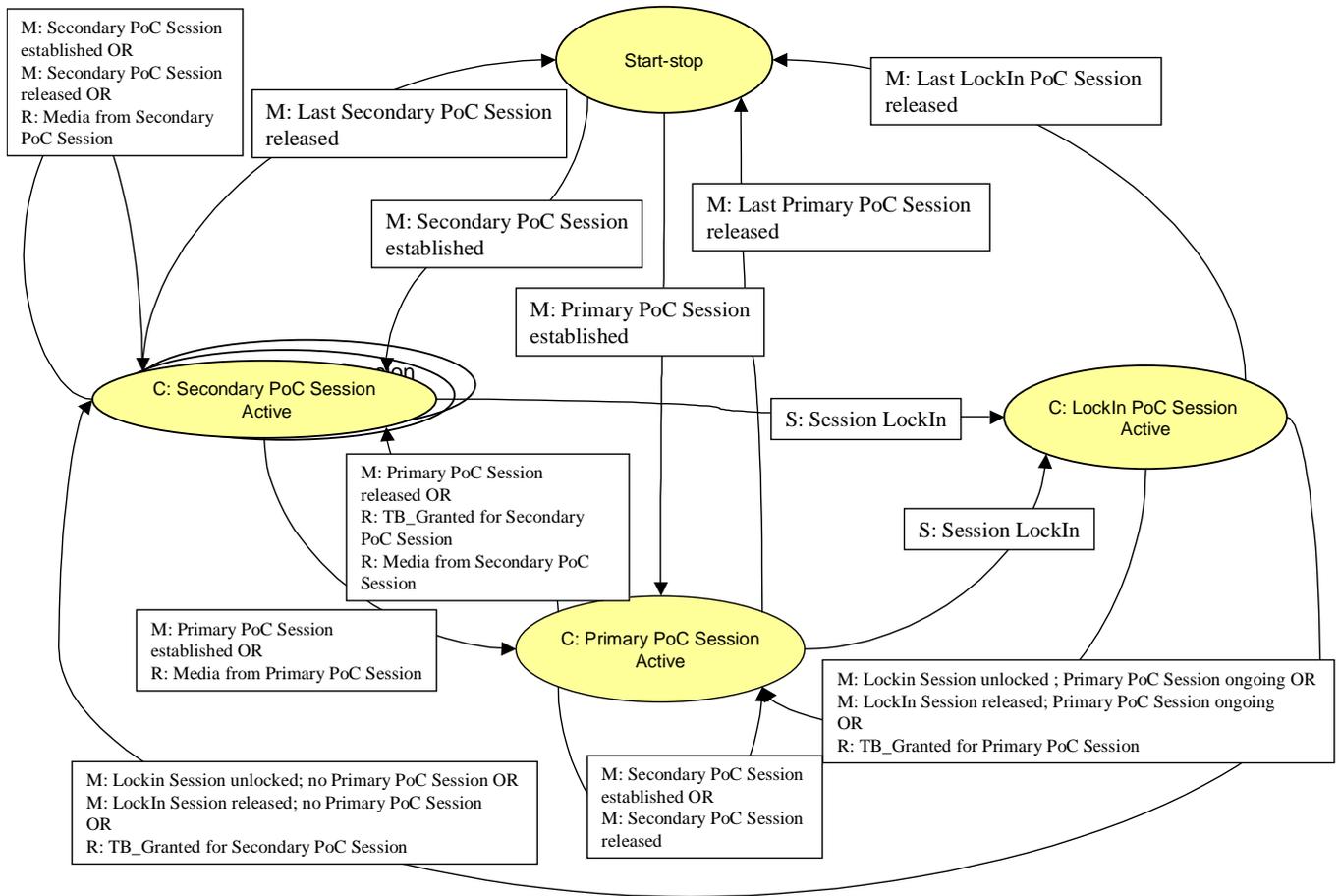


Figure 5: Simultaneous PoC Sessions state diagram – per PoC Client

The state diagram in

Figure 5 “*Simultaneous PoC Sessions state diagram – per PoC Client*” applies when the PoC Client for a PoC User supports several PoC Sessions simultaneously.

State details are explained in the following subclauses.

If a TBCP message, SIP request or RTP Media packet arrives in any state and there is no procedure specified for it in the subclauses below the PoC Client SHALL discard the TBCP message, SIP request or RTP Media packet and SHALL remain in the current state.

6.2.7.1 State ‘Start-stop’

In this state no PoC Session exists.

6.2.7.1.1 Monitor Primary PoC Session establishment (M: Primary PoC Session established)

When a Primary PoC Session is established as specified in the [OMA-POC-CP] “*PoC Client setting PoC Session priority*”, the PoC Client:

1. SHALL create an instance of the Simultaneous PoC Sessions state machine per PoC Client; and,
2. SHALL enter the ‘C: Primary PoC Session Active’ state.

6.2.7.1.2 Monitor Secondary PoC Session establishment (M: Secondary PoC Session established)

When a Secondary PoC Session is established as specified in the [OMA-POC-CP] “*PoC Client setting PoC Session priority*”, the PoC Client:

1. SHALL create an instance of the Simultaneous PoC Sessions state machine per PoC Client; and,
2. SHALL enter the ‘C: Secondary PoC Session Active’ state.

6.2.7.2 State: ‘C: Primary PoC Session Active’

In this state a Primary PoC Session exists as an Active PoC Session. The “C: Primary PoC Session Active” is a stable state. In the “C: Primary PoC Session Active” state the PoC Client:

1. SHALL send and receive RTP Media packets and TBCP messages for the Active PoC Session; and,
2. SHOULD send and receive TBCP messages for all other established PoC Sessions.

6.2.7.2.1 Monitor Primary PoC Session release when no other PoC Sessions are ongoing (M: Last Primary PoC Session released)

When a Primary PoC Session is released and no other PoC Sessions for the same PoC Client are established as specified in [OMA-POC-CP] “*PoC Client setting PoC Session priority*” the PoC Client:

1. SHALL enter the ‘Start-stop’ state.

6.2.7.2.2 Send SDP with Session LockIn (S: Session LockIn)

When the PoC Client sends SDP LockIn information for this PoC Session as specified in [OMA-POC-CP] “*PoC Client handling of PoC Session locking*” the PoC Client:

1. SHALL enter the ‘C: LockIn PoC Session Active’ state.

6.2.7.2.3 Monitor Secondary PoC Session release (M: Secondary PoC Session released)

When a Secondary PoC Session is released as specified in [OMA-POC-CP] the PoC Client:

1. SHALL remain in PoC Client state to ‘C: Primary PoC Session Active’.

6.2.7.2.4 Monitor Secondary PoC Session establishment (M: Secondary PoC Session established)

When a Secondary PoC Session is established as specified in [OMA-POC-CP] “*PoC Client setting PoC Session priority*” the PoC Client:

1. SHALL remain in PoC Client state to ‘C: Primary PoC Session Active’.

6.2.7.2.5 Monitor Primary PoC Session release (M: Primary PoC Session released)

When a Primary PoC Session is released as specified in the [OMA-POC-CP] and other PoC Sessions for the same PoC User are established as specified in [OMA-POC-CP] “*PoC Client setting PoC Session priority*” the PoC Client:

1. SHALL enter the ‘C: Secondary PoC Session Active’.

6.2.7.2.6 Receive Talk Burst Granted message (R: TB_Granted for Secondary PoC Session)

When the PoC Client receives a TBCP Talk Burst Granted message in response to a TBCP Talk Burst requests message for a secondary PoC Session to the PoC Server, the PoC Client:

1. SHALL enter the ‘C: Secondary PoC Session active’ state;
2. MAY provide information about the stop talking timer to the PoC User; and,
3. MAY provide notification of the number of Participants, receiving Talk Bursts in the PoC Session, to the PoC User, if included in the message.

6.2.7.2.7 Receive RTP media packets (R: Media from Secondary PoC Session)

Upon receiving RTP media packets from a Secondary PoC Session the PoC Client:

1. SHALL enter the ‘C: Secondary PoC Session Active’ state.

6.2.7.3 State: ‘C: Secondary PoC Session Active’

In this state a Secondary PoC Session exists as an Active PoC Session. The ‘C: Secondary PoC Session Active’ state is a stable state. In the “C: Secondary PoC Session Active” state the PoC Client:

1. SHALL send and receive RTP Media packets and TBCP messages for the Active PoC Session; and,
2. SHOULD send and receive TBCP messages for all other established PoC Sessions.

6.2.7.3.1 Monitor Secondary PoC Session release when no other PoC Sessions are ongoing (M: Last Secondary PoC Session released)

When the secondary PoC Session is released as specified in [OMA-POC-CP] and no other PoC Sessions for the same PoC Client are established as specified in [OMA-POC-CP] “*PoC Client setting PoC Session priority*” the PoC Client:

1. SHALL enter the ‘Start-stop’ state.

6.2.7.3.2 Send SDP with Session LockIn (S: Session LockIn)

When a Secondary PoC Session is an Active PoC Session and the PoC Client sends SDP: LockIn information for this PoC Session as specified in [OMA-POC-CP] “*PoC Client handling of PoC Session locking*” the PoC Client:

1. SHALL enter the ‘C: LockIn PoC Session Active’.

6.2.7.3.3 Monitor Primary PoC Session establishment (M: Primary PoC Session established)

When a Primary PoC Session is established as specified in the [OMA-POC-CP] “*PoC Client setting PoC Session priority*”, and fulfills the criteria defined in the subclause [OMA-POC-CP] “*Procedures at the PoC Client*” to be activated the PoC Client:

1. SHALL enter the ‘C: Primary PoC Session Active’.

6.2.7.3.4 Receive RTP media packets (R: Media from Primary PoC Session)

Upon receiving RTP media packets from a Primary PoC Session the PoC Client:

1. SHALL enter the 'C: Primary PoC Session Active' state.

6.2.7.3.5 Monitor Secondary PoC Session release (M: Secondary PoC Session released)

When the Secondary PoC Session is released as specified in [OMA-POC-CP] and at least one other PoC Sessions for the same PoC Client are established as specified in [OMA-POC-CP] and fulfills the criteria defined in the subclause 7.5.1 "Procedures at the PoC Client" to be activated the PoC Client:

1. SHALL remain in the state 'C: Secondary PoC Session Active'.

6.2.7.3.6 Monitor Secondary PoC Session establishment (M: Secondary PoC Session established)

When a Secondary PoC Session is established as specified in the [OMA-POC-CP] "PoC Client setting PoC Session priority", the PoC Client:

1. SHALL remain in PoC Client state to 'C: Secondary PoC Session Active'.

6.2.7.3.7 Receive RTP media packets (R: Media from Secondary PoC Session)

Upon receiving RTP media packets from a Secondary PoC Session different than the active PoC Session, the PoC Client:

1. SHALL enter in the 'C: Secondary PoC Session Active' state for the Secondary PoC Session it received RTP media packets from.

6.2.7.4 State: 'C: LockIn PoC Session Active'

In this state a LockIn PoC Session exists and is an Active PoC Session. The 'C: LockIn PoC Session Active' state is a stable state. In the "C: LockIn PoC Session Active" state the PoC Client:

1. SHALL send and receive RTP Media packets and TBCP messages for the active PoC Session;
2. SHOULD receive TBCP messages from any other PoC Sessions; and,
3. MAY prevent PoC User to request Talk Burst for any other PoC Sessions.

6.2.7.4.1 Monitor LockIn PoC Session release and no other PoC Session are ongoing (M: Last LockIn PoC Session released)

When a LockIn PoC Session is released as specified in [OMA-POC-CP] and no other PoC Sessions for the same PoC Client are ongoing the PoC Client:

1. SHALL enter the 'Start-stop' state;

6.2.7.4.2 Monitor LockIn PoC Session release and Primary PoC Session ongoing (M: LockIn PoC Session released; Primary PoC Session ongoing)

When a LockIn PoC Session is released as specified in [OMA-POC-CP] and a Primary PoC Sessions for the same PoC Client is already established the PoC Client:

1. SHALL enter the 'C: Primary PoC Session active' state.

6.2.7.4.3 Monitor LockIn PoC Session release and no Primary PoC Session ongoing (M: LockIn PoC Session released; no Primary PoC Session)

When a LockIn PoC Session is released as specified in [OMA-POC-CP] and no Primary PoC Session for the same PoC Client is established and at least one secondary PoC Session for the same PoC Client is established and fulfills criteria defined in the subclause 7.5.1 "Procedures at the PoC Client" to be activated the PoC Client:

1. SHALL enter the 'C: Secondary PoC Session active' state.

6.2.7.4.4 Monitor LockIn PoC Session is unlocked and Primary PoC Session ongoing (M: LockIn PoC Session unlocked; Primary PoC Session ongoing)

When a LockIn PoC Session is unlocked as specified in [OMA-POC-CP] “*PoC Client handling of PoC Session locking*” and a Primary PoC Sessions for the same PoC User is already established the PoC Client:

1. SHALL enter the ‘C: Primary PoC Session active’ state.

6.2.7.4.5 Monitor LockIn PoC Session is unlocked and no Primary PoC Session ongoing (M: LockIn PoC Session unlocked; no Primary PoC Session)

When a LockIn PoC Session is unlocked, as specified in [OMA-POC-CP] “*PoC Client handling of PoC Session locking*”, and no Primary PoC Session is ongoing and at least one Secondary PoC Session for the same PoC Client and fulfills criteria defined in the subclause 7.5.1 “*PoC Client handling of PoC Session locking*”, to be activated, the PoC Client:

1. SHALL enter the ‘C: Secondary PoC Session active’ state.

6.2.7.4.6 Receive TBCP Talk Burst Granted message for Primary PoC Session (R: TB_Granted for Primary PoC Session)

When the PoC Client receives a TBCP Talk Burst Granted message in response to a TBCP Talk Burst requests message for the Primary PoC Session to the PoC Server, the PoC Client:

1. SHALL enter the ‘C: Primary PoC Session active’ state;
2. MAY provide information about the stop talking timer to the PoC User; and,
3. MAY provide notification of the number of Participants, receiving Talk Bursts in the PoC Session, to the PoC User, if included in the message

6.2.7.4.7 Receive TBCP Talk Burst Granted message for Secondary PoC Session (R: TB_Granted for Secondary PoC Session)

When the PoC Client receives a TBCP Talk Burst Granted message in response to a TBCP Talk Burst Request message for a secondary PoC Session to the PoC Server, the PoC Client:

1. SHALL enter the ‘C: Secondary PoC Session active’ state;
2. MAY provide information about the stop talking time to the PoC User; and,
3. MAY provide notification of the number of Participants, receiving Talk Bursts in the PoC Session, to the PoC User, if included in the message.

6.2.8 PoC Session control state diagram – Simultaneous PoC Sessions

In the case PoC Client has Simultaneous PoC Sessions the PoC Client SHALL follow for each PoC Session the PoC Session specific state diagrams and state transitions specified in the subclause 6.2.5 “*PoC Session control state diagram – basic*” or 6.2.9 “*PoC Session control state diagram – queuing*” if queuing of Talk Burst requests are used.

For the handling of each of the Simultaneous PoC Sessions the PoC Client SHALL support the state diagram and the state transitions specified in this subclause.

Transitions between different PoC Sessions are dictated by actions of the PoC User and changes in the Simultaneous PoC Session states. The changes of the states are partly controlled by the Control Plane as specified in.

Figure 6 “*PoC Session control state diagram – Simultaneous PoC Sessions*” shows Simultaneous PoC Sessions states and the state transitions for a PoC User per PoC Session.

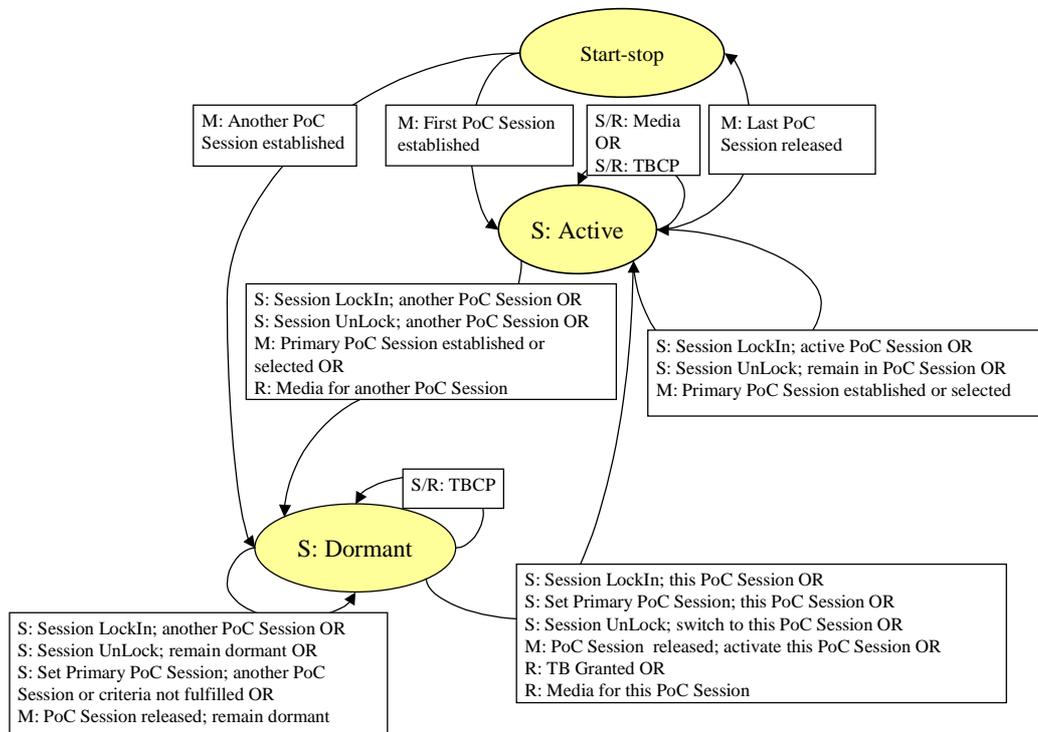


Figure 6: PoC Session control state diagram – Simultaneous PoC Sessions

The State Diagram in Figure 6 “*PoC Session control state diagram - Simultaneous PoC Sessions*” applies to one PoC Session out of multiple Simultaneous PoC Sessions supported by the PoC Client.

The PoC Client SHALL create an instance of the state machine for each PoC Session.

State details are explained in the following subclauses.

If a TBCP message, SIP request or RTP Media packet arrives in any state and there is no procedure specified for it in the subclauses below the PoC Client SHALL discard the TBCP message, SIP request or RTP Media packet and SHALL remain in the current state.

6.2.8.1 State ‘Start-Stop’

In this state no PoC Session exists.

6.2.8.1.1 Monitor first PoC Session established (M: First PoC Session established)

When a PoC Session is established as specified in [OMA-POC-CP] “*PoC Client procedures at PoC Session initialization*” and in case there is no active PoC Session for the same PoC User the PoC Client:

1. SHALL create an instance of the general Talk Burst operation state machine; and,
2. SHALL enter the ‘S: Active’ state.

6.2.8.1.2 Monitor another PoC Session established (M: Another PoC Session established)

When an another PoC Session is established as specified in the [OMA-POC-CP] “*PoC Client procedures at PoC Session initialization*” the PoC Client:

1. SHALL create an instance of the general Talk Burst operation state machine; and,
2. SHALL enter the ‘S: Dormant’ state in case there is an Active PoC Session for the same PoC User.

6.2.8.2 State: ‘S: Active’

The ‘S: Active’ state of a PoC Session (one of the Simultaneous PoC Sessions) is a stable state.

In this state the PoC Client is receiving and sending RTP Media packets and TBCP messages of this PoC Session and monitoring TBCP messages and SIP requests with associated SDP information of other PoC Sessions and is reacting on PoC Session events, as specified in the following subclauses.

6.2.8.2.1 Send or receive TBCP message (S/R: TBCP)

Upon receiving TBCP Messages the PoC Client:

1. SHALL act as specified in the PoC Session specific state diagrams and state transitions specified in the subclause 6.2.5 “*PoC Session control state diagram – basic*” or 6.2.9 “*PoC Session control state diagram – queuing*” if queuing of Talk Burst requests are used; and,
2. SHALL remain in ‘S: Active’ state.

6.2.8.2.2 Send or receive RTP media packets (S/R: Media)

When sending or receiving of RTP Media packets for this PoC Session the PoC Client:

1. SHALL act as specified in the PoC Session specific state diagrams and state transitions specified in the subclause 6.2.5 “*PoC Session control state diagram – basic*” or 6.2.9 “*PoC Session control state diagram – queuing*” if queuing of Talk Burst requests are used; and,
2. SHALL remain in ‘S: Active’ state.

6.2.8.2.3 Monitor PoC Session release when no other PoC Sessions are ongoing (M: Last PoC Session released)

When the PoC Session is released and no other PoC Sessions for the same PoC Client are ongoing as specified in [OMA-POC-CP] “*PoC Client setting PoC Session priority*” the PoC Client:

1. SHALL enter the ‘Start-stop’ state.

6.2.8.2.4 Send SDP with Session LockIn; LockIn indication for the active PoC Session (S: Session LockIn; active PoC Session)

Upon receiving an indication from the PoC User that the active PoC Session is to be LockIn the PoC Client:

1. SHALL proceed with message handling as specified in [OMA-POC-CP] “*PoC Client Handling of PoC Session locking*”; and,
2. SHALL remain in ‘S: Active’ state.

6.2.8.2.5 Send SDP with Session LockIn; LockIn indication for another PoC Session (S: Session LockIn; another PoC Session)

Upon receiving an indication from the PoC User that another PoC Session (not the active PoC Session) is to be LockIn the PoC Client:

1. SHALL proceed with message handling as specified in [OMA-POC-CP] “*PoC Client Handling of PoC Session locking*”; and,
2. SHALL enter the ‘S: Dormant’ state.

6.2.8.2.6 Send SDP with Session UnLock; switch to another PoC Session (S: Session UnLock; another PoC Session)

Upon receiving an indication from the PoC User that this PoC Session is to be UnLocked, and if criteria defined in the subclause 7.5.1 “*Procedures at the PoC Client*” for switching to another PoC Session are fulfilled then the PoC Client:

1. SHALL proceed with message handling as specified in [OMA-POC-CP] “*PoC Client Handling of PoC Session locking*”; and,
2. SHALL enter the ‘S: Dormant’ state.

6.2.8.2.7 Send SDP with Session UnLock; remain active in the current PoC Session (S: Session UnLock; remain in PoC Session)

Upon receiving an indication from the PoC User that this PoC Session is to be UnLocked and the PoC Client remains in the current PoC Session (thus the criteria for switching to another PoC Session is not fulfilled) then the PoC Client:

1. SHALL proceed with message handling as specified in [OMA-POC-CP] “*PoC Client Handling of PoC Session locking*”; and,
2. SHALL remain in the ‘S: Active’ state.

6.2.8.2.8 Monitor SDP with Primary PoC Session established or selected (M: Primary PoC Session established or selected)

Upon receiving of an indication that a Primary PoC Session has been established or should become the Active PoC Session based on new priority settings the PoC Client:

1. SHALL proceed with message handling as specified in [OMA-POC-CP] “*PoC Client Setting Session priority*” and,
2. if criteria *specified* in the subclause 7.5.1 “*Procedures at the PoC Client*” for switching to another PoC Session are fulfilled then the PoC Client:
 - a. SHALL enter the ‘S: Dormant’ state.
3. Otherwise the PoC Client:
 - a. SHALL remain in the ‘S: Active’ state.

6.2.8.2.9 Receive RTP Media packets (R: Media for another PoC Session)

Upon receiving RTP Media packets for a different PoC Session the PoC Client:

1. SHALL enter the ‘S: Dormant’ state.

6.2.8.3 State: ‘S: Dormant’

The ‘S: Dormant’ state of a PoC Session is a stable state.

In this state the PoC Client is monitoring TBCP and SIP messages pertaining to this PoC Session and to all other PoC Sessions of the same PoC User and is reacting on PoC Session Activation events, as specified in the following subclauses.

6.2.8.3.1 Send or receive TBCP message (S/R: TBCP)

Upon receiving TBCP messages (other than the TBCP Talk Burst Granted message) or when sending TBCP messages the PoC Client:

1. SHALL act as specified in the PoC Session specific state diagrams and state transitions specified in the subclause 6.2.5 “*PoC Session control state diagram – basic*” or 6.2.9 “*PoC Session control state diagram – queuing*” if queuing of Talk Burst requests are used; and,
2. SHALL remain in ‘S: Dormant’ state.

6.2.8.3.2 Send SDP with Session LockIn for this PoC Session (S: Session LockIn; this PoC Session)

When sending an indication that this PoC Session is to be LockIn, the PoC Client:

1. SHALL proceed with message handling as specified in [OMA-POC-CP] “*PoC Client handling PoC Session locking*”; and,
2. SHALL enter the ‘S: Active’ state.

6.2.8.3.3 Send SDP with Session LockIn for another PoC Session (S: Session LockIn; another PoC Session)

When sending an indication that another PoC Session is to be LockIn, the PoC Client:

1. SHALL proceed with message handling as specified in [OMA-POC-CP] “*PoC Client handling PoC Session locking*”; and,
2. SHALL remain in the ‘S: Dormant’ state.

6.2.8.3.4 Send SDP with Primary PoC Session selected; this PoC Session selected (S: Set Primary PoC Session; this PoC Session)

When sending an indication that a PoC Session is to be selected as Primary PoC Session and if the Primary PoC Session setting is for this PoC Session and if criteria defined in the subclause 7.5.1 “*Procedures at the PoC Client*” for switching to another PoC Session are fulfilled the PoC Client:

1. SHALL proceed with message handling as specified in [OMA-POC-CP] “*PoC Client setting PoC Session priority*”; and,
2. SHALL enter the ‘S: Active’ state.

6.2.8.3.5 Send SDP with Primary PoC Session selected; another PoC Session selected or criteria not fulfilled (S: Set Primary PoC Session; another PoC Session or criteria not fulfilled)

When sending an indication that a PoC Session is to be selected as Primary PoC Session and if the Primary PoC Session setting is for another PoC Session or if criteria defined in the subclause 7.5.1 “*Procedures at the PoC Client*” for switching to another PoC Session are not fulfilled the PoC Client:

1. SHALL proceed with message handling as specified in [OMA-POC-CP] “*PoC Client setting PoC Session priority*”; and,
2. SHALL remain in the ‘S: Dormant’ state.

6.2.8.3.6 Send SDP with PoC Session UnLock and remain active in another PoC Session (S: Session UnLock; remain dormant)

When sending an indication that another PoC Session is to be unlocked and if criteria defined in the subclause 7.5.1 “*Procedures at the PoC Client*” for switching to this PoC Session are not fulfilled, the PoC Client:

1. SHALL proceed with message handling as specified in [OMA-POC-CP] “*PoC Client handling PoC Session locking*”; and,
2. SHALL remain in the ‘S: Dormant’ state.

6.2.8.3.7 Send SDP with PoC Session UnLock and switch to this PoC Session (S: Session UnLock; switch to this PoC Session)

When sending an indication that another PoC Session is to be unlocked and if criteria defined in the subclause 7.5.1 “*Procedures at the PoC Client*” for switching to this PoC Session are fulfilled, the PoC Client:

1. SHALL proceed with message handling as specified in [OMA-POC-CP] “*PoC Client handling PoC Session locking*”; and,
2. SHALL enter the ‘S: Active’ state.

6.2.8.3.8 Monitor PoC Session release and activate this PoC Session (M: PoC Session released; activate this PoC Session)

Upon receiving an indication that another PoC Session has been released, and if criteria for activation of this PoC Session defined in the subclause 7.5.1 “*Procedures at the PoC Client*” activation for this PoC Session are fulfilled, then the PoC Client:

1. SHALL enter the ‘S: Active’ state.

6.2.8.3.9 Monitor PoC Session release and remain active in another PoC Session (M: PoC Session released; remain dormant)

Upon receiving an indication that another PoC Session has been released, and if criteria for activation of this PoC Session defined in the subclause 7.5.1 “*Procedures at the PoC Client*” activation for this PoC Session are not fulfilled, then the PoC Client:

1. SHALL remain in the ‘S: Dormant’ state.

6.2.8.3.10 Receive TBCP Talk Burst Granted message (R: TB_Granted)

When receiving a TBCP Talk Burst Granted message in a response to a TBCP Talk Burst Request the PoC Client:

1. SHALL enter the ‘S: Active’ state;
2. MAY provide information about the stop talking timer to the PoC User; and,
3. MAY provide notification of the number of Participants, receiving Talk Bursts in the PoC Session, to the PoC User, if included in the message

6.2.8.3.11 Receive RTP Media packets (R: Media for this PoC Session)

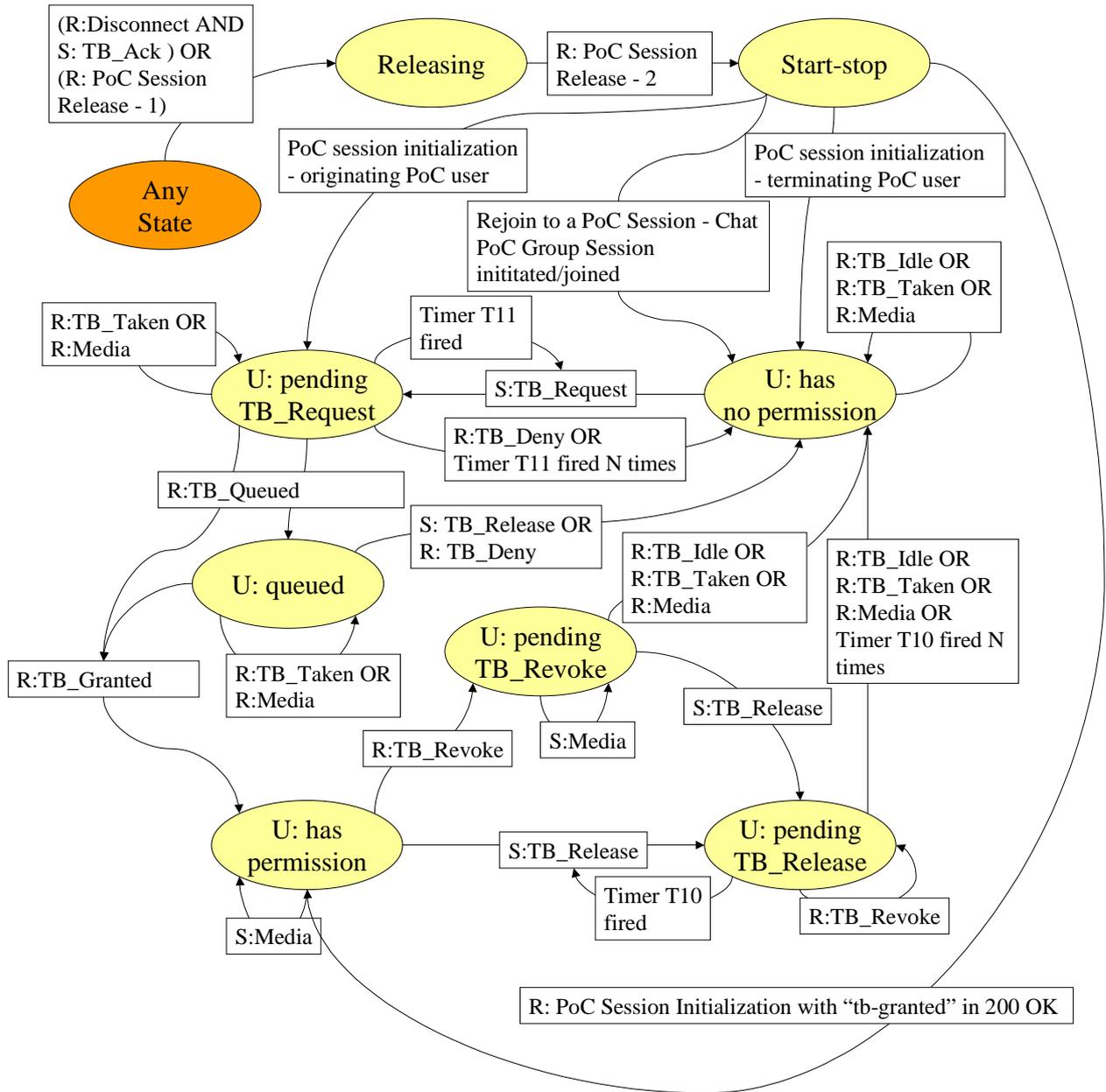
Upon receiving RTP Media packets for this PoC Session the PoC Client:

1. SHALL enter the ‘S: Active’ state.

6.2.9 PoC Session control state diagram – queuing

If the PoC Client and PoC Server negotiate support of queuing for the PoC Session, the PoC Client SHALL support the state diagram and the state transitions specified in this subclause.

Figure 7 “PoC Session control state diagram – queuing” shows the state diagram for queued operation.



NOTE: T10 is the ‘Talk Burst Release’ timer and T11 is the ‘Talk Burst Request’ timer.

Figure 7: PoC Session control state diagram – queuing

State details are explained in the following subclauses.

If a TBCP message or RTP Media packet arrives in any state and there is no procedure specified for it in the subclauses below the PoC Client SHALL discard the TBCP message or RTP Media packet and SHALL remain in the current state.

6.2.9.1 State: 'Start-stop'

In this state no PoC Session exists.

Do the actions specified in the subclause 6.2.5.1 "*State: 'Start-stop'*".

6.2.9.2 State: 'U: has no permission'

Do the actions specified in the subclause 6.2.5.2 "*State: 'U: has no permission'*", but instead of subclause 6.2.5.2.4 "*Send TBCP Talk Burst Request message (S: TB_Request)*" do 6.2.9.2.1 "*Send TBCP Talk Burst Request message (S: TB_Request)*".

6.2.9.2.1 Send TBCP Talk Burst Request message (S: TB_Request)

Upon receiving an indication from the PoC User to request permission to speak the PoC Client:

1. if the PoC Client has a maxpriority = '00 - listen only' the PoC Client:
 - a. SHALL provide an indication to the User that the PoC Client is in listen only mode; and,
 - b. SHALL remain in the 'U: has no permission' state.
2. Otherwise the PoC Client:
 - a. SHALL send the TBCP Talk Burst Request message toward the PoC Server;

The TBCP Talk Burst Request message:

 - i. MAY include the Talk Burst request priority level; and,
 - ii. MAY include the Talk Burst request timestamp.
 - b. SHALL start T11 (Talk Burst Request) timer; and,
 - c. SHALL enter the 'U: pending TB_Request' state.

6.2.9.3 State: 'U: pending TB request'

The 'U: pending TB_Request' state is a transition state, and the PoC Client uses this state when the PoC Client is waiting for response to a TBCP Talk Burst Request message.

In this state the PoC Client may receive RTP Media packets or TBCP Talk Burst Control messages.

Timer T11 (Talk Burst Request) is running in this state.

6.2.9.3.1 Receive TBCP Talk Burst Granted message (R: TB_Granted)

Do the actions specified in the subclause 6.2.5.3.1 "*Receive TBCP Talk Burst Granted message (R: TB_Granted)*".

6.2.9.3.2 Receive TBCP Talk Burst Taken message (R: TB_Taken)

Upon receiving a TBCP Talk Burst Taken message from the PoC Server, the PoC Client:

1. SHALL provide Talk Burst taken notification to the PoC User.
2. SHOULD perform the mapping between the SSRC of the PoC Client granted a permission to send a Talk Burst and the PoC Address and/or Nick Name, if they are included in the message;

3. MAY display the PoC Address and/or Nick Name based on SSRC of the sending PoC Client, if mapping between those exists in PoC Client; and,
4. SHALL remain in the 'U: pending TB_Request' state.

6.2.9.3.3 Receive TBCP Talk Burst Deny message (R: TB_Deny)

Do the actions specified in the subclause 6.2.5.3.3 "*Receive TBCP Talk Burst Deny message (R: TB_Deny)*".

6.2.9.3.4 T11 (Talk burst request) timer fired

On firing of timer T11 (Talk Burst Request), the PoC Client:

1. SHALL send a TBCP Talk Burst Request message towards the PoC Server.

The TBCP Talk Burst Request message:

- a. MAY include the Talk Burst request priority level; and,
 - b. MAY include the Talk Burst Request Timestamp of the original Talk Burst Request.
2. SHALL remain in the U: pending TB_Request' state

6.2.9.3.5 T11 timer fired N times

Do the action specified in the subclause 6.2.5.3.5 "*T11 timer fired N times*".

6.2.9.3.6 Receive RTP Media packets (R: Media)

Upon receiving RTP Media packets the PoC Client:

1. SHALL render the media;
2. MAY display the PoC Address and/or Nick Name based on SSRC of the sending PoC Client, if mapping between those exists in PoC Client; and,
3. SHALL remain in the 'U: pending TB_Request' state.

6.2.9.3.7 Receive TBCP Talk Burst Request Queue Status Response message (R: TB_Queued)

Upon receiving a TBCP Talk Burst Request Queue Status Response message from the PoC Server,

1. if the message indicates that the request has been queued, the PoC Client:
 - a. SHALL provide Talk Burst request queued status response notification to the PoC User;
 - b. MAY provide the queue position (if available) to the PoC User;
 - c. SHALL stop T11 (Talk Burst Request) timer; and,
 - d. SHALL enter the 'U: queued' state.
2. if the message indicates that the request has not been queued the PoC Client:
 - a. SHALL remain in the 'U: pending TB_Request' state.

6.2.9.4 State: 'U: has permission'

Do the actions specified in the subclause 6.2.5.4 "*State: 'U: has permission'*".

6.2.9.5 State: 'U: pending TB Release'

Do the actions specified in the subclause 6.2.5.5 "State: 'U: pending TB Release'".

6.2.9.6 State: 'U: pending TB_Revoke'

Do the actions specified in the subclause 6.2.5.6 "State: 'U: pending TB_Revoke'".

6.2.9.7 State: 'U: Queued'

The 'U: queued' state is a stable state and the PoC Client uses this state when the PoC Client has received indication from the PoC Server that a request to send a Talk Burst has been queued by the PoC Server, and is awaiting indication that a Talk Burst has been granted. In this state the PoC Client may receive RTP Media packets and may send and receive TBCP Talk Burst Control messages.

6.2.9.7.1 Receive RTP Media packets (R: Media)

Upon receiving RTP Media packets the PoC Client:

1. SHALL render the media;
2. MAY display the PoC Address and/or Nick Name based on SSRC of the sending PoC Client, if mapping between those exists in PoC Client;
3. SHOULD restart the T13 (end of RTP media) timer; and,
4. SHALL remain in the 'U: Queued' state.

6.2.9.7.2 Receive TBCP Talk Burst Taken message (R: TB_Taken)

Upon receiving a TBCP Talk Burst Taken message from the PoC Server, the PoC Client:

1. SHOULD perform the mapping between the SSRC of the PoC Client granted a permission to send a Talk Burst and the PoC Address and/or Nick Name, if they are included in the message;
2. MAY display the PoC Address and Nick Name to the PoC User, if they are included in the message, or alternatively if the PoC Client has a mapping between SSRC of the PoC Client granted a permission to send a Talk Burst and the PoC Address and /or Nick Name;
3. SHALL provide Talk Burst taken notification to the PoC User; and,
4. SHALL remain in the 'U: Queued' state.

6.2.9.7.3 Receive TBCP Talk Burst Granted message (R: TB_Granted)

Upon receiving a TBCP Talk Burst Granted message from the PoC Server, the PoC Client:

1. SHALL provide Talk Burst granted notification to the PoC User;
2. MAY provide information about the stop talking timer to the PoC User;
3. MAY provide notification of the number of Participants, receiving Talk Bursts in the PoC Session, to the PoC User, if included in the message; and,
4. SHALL enter the 'U: has permission' state.

6.2.9.7.4 Receive TBCP Talk Burst Deny message (R: TB_Deny)

Upon receiving a TBCP Talk Burst Deny message from the PoC Server, the PoC Client:

1. SHALL provide Talk Burst deny notification to the PoC User;

2. MAY display the Talk Burst Deny reason, if it is included in the message; and,
3. SHALL enter the 'U: has no permission' state.

6.2.9.7.5 Send TBCP Talk Burst Release message (S: TB_Release)

Upon receiving an indication to release the queued Talk Burst request from the PoC User, the PoC Client:

1. SHALL send a TBCP Talk Burst Release message towards the PoC Server.

The TBCP Talk Burst Release message:

- a. SHALL include the sequence number ignore field set to 1.
2. SHALL enter the 'U: has no permission' state.

6.2.9.8 State: Any state

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

6.2.9.8.1 Receive TBCP Disconnect message (R: Disconnect)

Do the actions specified in the subclause 6.2.5.7.1 "*Receive TBCP Disconnect message (R: Disconnect)*".

6.2.9.8.2 Receive PoC Session release - 1 (R: PoC Session release - 1)

Do the actions specified in the subclause 6.2.5.7.2 "*Receive PoC Session release - 1*".

6.2.9.9 State: Releasing

Do the actions specified in the subclause 6.2.5.8 "*State: Releasing*".

6.3 Procedures at the PoC Server performing the Participating PoC Function

6.3.1 General

The PoC Server SHALL support the basic procedures specified in the subclause 6.3.4 "*PoC Session Procedures – Basic*" if the PoC Server stays in the media path.

The PoC Server MAY support the Pre-established Session procedure as specified in subclauses 6.3.6 "*Pre-established Session state diagrams – basic*".

The PoC Server MAY support the Simultaneous PoC Session procedure as specified in the subclause 6.2.7 "*Simultaneous PoC Sessions state diagram - per PoC Client*" and 6.3.8 "*Simultaneous PoC Sessions state diagram - per PoC Session*".

6.3.2 Participating PoC Function procedures at PoC Session initialization

There are two types of PoC Sessions where the PoC Server needs to initiate procedures in the User Plane:

1. The PoC Session is an On-demand Session and the PoC Server remains in the transport path; or,
2. The PoC Session is using a Pre-established Session.

If the PoC Server and PoC Client support Simultaneous PoC Sessions, the PoC Session may be one of many Simultaneous PoC Sessions that the PoC Server is managing for a given PoC Client. When the first PoC Session is established, the procedures specified in subclause 6.2.7 "*Simultaneous PoC Sessions state diagram – per PoC Client*" are performed.

If the PoC Session is either an On-demand Session or a PoC Session using a Pre-established Session, if the PoC Server does not support Simultaneous PoC Sessions, the procedures in subclause 6.3.5 “*PoC Session Procedure –basic*” is performed.

Before the PoC Server sends the first Talk Burst Control Protocol message in the PoC Session, the PoC Server has to assign itself a SSRC identifier to be included in the Talk Burst Control Protocol messages. A suitable algorithm to generate the SSRC identifier is described in [RFC3550].

6.3.3 Participating PoC Function procedures at PoC Session release

When a PoC Session is released (whether it is initiated by the PoC Client or PoC Server) and the PoC Server remained on the transport path, a two-stage procedure is followed:

1. In the first stage, the PoC Server stops forwarding all TBCP messages, RTP media and RTCP packets between the PoC Client and the PoC Server performing the Controlling PoC Function.
2. In the second stage, the PoC Server terminates any processes or state machines on the User Plane associated with this PoC Session.

There are no cases where a User Plane state machine will cause the PoC Session to be released.

If Simultaneous PoC Sessions are supported:

1. The ‘Simultaneous PoC Sessions state machine – per PoC Client’ associated with the PoC Session being released is terminated; and,
2. if the last PoC Session is being released, the ‘Simultaneous PoC Sessions state machine – per PoC Client’ is terminated.

If the PoC Session uses a Pre-established Session, the Pre-established Session state machine returns to the a state specified in subclause 6.3.6 “*Pre-established Session state diagrams – basic*”.

If a Pre-established Session is released, the Pre-established Session state machine is terminated.

6.3.4 Participating PoC Function procedures at Pre-established Session release

The User Plane resources for a Pre-established Session are released after the Control Plane has released the Pre-established Session. This means that any PoC Session over the Pre-established Session has been released before the Pre-established Session is released and so, there are no RTP Media packets or TBCP messages flowing at the time that the Pre-established Session is released. All that the PoC Server needs to do is to release any User Plane resources associated with the Pre-established Session.

6.3.5 PoC Session Procedures – basic

When a PoC Session is initiated and the PoC Server remains on the transport path, a process SHALL be created that

1. SHALL forward all TBCP messages from the PoC Client to the PoC Server performing the Controlling PoC Function at the address and port as specified during PoC Session setup. See [OMA-POC-CP] “*Participating PoC Function procedures*”.
2. SHALL forward all TBCP messages from the PoC Server performing the Controlling PoC Function to the PoC Client at the address and port as specified during PoC Session setup. See [OMA-POC-CP] “*Participating PoC Function procedures*”.
3. SHALL forward all RTP Media packets from the PoC Client to the PoC Server performing the Controlling PoC Function at the address and port as specified during PoC Session setup. See [OMA-POC-CP] “*Participating PoC Function procedures*”.

4. SHALL forward all RTP Media packets from the PoC Server performing the Controlling PoC Function to the PoC Client at the address and port as specified during PoC Session setup. See [OMA-POC-CP] “*Participating PoC Function procedures*”.

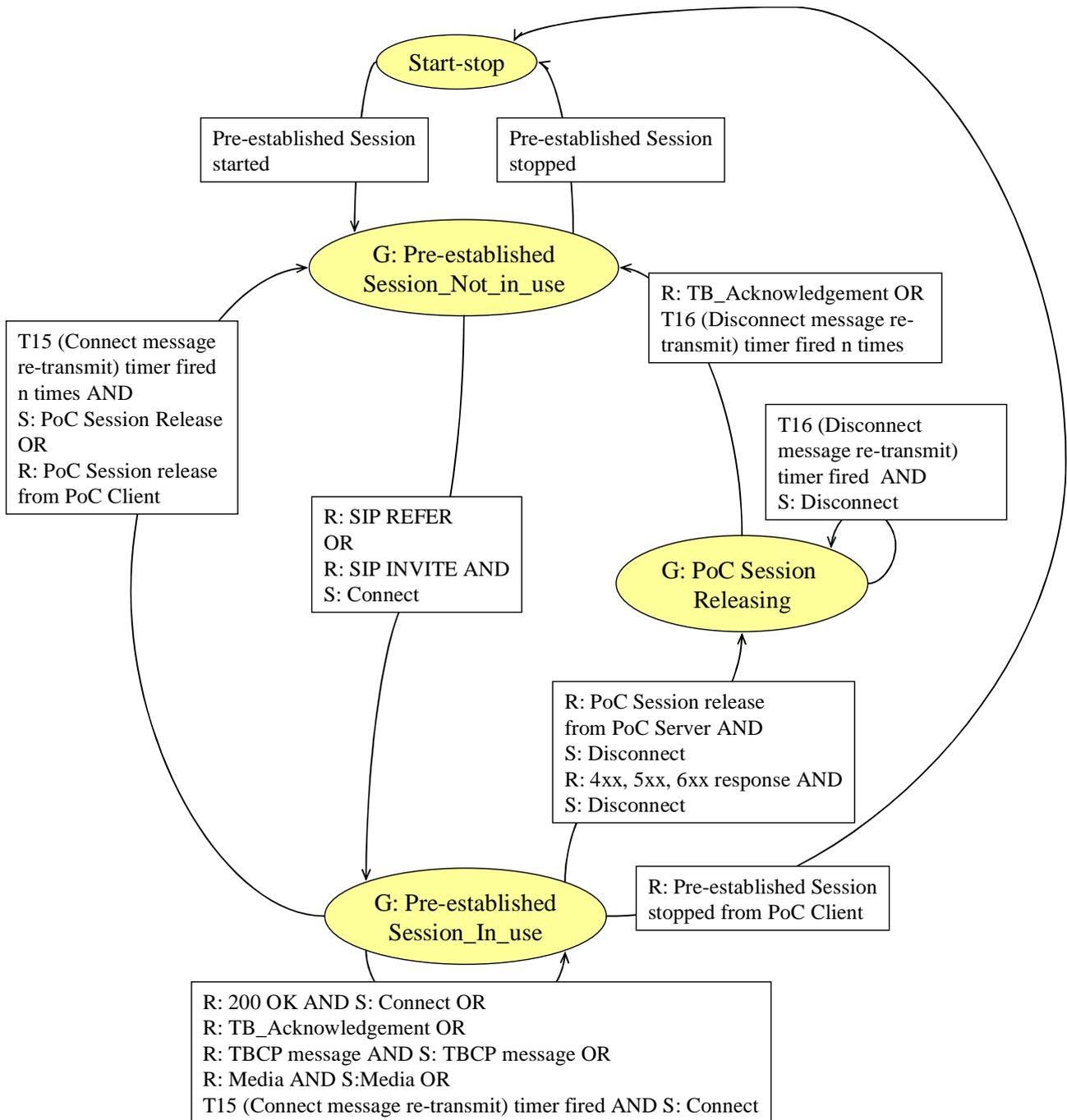
NOTE: The handling of RTCP packets is explained in the subclause 5.4 “*RTCP*”.

6.3.6 Pre-established Session state diagrams – basic

If the PoC Server supports Pre-established Session the PoC Server SHALL support the state diagram and the state transitions specified in this subclause.

Pre-established Session has three states: ‘Pre-established Session_Not_In_Use’ state, Pre-established Session_In_use’ state and ‘PoC Session Releasing’ state. The states are partly controlled by the Control Plane as specified in [OMA-POC-CP].

Figure 8 “*Pre-established Session state diagrams – basic*” shows the general Pre-established Session states (G states) and the state transitions.



NOTE: T15 is the 'Connect message re-transmit' timer and T 16 is the 'Disconnect message re-transmit' timer.

Figure 8: Pre-established Session state diagrams – basic

The PoC Server SHALL create one instance of the Pre-established Session state machine per Pre-established Session initiated by PoC Client.

State details are explained in the following subclauses.

If a TBCP message, SIP request, SIP response or RTP Media packet arrives in any state and there is no procedure specified for it in the subclauses below the PoC Server SHALL discard the TBCP message, SIP request, SIP response or RTP Media packet and SHALL remain in the current state.

6.3.6.1 State 'Start-stop'

In this state, no Pre-established Session exists.

6.3.6.1.1 Pre-established Session started

When a Pre-established Session is created between the PoC Server and a PoC Client, the PoC Server:

1. SHALL initialize any needed User Plane resources for the Pre-established Session; and,
2. SHALL enter the 'G: Pre-established Session_Not_in_use' state.

6.3.6.2 State 'G: Pre-established Session_Not_in_use'

The 'G: Pre-established Session_Not_in_use' state is a stable state. The PoC Server Function is in this state when the Pre-established Session is established, but it is not used for a PoC Session.

In this state the PoC Server may receive PoC Session initiation or RTP Media packets.

6.3.6.2.1 Receive SIP REFER request (R: SIP REFER)

Upon receiving a SIP REFER request from the PoC Client the PoC Server:

1. SHALL enter the 'G: Pre-established Session_In_use' state.

6.3.6.2.2 Receive SIP INVITE request (R: SIP INVITE)

Upon receiving a SIP INVITE request from the PoC Server performing the Controlling PoC Function the PoC Server:

1. if Automatic Answer Mode is used the PoC Server:
 - a. SHALL send the TBCP Connect message to the invited PoC Client.

The TBCP Connect message:

- i. SHALL include the CNAME to identify the PoC Session Identity;
 - ii. SHALL include the CNAME to identify the PoC Client initiating the PoC Session, if privacy was not requested;
 - iii. MAY include the NAME to identify the Nick Name of the PoC Client initiating the PoC Session;
 - iv. SHALL include the CNAME of the PoC Group Identity, if this is a Pre-arranged or Chat PoC Group Session; and,
 - v. MAY include the NAME to identify the PoC Group Name, if this is a Pre-arranged or Chat PoC Group Session.
- b. SHALL start the T15 (Connect message re-transmit) timer; and,
2. SHALL enter the 'G: Pre-established Session_In_use' state.

NOTE: In case manual answer is used the procedure is described in [OMA-POC-CP] "*Manual-Answer*".

6.3.6.2.3 Pre-established Session stopped

When the Pre-established Session between the PoC Client and the PoC Server is stopped, the PoC Server:

1. SHALL release any User Plane resources including any running timers associated with the Pre-established Session; and,
2. SHALL enter the 'Start-stop' state.

6.3.6.3 State 'G: Pre-established Session_In_use'

The 'G: Pre-established Session_In_use' state is a stable state. The PoC Server is in this state when a Pre-established Session is established and it is used for a PoC Session.

In this state the PoC Server may receive RTP Media packets and TBCP messages.

6.3.6.3.1 Receive TBCP message (R: TBCP message)

Upon receiving a TBCP message the PoC Server:

1. SHALL forward the TBCP message between the PoC Client and the PoC Server performing the Controlling PoC Function; and,
2. SHALL remain in the 'Pre-established Session_In_use' state.

6.3.6.3.2 Receive RTP Media packets (R: Media)

Upon receiving RTP Media packets the PoC Server:

1. SHALL forward the RTP Media packets between the PoC Client and the PoC Server performing the Controlling PoC Function; and,
2. SHALL remain in the 'Pre-established Session_In_use' state.

6.3.6.3.3 Receive PoC Session release indication from PoC Client (R: PoC Session release from PoC Client)

Upon receiving an indication that the PoC Session is released, but the Pre-established Session is kept alive the PoC Server:

1. SHALL send PoC Session release to the Controlling PoC Function as specified in [OMA-POC-CP] "*PoC Session release from User Plane*";
2. SHALL release any User Plane resources associated with the PoC Session; and,
3. SHALL enter the 'G: Pre-established Session_Not_in_use' state.

6.3.6.3.4 Receive PoC Session release indication from Controlling PoC Function (R: PoC Session release from PoC Server)

Upon receiving an indication from the PoC Server performing the Controlling PoC Function that the PoC Session is released, the PoC Server:

1. SHALL send a TBCP Disconnect message to the PoC Client;
2. SHALL start the T16 (Disconnect message re-transmit) timer; and,
3. SHALL enter the 'G: PoC Session Releasing' state.

6.3.6.3.5 Receive Pre-established Session stopped indication from PoC Client (R: Pre-established Session stopped from PoC Client)

Upon receiving an indication from the PoC Client that the Pre-established Session is released, the PoC Server:

1. SHALL stop sending RTP media packets and TBCP messages between the PoC Client and the PoC Server performing the Controlling PoC Function;
2. SHALL release any User Plane resources including any running timers associated with the PoC and Pre-established Sessions; and,
3. SHALL enter the 'Start-stop' state.

6.3.6.3.6 Receive TBCP Talk Burst Acknowledgement message (R: TB_Ack)

Upon receiving a TBCP Talk Burst Acknowledgement message from the PoC Client, the PoC Server:

1. SHALL stop the T15 (Connect message re-transmit) timer; and,
2. if the reason code is not "Accepted" the PoC Server:
 - a. SHALL send TBCP Disconnect message to the PoC Client;
 - b. SHALL start the T16 (Disconnect message re-transmit) timer;
 - c. SHALL send a PoC Session release to the Controlling PoC Function as specified in in [OMA-POC-CP] "*PoC Session release from User Plane*"; and,
 - d. SHALL enter the 'G: Releasing' state.
3. Otherwise the PoC Server:
 - a. SHALL remain in the 'G: Pre-established Session_In_use' state.

6.3.6.3.7 T15 (Connect message re-transmit) timer fired

On expiry of T15 (Connect message re-transmit) timer, the PoC Server:

1. SHALL send a TBCP Connect message to the PoC Client.
The TBCP Connect message:
 - a. SHALL include the CNAME to identify the PoC Session Identity;
 - b. SHALL include the CNAME to identify the PoC Client initiating the PoC Session, if privacy was not requested;
 - c. MAY include the NAME to identify the Nick Name of the PoC Client initiating the PoC Session;
 - d. SHALL include the CNAME of the PoC Group Identity, if this is a Pre-arranged or Chat PoC Group Session; and,
 - e. MAY include the NAME to identify the PoC Group Name, if this is a Pre-arranged or Chat PoC Group Session.
2. SHALL restart the T15 (Connect message re-transmit) timer; and,
3. SHALL remain in the 'G: Pre-established Session_In_use' state.

6.3.6.3.8 T15 (Connect message re-transmit) timer fired N times

On the N:th firing of timer T15 (Connect message re-transmit), the PoC Server:

1. SHALL send a PoC Session release to the Controlling PoC Function as specified in [OMA-POC-CP] "*PoC Session release from User Plane*".
2. SHALL release User Plane resources; and,
3. SHALL enter the 'G: Pre-established Session_Not_in_use' state.

6.3.6.3.9 Receive SIP 200 “OK” response (R: SIP 200 OK)

Upon receiving a SIP 200 “OK” response from the PoC Server performing the Controlling PoC Function the PoC Server:

1. SHALL send the TBCP Connect message to the PoC Client, which initiated a PoC Session.

The TBCP Connect message:

- a. SHALL include the CNAME to identify the PoC Session Identity;
 - b. SHALL include the CNAME to identify the PoC Client initiating the PoC Session, if privacy was not requested;
 - c. MAY include the NAME to identify the Nick Name of the PoC Client initiating the PoC Session;
 - d. SHALL include the CNAME of the PoC Group Identity, if this is a Pre-arranged or Chat PoC Group Session; and,
 - e. MAY include the NAME to identify the PoC Group Name, if this is a Pre-arranged or Chat PoC Group Session.
2. SHALL start the T15 (Connect message re-transmit) timer; and,
 3. SHALL remain in the ‘G: Pre-established Session_In_use’ state.

6.3.6.3.10 Receives a failed SIP response from the Controlling PoC Function (R: PoC Session release from PoC Server)

Upon receiving a failed PoC Session establishment indication from the PoC Server performing the Controlling PoC Function, the PoC Server:

1. SHALL send a TBCP Disconnect message to the PoC Client;
2. SHALL start the T16 (Disconnect message re-transmit) timer;
3. SHALL terminate the PoC Session; and,
4. SHALL enter the ‘G: PoC Session Releasing’ state.

6.3.6.4 State ‘G: PoC Session Releasing’

The ‘G: PoC Session Releasing’ state is a transition state. The PoC Server is in this state when a PoC Server originated PoC Session is releasing.

The T16 (Disconnect message re-transmit) timer is running in this state.

6.3.6.4.1 Receive TBCP Talk Burst Acknowledgement message (R: TB_Acknowledgement)

Upon receiving a TBCP Talk Burst Acknowledgement message from the PoC Client, the PoC Server:

1. SHALL stop the T16 (Disconnect message re-transmit) timer;
2. SHALL stop T15 (Connect message re-transmit), if running;
3. SHALL release any User Plane resources associated with the PoC Session; and,
4. SHALL enter the ‘G: Pre-established Session_Not_in_use’ state.

6.3.6.4.2 T16 (Disconnect message re-transmit) timer fired

On expiry of T16 (Disconnect message re-transmit) timer, the PoC Server:

1. SHALL send a TBCP Disconnect message to the PoC Client;

2. SHALL restart the T16 (Disconnect message re-transmit) timer; and,
3. SHALL remain in the 'G: PoC Session Releasing' state.

6.3.6.4.3 T16 timer fired N times

On the N: th firing of timer T16 (Disconnect message re-transmit), the PoC Server:

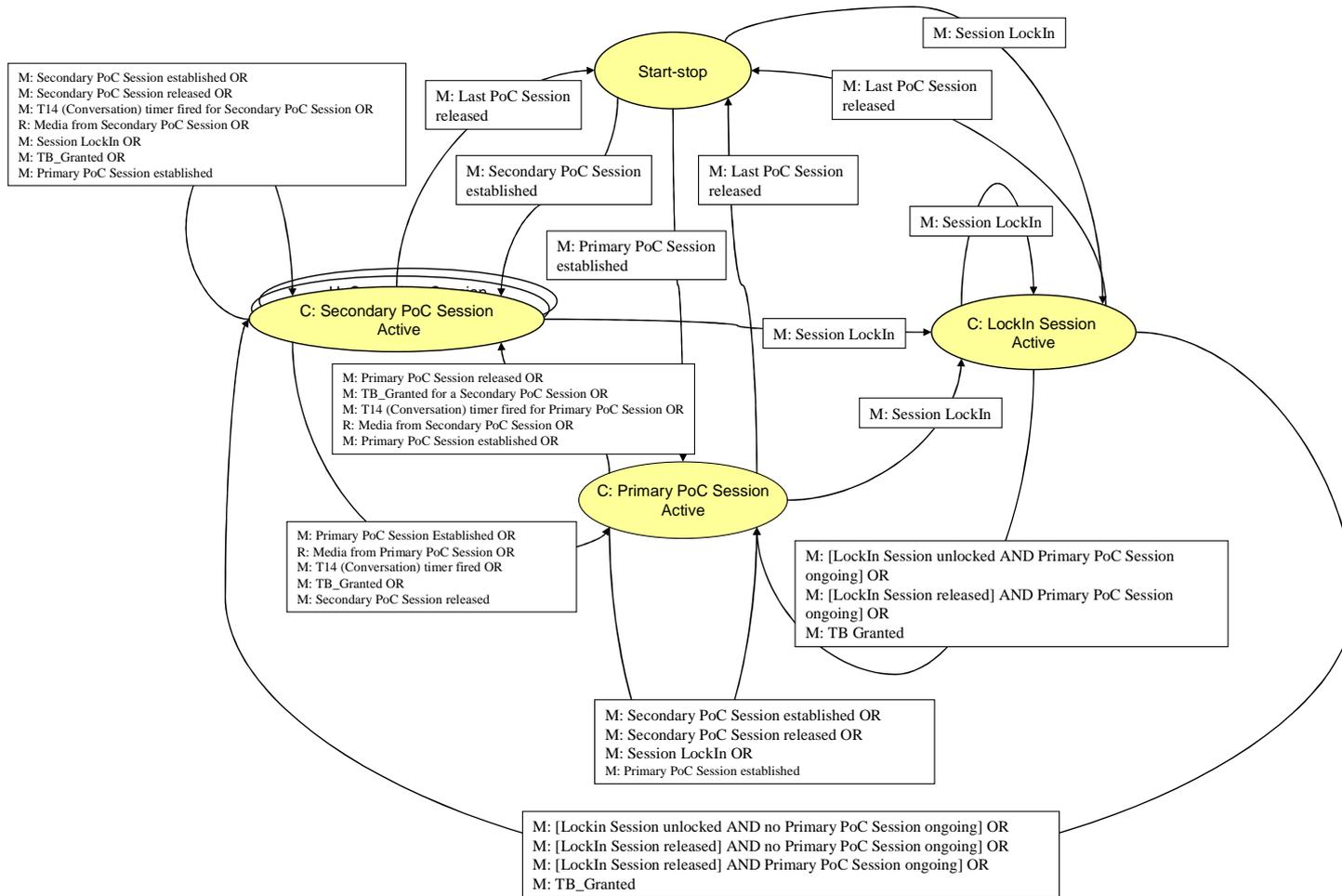
1. SHALL stop the T16 (Disconnect message re-transmit) timer;
2. SHALL release any User Plane resources associated with the PoC Session; and,
3. SHALL enter the 'G: Pre-established Session_Not_in_use' state.

6.3.7 Simultaneous PoC Sessions state diagram - per PoC Client

If the PoC Server supports Simultaneous PoC Sessions the PoC Server SHALL support the state diagram and the state transitions specified in this subclause.

The PoC Server SHOULD determine the PoC Sessions used by the PoC Client as specified in subclause [OMA-POC-CP] "*PoC Session association*".

Figure 9 "*Simultaneous PoC Sessions state diagram - per PoC Client*" shows the state diagram for Simultaneous PoC Session per PoC Client.



NOTE: T14 is the 'Conversation' timer.

Figure 9: Simultaneous PoC Sessions state diagram - per PoC Client

State details are explained in the following subclauses.

If a TBCP message, SIP request or RTP Media packet arrives in any state and there is no procedure specified for it in the subclauses below the PoC Server SHALL discard the TBCP message, SIP request or RTP Media packet and SHALL remain in the current state.

6.3.7.1 State 'Start-stop'

The state 'Start-stop' is a stable state. In this state no PoC Session exists.

6.3.7.1.1 Monitor Primary PoC Session establishment (M: Primary PoC Session established)

When a Primary PoC Session is established as specified in [OMA-POC-CP] "PoC Session priority request" the PoC Server:

1. SHALL create an instance of the Simultaneous PoC Sessions state machine - per PoC Client; and,

2. SHALL enter the 'C: Primary PoC Session Active' state.

6.3.7.1.2 Monitor Secondary PoC Session establishment (M: Secondary PoC Session established)

When a Secondary PoC Session is established as specified in the [OMA-POC-CP] "*PoC Session priority request*" the PoC Server:

1. SHALL create an instance of the Simultaneous PoC Sessions state machine - per PoC Client; and,
2. SHALL enter the 'S: Secondary PoC Session Active' state.

6.3.7.1.3 Monitor SDP LockIn PoC Session establishment (M: Session LockIn)

When a PoC Session is established as specified in the [OMA-PoC-CP] "*PoC Session Locking request*" the PoC Server:

1. SHOULD create an instance of the Simultaneous PoC Sessions state machine - per PoC Client; and,
2. SHOULD enter the 'C: LockIn PoC Session Active' state.

6.3.7.2 State 'C: Primary PoC Session Active'

The "C: Primary PoC Session Active state" is a stable state. In this state a Primary PoC Session exists as an Active PoC Session. In the 'C: Primary PoC Session Active' state the PoC Server:

1. SHALL start the T14 (Conversation) timer upon receipt of the TBCP Talk Burst Release message from the PoC Client or TBCP Talk Bust Idle message from the PoC Server performing the Controlling PoC Function for this PoC Session;
2. SHALL stop the T14 (Conversation) timer upon receipt of a Talk Burst for this PoC Session;
3. SHALL relay RTP Media packets between the PoC Server performing the Controlling PoC Function and the PoC Client for this PoC Session; and,
4. SHALL NOT relay RTP Media packets between the PoC Server performing the Controlling PoC Function and the PoC Client for any other PoC Session(s).

6.3.7.2.1 Monitor Primary PoC Session release when no other PoC Sessions are established (M: Last PoC Session released)

When a Primary PoC Session is released and no other PoC Sessions for the same PoC Client are established as specified in [OMA-POC-CP] the PoC Server:

1. SHALL enter the PoC Client state to 'Start-Stop' state.

6.3.7.2.2 Monitor SDP with PoC Session LockIn (M: Session LockIn)

When a Primary PoC Session is an Active PoC Session and the PoC Server receives SDP: LockIn information for this Session as specified in [OMA-POC-CP] "*PoC Session locking request*" the PoC Server:

1. SHALL enter the 'C: LockIn PoC Session Active' state.

When the PoC Server receives SDP LockIn information for another PoC Session for this PoC Client as specified in [OMA-PoC-CP] "*PoC Session locking request*" the PoC Server either

1. SHOULD enter the 'C: LockIn PoC Session Active' state if the PoC Client does not have the permission to send a Talk Burst, for this Primary PoC Session;
- or,
2. SHOULD

- a. remain in the 'C: Primary PoC Session Active' state if the PoC Client has permission to send a Talk Burst for this Primary PoC Session; and,
- b. reject the LockIn request as specified in [OMA-PoC-CP] "*PoC Session locking request*".

NOTE: The LockIn request can be received when initializing a PoC Session or during the PoC Session.

6.3.7.2.3 Monitor Secondary PoC Session release (M: Secondary PoC Session released)

When a Secondary PoC Session is released as specified in [OMA-POC-CP] the PoC Server:

1. SHALL remain in PoC Client state to 'C: Primary PoC Session Active'.

6.3.7.2.4 Monitor Secondary PoC Session establishment (M: Secondary PoC Session established)

When a Secondary PoC Session is established as specified in [OMA-POC-CP] "*PoC Client setting PoC Session priority*" the PoC Server:

1. SHALL remain in PoC Client state to 'C: Primary PoC Session Active'.

6.3.7.2.5 Monitor Primary PoC Session release (M: Primary PoC Session released)

When a Primary PoC Session is released and other PoC Sessions for the same PoC Client are ongoing the PoC Server:

1. SHALL enter to 'C: Secondary PoC Session Active' state.

6.3.7.2.6 Monitor Talk Burst message (M:TB_Granted for a PoC Secondary PoC Session)

When the PoC Server receives a TBCP Talk Burst Granted message in response to a TBCP Talk Burst Request message of the PoC Client for a secondary PoC Session, the PoC Server:

1. SHALL enter the 'C: Secondary PoC Session active'; and,
2. SHALL unlock the PoC Session as specified in [OMA-POC-CP] "*PoC Session Locking request*".

6.3.7.2.7 T14 (Conversation) timer fired for Primary PoC Session

When T14 (Conversation) timer fires for the Primary PoC Session and at least one other Secondary PoC Session for the same PoC Client is established as specified in the [OMA-POC-CP] and fulfils conditions as defined in the subclause 7.5.2 "*Procedures at the PoC Server performing the participating PoC Function*" to be activated, the PoC Server:

1. MAY send TBCP Talk Burst Taken message to the PoC Client, if the Talk Burst is on-going;

NOTE: The TBCP Talk Burst Taken message is the same as the one received from the PoC Server performing the Controlling PoC Function in the beginning of the Talk Burst.

2. SHALL enter the 'C: Secondary PoC Session active' state for the identified Secondary PoC Session.

6.3.7.2.8 Monitor Primary PoC Session establishment (M: Primary PoC Session established)

When a Primary PoC Session is established or when a Secondary PoC Session becomes a Primary PoC Session as specified in [OMA-POC-CP] "*PoC Session priority request*" the PoC Server:

1. SHOULD remain in the 'C: Primary PoC Session Active' state if the new PoC Session fulfils conditions as defined in the subclause 7.5.2 "*Procedures at the PoC Server performing the Participating PoC Function*" to be activated;

or,

2. SHOULD enter the 'C: Secondary PoC Session active' state if the existing Primary PoC Session fulfils conditions as defined in the subclause 7.5.2 "*Procedures at the PoC Server performing the Participating PoC Function*" to be activated.

6.3.7.2.9 Monitor Secondary PoC Session receiving RTP Media packets (R: Media from Secondary PoC Session)

When receiving RTP Media packets in one of the Secondary PoC Sessions and that Secondary PoC Session fulfils conditions as defined in the subclause 7.5.2 "*Procedures at the PoC Server performing the participating PoC Function*" to be activated and the T14 (Conversation) timer has expired, the PoC Server:

1. MAY send a TBCP Talk Burst Taken message to the PoC Client, if the Talk Burst is on-going; and,
2. SHOULD enter the 'C: Secondary PoC Session active' state for the identified Secondary PoC Session.

6.3.7.3 State: 'C: Secondary PoC Session Active'

The 'C: Secondary PoC Session active' state is a stable state. In this state a PoC Secondary PoC Session exists as an Active PoC Session. In the 'C: Secondary PoC Session Active' state the PoC Server:

1. SHALL start the T14 (Conversation) timer upon receipt of the TBCP Talk Burst Release message from the PoC Client or TBCP Talk Bust Idle message from the PoC Server performing the Controlling PoC Function for this PoC Session;
2. SHALL stop the T14 (Conversation) timer upon receipt of a Talk Burst for this PoC Session;
3. SHALL relay RTP Media packets between the PoC Server performing the Controlling PoC Function and the PoC Client for this PoC Session; and,
4. SHALL NOT relay RTP Media packets between the PoC Server performing the Controlling PoC Function and the PoC Client for any other PoC Session(s).

6.3.7.3.1 Monitor Secondary PoC Session release when no other PoC Sessions are established (M: Last PoC Session released)

When the Secondary PoC Session is released and no other PoC Sessions for the same PoC Client are established as specified in [OMA-POC-CP] "*PoC Session priority request*" the PoC Server:

1. SHALL enter the 'Start-stop' state.

6.3.7.3.2 Monitor SDP with PoC Session LockIn (M: Session LockIn)

When a Secondary PoC is an Active PoC Session and the Participating PoC Server receives SDP LockIn information for the Active PoC Session for this PoC Client as specified in [OMA-POC-CP] "*PoC Session Locking request*" the PoC Server:

1. SHALL enter the 'C: LockIn PoC Session Active' state.

When the PoC Server receives SDP: LockIn information for another PoC Session for this PoC Client as specified in 7.5.2 "*PoC Session locking request*" the PoC Server either

2. SHOULD enter the 'C: LockIn PoC Session Active' state if the PoC Client does not have the permission to send a Talk Burst for this Secondary PoC Session;
- or,
3. SHOULD perform the following actions:
 - a. remain in the 'C: Secondary PoC Session Active' state if the PoC Client has permission to send a Talk Burst for this Secondary PoC Session; and,
 - b. reject the LockIn request as specified in [OMA-PoC-CP] "*PoC Session locking request*".

NOTE: The LockIn request can be received when initializing a PoC Session or during the PoC Session.

6.3.7.3.3 Monitor Primary PoC Session establishment (M: Primary PoC Session established)

When a Primary PoC Session is established or when a Secondary PoC Session becomes a Primary PoC Session as specified in [OMA-POC-CP] "*PoC Session priority request*" and that Primary PoC Session fulfills the criteria defined in the subclause 7.5.2 "*Procedures at the PoC Server performing the Participating PoC Function*" to be activated the PoC Server:

1. SHOULD enter the state 'C: Primary PoC Session Active' if the changed PoC Session fulfills the conditions defined in the subclause 7.5.2 "*Procedures at the PoC Server performing the participating PoC Function*" to be activated;

or,

2. SHOULD remain in the 'C: Secondary PoC Session active' state if a Secondary PoC Session fulfills the conditions defined in the subclause 7.5.2 "*Procedures at the PoC Server performing the participating PoC Function*" to be activated.

6.3.7.3.4 Receive RTP media packets (R: Media from Primary PoC Session)

Upon receiving RTP media packets from a Primary PoC Session and that Primary PoC Session fulfills the criteria defined in the subclause 7.5.2 "*Procedures at the PoC Server performing the Participating PoC Function*" to be activated the PoC Server:

1. SHALL enter the 'C: Primary PoC Session Active' state.

NOTE: If the Primary PoC Session does not fulfill the criteria defined in the subclause 7.5.2 "*Procedures at the PoC Server performing the Participating PoC Function*" the PoC Server remains in the 'C: Secondary PoC Session Active' state.

6.3.7.3.5 Monitor Secondary PoC Session release (M: Secondary PoC Session released)

When the Secondary PoC Session is released as specified in [OMA-POC-CP] and at least one other PoC Sessions for the same PoC Client are established and that other PoC Session fulfills the criteria defined in the subclause 7.5.2 "*Procedures at the PoC Server performing the participating PoC Function*" to be activated the PoC Server

1. SHALL remain in the state 'C: Secondary PoC Session Active' if the identified PoC Session is a Secondary PoC Session; or,
2. SHOULD enter the 'C: Primary PoC Session Active' state if the identified PoC Session is a Primary PoC Session.

6.3.7.3.6 Monitor Secondary PoC Session establishment (M: Secondary PoC Session established)

When a Secondary PoC Session is established as specified in the [OMA-POC-CP] "*PoC Session priority request*", the PoC Server:

1. SHALL remain in the 'C: Secondary PoC Session Active'.

6.3.7.3.7 Monitor T14 (Conversation) timer fired for Secondary PoC Session (M: T14 (Conversation) timer fired)

When T14 (Conversation) timer fires for the Secondary PoC Session and at least one other PoC Session for the same PoC Client is established as specified in the [OMA-POC-CP] and fulfills conditions to be activated, the PoC Server:

1. MAY send TBCP Talk Burst Taken message to the PoC Client, if the Talk Burst is on-going;
2. SHALL remain in the 'C: Secondary PoC Session active' state if the identified PoC Session is a Secondary PoC Session; and,

3. SHOULD enter the 'C: Primary PoC Session active' state if the identified PoC Session is a Primary PoC Session.

6.3.7.3.8 Receive RTP Media packets (R: Media from Secondary PoC Session)

Upon receiving RTP Media packets from a Secondary PoC Session different than the active PoC Session and that other PoC Session fulfills the criteria defined in the subclause 7.5.2 "*Procedures at the PoC Server performing the participating PoC Function*", the PoC Server:

1. SHALL remain in 'C: Secondary PoC Session Active' state for the Secondary PoC Session it received RTP Media packets from.

6.3.7.3.9 Monitor TBCP Talk Burst Granted message (M: TB_Granted)

Upon receiving a TBCP Talk Burst Granted message on another PoC Session the PoC Server:

1. SHOULD enter the 'C: Primary PoC Session Active' state if that other PoC Session is a Primary PoC Session and fulfills the conditions defined in the subclause 7.5.2 "*Procedures at the PoC Server performing the participating PoC Function*" to be activated; or,
2. SHOULD remain in the 'C: Secondary PoC Session Active' state if that other PoC Session is a Secondary PoC Session and fulfills the conditions defined in the subclause 7.5.2 "*Procedures at the PoC Server performing the participating PoC Function*" to be activated.

6.3.7.4 State: 'C: LockIn PoC Session Active'

The 'U: LockIn PoC Session active' state is a stable state. In this state a PoC LockIn PoC Session exists and is an Active PoC Session.

In the 'C: LockIn PoC Session Active' state the PoC Server:

1. SHALL relay RTP Media packets between the PoC Server performing the Controlling PoC Function and the PoC Client for this PoC Session; and,
2. SHALL NOT relay RTP Media packets between the PoC Server performing the Controlling PoC Function and the PoC Client for any other PoC Session(s).

6.3.7.4.1 Monitor LockIn PoC Session release and no other PoC Session ongoing (M: Last PoC Session released)

When a LockIn PoC Session is released and no other PoC Sessions for the same PoC Client are ongoing the PoC Server:

1. SHALL enter the 'Start-stop' state.

6.3.7.4.2 Monitor LockIn PoC Session release and Primary PoC Session ongoing (M: [LockIn PoC Session released AND Primary PoC Session ongoing])

When a LockIn PoC Session is released and a Primary PoC Session for the same PoC Client is ongoing and a PoC Session fulfills the criteria defined in the subclause 7.5.2 "*Procedures at the PoC Server performing the participating PoC Function*" the PoC Server:

1. SHALL enter the 'S: Primary PoC Session active' state if the identified PoC Session is a Primary PoC Session;
- or
2. SHOULD enter the 'C: Secondary PoC Session Active' state if the identified PoC Session is a Secondary PoC Session.

6.3.7.4.3 Monitor LockIn PoC Session release and no Primary PoC Session ongoing (M: [LockIn PoC Session released AND no Primary PoC Session ongoing])

When a LockIn PoC Session is released, at least one Secondary PoC Session for the same PoC Client is already established as specified in [OMA-POC-CP] "*PoC Session priority request*" and fulfills criteria defined in subclause 7.5.2 "*Procedures at the PoC Server performing the Participating PoC Function*" to be activated the PoC Server:

1. SHALL enter the 'S: Secondary PoC Session active' state.

6.3.7.4.4 Monitor LockIn PoC Session is unlocked and Primary PoC Session ongoing (M: [LockIn PoC Session unlocked AND Primary PoC Session ongoing])

When a LockIn PoC Session is unlocked as specified in [OMA-POC-CP] "*PoC Session Locking request*" and a Primary PoC Sessions for the same PoC Client is already established and a PoC Session fulfills the criteria defined in the subclause 7.5.2 "*Procedures at the PoC Server performing the participating PoC Function*" as specified in the [OMA-POC-CP] "*PoC Session priority request*" the PoC Server:

1. SHALL enter the 'C: Primary PoC Session active' state if the identified PoC Session is a Primary PoC Session;
- or,
2. SHOULD enter the 'C: Secondary PoC Session Active' state if the identified PoC Session is a Secondary PoC Session.

6.3.7.4.5 Monitor LockIn PoC Session is unlocked and no Primary PoC Session ongoing (M: [LockIn PoC Session unlocked AND no Primary PoC Session ongoing])

When a LockIn PoC Session is unlocked, as specified in [OMA-POC-CP] "*PoC Session Locking request*" and no Primary PoC Session is ongoing and at least one Secondary PoC Session for the same PoC Client is ongoing as specified in the [OMA-POC-CP] and fulfills criteria defined in the subclause 7.5.2 "*Procedures at the PoC Server performing the Participating PoC Function*" to be activated, the PoC Server:

1. SHALL enter the 'C: Secondary PoC Session active'.

6.3.7.4.6 Monitor TBCP Talk Burst Granted message (M: TB_Granted)

Upon receiving a TBCP Talk Burst Granted message on another Secondary PoC Session the PoC Server:

1. SHOULD enter the 'C: Secondary PoC Session active' state if the other PoC Session is an Secondary PoC Session;
2. SHOULD enter the 'C: Primary PoC Session active' state if the other PoC Session is an Primary PoC Session; and,
3. SHOULD unlock the LockIn PoC Session.

NOTE 1: The PoC Server unlocks the locked PoC Session without informing the PoC Client.

NOTE 2: If the TBCP Talk Burst Granted message is received on the LockIn PoC Session no state change is needed.

6.3.7.4.7 Monitor SDP with PoC Session LockIn (M: Session LockIn)

When the PoC Server receives SDP: LockIn information for another PoC Session for this PoC Client as specified in 7.5.2 "*PoC Session locking request*" the PoC Server either

1. SHOULD remain in the 'C: LockIn PoC Session Active' state;
2. SHOULD reject the LockIn request as specified in [OMA-PoC-CP] "*PoC Session locking request*" if the PoC Client have the permission to speak for the already LockIn PoC Session.

6.3.8 Simultaneous PoC Sessions state diagram - per PoC Session

If the PoC Server supports Simultaneous PoC Sessions the PoC Server SHALL support the state diagram and the state transitions specified in this subclause for each PoC Session.

Figure 10 “*Simultaneous PoC Sessions state diagram - per PoC Session*” shows the state diagram for Simultaneous PoC Session per PoC Session.

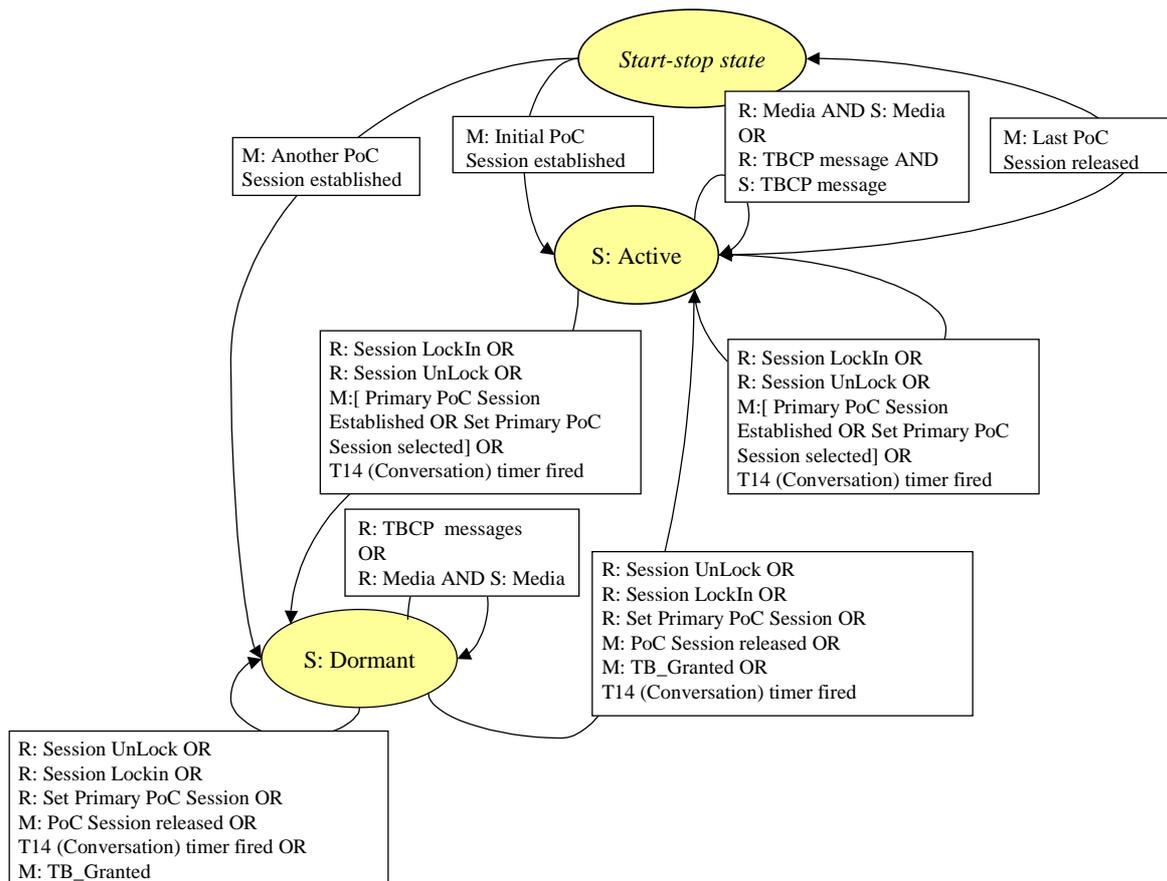


Figure 10: Simultaneous PoC Sessions state diagram - per PoC Session

The State Diagram in Figure 10 “*Simultaneous PoC Sessions state diagram - per PoC Session*” applies to one PoC Session out of multiple Simultaneous PoC Sessions supported the PoC Server for a PoC User.

The PoC Server SHALL create an instance of the state machine for each PoC Session.

State details are explained in the following subclauses.

If a TBCP message, SIP request or RTP Media packet arrives in any state and there is no procedure specified for it in the subclauses below the PoC Server SHALL discard the TBCP message, SIP request or RTP Media packet and SHALL remain in the current state.

6.3.8.1 State ‘Start-Stop’

In this state no PoC Session state machine exists.

6.3.8.1.1 Initial PoC Session establishment (M: Initial PoC Session established)

When a PoC Session is established as specified in [OMA-POC-CP] “*PoC Session priority request*” and in case there is no active PoC Session for the same PoC User the PoC Server:

1. MAY create an instance of the Simultaneous PoC Sessions state machine per PoC Session; and,
2. SHALL enter the ‘S: Active’ state.

6.3.8.1.2 Another PoC Session establishment (M: Another PoC Session established)

When a PoC Session is established as specified in the [OMA-POC-CP] “*PoC Session priority request*” the PoC Server:

1. SHALL create an instance of the Simultaneous PoC Sessions state machine per PoC Session; and,
2. SHALL enter the ‘S: Dormant’ state in case there is an Active PoC Session for the same PoC User.

6.3.8.2 State ‘S: Active’

The ‘S: Active’ state of a PoC Session (one of the Simultaneous PoC Sessions) is a stable state.

In this state the PoC Server is receiving and sending RTP Media and TBCP messages of this PoC Session and monitoring TBCP messages and SIP requests with associated SDP information of other PoC Sessions and is reacting on PoC Session Events, as specified in the following subclauses.

6.3.8.2.1 Receive TBCP messages (R: TBCP Messages)

Upon receiving TBCP Messages from the PoC Client or Controlling PoC Function, the PoC Server:

1. SHALL relay the TBCP messages between the PoC Client or PoC Controlling PoC Function;
2. SHALL monitor TBCP and SIP messages for PoC Session; and,
3. SHALL remain in ‘S: Active’ state.

6.3.8.2.2 Receive RTP Media packets (R: Media)

Upon receiving RTP Media packets from the PoC Client or the PoC Server performing the Controlling PoC Function, the PoC Server:

1. SHALL relay the RTP Media packets between the PoC Client or PoC Server performing the Controlling PoC Function; and,
2. SHALL remain in ‘S: Active’ state.

6.3.8.2.3 Monitor PoC Session release when no other PoC Sessions are ongoing (M: Last PoC Session released)

When the PoC Session is released and no other PoC Sessions for the same PoC Client are ongoing as specified in [OMA-POC-CP] “*PoC Session priority request*” the PoC Server:

1. SHALL return to the ‘Start-stop state’.

6.3.8.2.4 Receive SDP with Session LockIn (R: Session LockIn)

Upon receiving an indication from the PoC Client that a PoC Session is to be LockIn the PoC Server:

1. SHALL proceed with message handling as specified in [OMA-POC-CP] “*PoC Session locking request*”; and,
2. if the LockIn indication is for the active PoC Session, the PoC Server:
 - a. SHALL remain in ‘S: Active’ state.

3. Otherwise the PoC Server:
 - a. SHALL enter the 'S: Dormant' state.

6.3.8.2.5 Monitor SDP with Session UnLock (M: Session UnLock)

Upon receiving an indication from the PoC Client that this PoC Session is to be UnLock, the PoC Server:

1. SHALL proceed with message handling as specified in [OMA-POC-CP] "PoC Session locking request"; and,
2. if criteria defined in the subclause 7.5.2 "Procedures at the PoC Server performing the Participating PoC Function" for switching to another PoC Session are fulfilled the PoC Server:
 - a. SHALL enter the 'S: Dormant' state.
3. Otherwise the PoC Server:
 - a. SHALL remain in the 'S: Active' state.

6.3.8.2.6 T14 (Conversation) timer fired

On expiry of the T14 (Conversation) timer for the PoC Session and,

1. if criteria specified in the subclause 7.5.2 "Procedures at the PoC Server performing the Participating PoC Function" for switching to another PoC Session are fulfilled the PoC Server:
 - a. SHALL enter the 'S: Dormant' state.
2. Otherwise the PoC Server:
 - a. SHALL remain in the 'S: Active' state.

6.3.8.2.7 Monitor SDP with Primary PoC Session established or selected (M: [Primary PoC Session established OR Primary PoC Session selected])

Upon receiving an indication from the PoC Client that a Primary PoC Session has been established or should become the Active PoC Session, based on new priority settings and,

1. if criteria defined in the subclause 7.5..2 "Procedures at the PoC Server performing the Participating PoC Function" for switching to another PoC Session are fulfilled the PoC Server:
 - a. SHALL enter the 'S: Dormant' state.
2. Otherwise the PoC Server:
 - a. SHALL remain in the 'S: Active' state.

6.3.8.3 State: 'S: Dormant'

The 'S: Dormant' state of a PoC Session (out of Simultaneous PoC Sessions) is a stable state.

In this state the PoC Participating Function is monitoring TBCP and SIP messages pertaining to this PoC Session and to all other PoC Sessions of the same PoC User and is reacting on PoC Session Activation events as specified in the following subclauses.

6.3.8.3.1 Receive TBCP message (R: TBCP messages)

Upon receiving TBCP Messages from the PoC Client or PoC Controlling Function, the PoC Server:

1. MAY relay the TBCP messages between the PoC Client and Controlling PoC Function according to rules as specified in subclause 5.4 "RTCP";

2. SHALL continue to monitor TBCP and SIP messages; and,
3. SHALL remain in 'S: Dormant' state.

6.3.8.3.2 Receive RTP Media packets (R: Media)

Upon receiving RTP Media packets from the PoC Controlling PoC Function, the PoC Server:

1. SHALL discard the RTP Media packet; and,
2. SHALL remain in 'S: Dormant' state.

6.3.8.3.3 Receive SDP with SIP Session LockIn (R: Session LockIn)

Upon receiving an indication from the PoC Client that the PoC Session is to be LockIn, the PoC Server:

1. SHALL proceed with message handling as specified in [OMA-POC-CP] "*PoC Session locking request*"; and,
2. if the LockIn indication is for another PoC Session, the PoC Server:
 - a. SHALL remain in 'S: Dormant' state.
3. Otherwise the PoC Server:
 - a. SHALL enter the 'S: Active' state.

6.3.8.3.4 Receive SDP with Primary PoC Session selected (R: Set Primary PoC Session)

Upon receiving an indication from the PoC Client that the PoC Session is to be selected as the Primary PoC Session and,

1. if the Primary PoC Session setting is for this PoC Session and if criteria defined in the 7.5.2 "*Procedures at the PoC Server performing the Participating PoC Function*" for switching to another PoC Session are fulfilled the PoC Server:
 - a. SHALL enter the 'S: Active' state if no other PoC Sessions is in the state "LockIn".
2. Otherwise the PoC Server:
 - a. SHALL enter the 'S: Dormant' state if any other PoC Session is in the state "LockIn".

6.3.8.3.5 Receive SDP with SIP Session UnLock (R: Session UnLock)

Upon receiving an indication from the PoC Client that this PoC Session is to be unlocked the PoC Server:

1. SHALL proceed with message handling as specified in [OMA-POC-CP] "*PoC Session locking request*", and,
2. if criteria defined in the subclause 7.5.2 "*Procedures at the PoC Server performing the Participating PoC Function*" for switching to another PoC Session are fulfilled the PoC Server:
 - a. SHALL enter the 'S: Active' state, and;
 - b. MAY send the latest TBCP Talk Burst Taken message for the activated PoC Session to the PoC Client.
3. Otherwise the PoC Server:
 - a. SHALL remain in the 'S: Dormant state.

6.3.8.3.6 Monitor PoC Session release (M: PoC Session released)

Upon receiving an indication from the PoC Client or the PoC Server performing the Controlling PoC Function that another PoC Session has been released and,

1. if criteria defined in the subclause 7.5.2 “*Procedures at the PoC Server performing the Participating PoC Function*” for switching to another PoC Session are fulfilled the PoC Server:
 - a. SHALL enter the ‘S: Active’ state; and,
 - b. MAY send the latest TBCP Talk Burst Taken message for the activated PoC Session to the PoC Client.
2. Otherwise the PoC Server:
 - a. SHALL remain in the ‘S: Dormant’ state.

6.3.8.3.7 Monitor Talk Burst Granted message (M: TB_Granted)

Upon receiving a TBCP Talk Burst Granted message as the response to a TBCP Talk Burst Request message from the PoC Client and,

1. if criteria defined in the subclause 7.5.2 “*Procedures at the PoC Server performing the Participating PoC Function*” for switching to this PoC Session are fulfilled the PoC Server:
 - a. SHALL enter the ‘S: Active’ state.
2. Otherwise the PoC Server:
 - a. SHALL remain in the ‘S: Dormant’ state.

6.3.8.3.8 T14 (Conversation) timer fired

On expiry of the T14 (Conversation) timer for another PoC Session, and,

1. if criteria defined in the subclause 7.5.2 “*Procedures at the PoC Server performing the Participating PoC Function*” for switching to this PoC Session are fulfilled the PoC Server:
 - a. SHALL enter the ‘S: Active’ state; and,
 - b. MAY send the latest TBCP Talk Burst Taken message for the activated PoC Session to the PoC Client.
2. Otherwise the PoC Server:
 - a. SHALL remain in the ‘S: Dormant’ state.

6.4 Procedures at the PoC Server performing the Controlling PoC Function

6.4.1 General

The PoC Server SHALL support the procedures specified in subclause 6.4.4 “*PoC Server state transition diagram for general Talk Burst operation*”.

The PoC Server SHALL support the procedures specified in subclause 6.4.4.8 “*PoC Server state transition diagram for basic Talk Burst operation to the PoC Client*”.

6.4.2 Controlling PoC Function procedures at PoC Session initialization

When a PoC Session is established, a new instance of the PoC Server state machine for general Talk Burst operation is created for the PoC Session. The PoC Server state machine for general Talk Burst operation transitions to the ‘G: TB_Idle’ state.

As each member is added to the PoC Session, new instances of the PoC Server state machine for basic Talk Burst operation to the PoC Client are created for each PoC Client. The PoC Server state machine for basic Talk Burst operation to the PoC Client transitions to the ‘U: not permitted and TB_Idle’ state.

The original initial SIP INVITE / SIP REFER request to establish a 1-1 PoC Session, an Ad-hoc PoC Group Session or a Pre-arranged PoC Group Session (regardless if the PoC Session is ongoing or not) is treated as an implicit Talk Burst request and the PoC Server state machine for basic Talk Burst operation to the PoC Client for that PoC Client behaves as if a TBCP Talk Burst Request message has been received. If the optional queuing feature is supported and has been negotiated, the PoC Server could queue the request.

The original initial SIP INVITE / REFER request to establish a Chat PoC Group Session or to rejoin an ongoing PoC Session (regardless of type of PoC Session) is not handled as an implicit TBCP Talk Burst Request message by the PoC Server.

When the first Unconfirmed Indication is received from the Participating PoC Function the PoC Server MAY give an early indication to send RTP Media to the Inviting PoC Client, see [OMA-POC-CP] “*Controlling PoC function procedures*”. If an early indication to send RTP Media is given to the Inviting PoC Client, the PoC Client SHALL be granted the permission to send a Talk Burst and the PoC Server SHALL buffer RTP Media packets received from the PoC Client at least until the first Invited PoC User accepts the invitation or until the RTP Media buffer exceeds its maximum limit to store RTP Media packets.

NOTE 1: The amount of RTP Media packets the PoC Server buffers is an implementation option.

When an early indication to send RTP Media is not given to the Inviting PoC Client the PoC Client SHALL be granted the permission to send a Talk Burst when the first PoC Client accepts the invitation.

Before the PoC Server sends the first Talk Burst Control Protocol message in the PoC Session, the PoC Server has to assign itself a SSRC identifier to be included in the Talk Burst Control Protocol messages and quality feedback messages if the PoC Server is supporting that option. A suitable algorithm to generate the SSRC identifier is described in [RFC3550].

Based on the negotiation during PoC Session establishment the optional feature queuing combined with priority levels in TBCP Talk Burst Request messages may be supported. In that case, the PoC Server SHALL use local policy to determine the highest priority level, which can be granted to a specific PoC Client. In the PoC Session, the PoC Server SHALL control that Talk Burst Control messages from PoC Clients are not using a higher priority level than they are allowed to use.

NOTE 2: The local policy used by the PoC Server to determine the highest priority level, which can be granted to a specific PoC Client is out of scope for this specification.

6.4.3 Controlling PoC Function procedures at PoC Session release

When a PoC Client leaves a PoC Session, but the PoC Session remains ongoing with the other PoC Clients, the PoC Server follows a two-stage procedure.

1. In the first stage, the PoC Server stops sending TBCP messages and sending RTP Media to the PoC Client leaving the PoC Session.
2. In the second stage, when the Control Plane has determined that the PoC Session with this PoC Client has been released, the corresponding instance of the PoC Server state machine for basic Talk Burst operation to the PoC Client is released.

There are no cases where the PoC Server state machine for basic Talk Burst operation to the PoC Client will cause the PoC Client to be dropped from a PoC Session.

When a PoC Session is released, the PoC Server follows a two-stage procedure.

1. In the first stage, the PoC Server stops sending TBCP messages and sending RTP media to all PoC Clients in the PoC Session.
2. In the second stage, when the Control Plane has determined that the PoC Session has been released, the corresponding instance of the PoC Server state machine for general Talk Burst operation is also terminated, along with any PoC Server state machines for basic Talk Burst operation to the PoC Clients in the PoC Session.

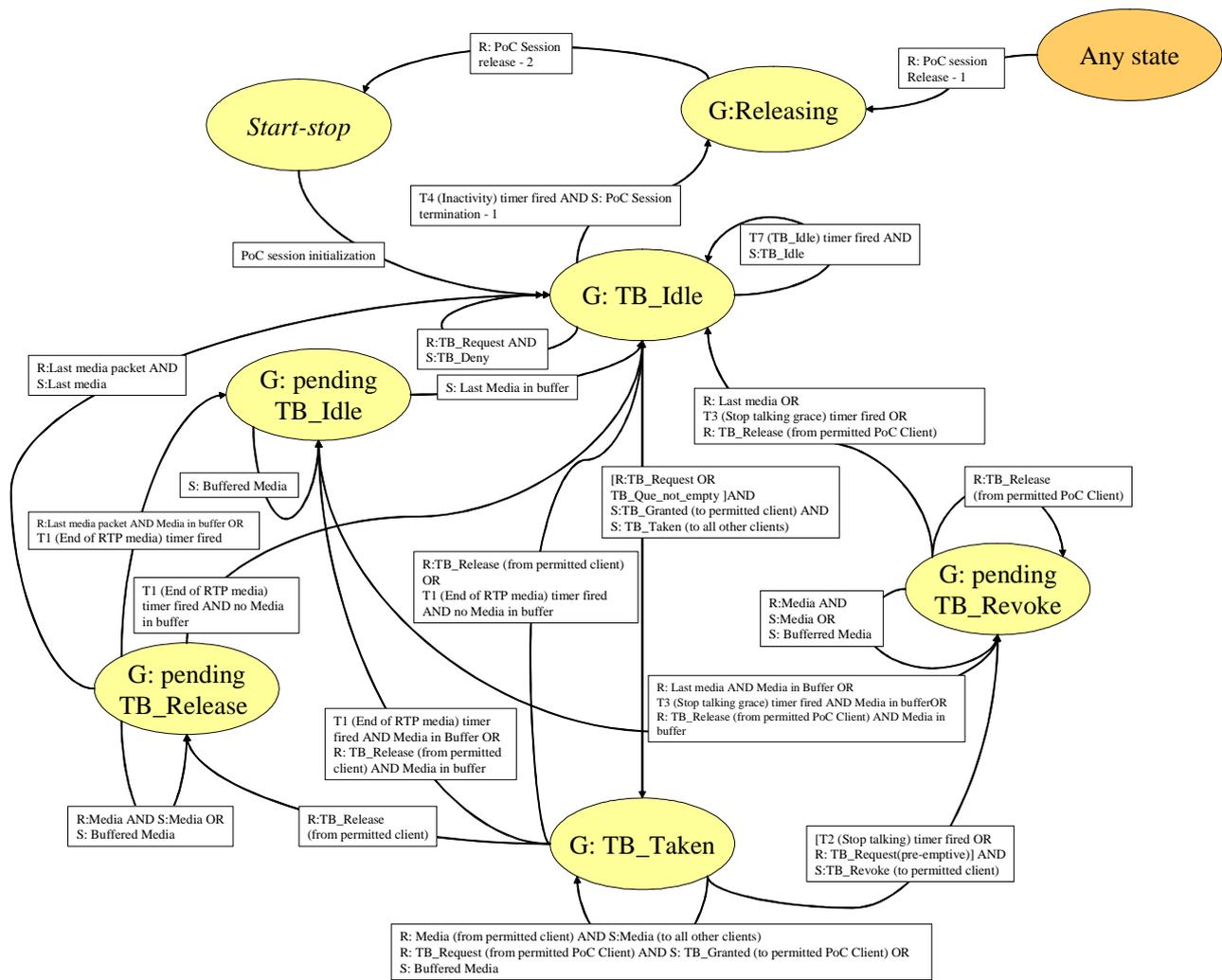
In the normal case for a PoC Session release the PoC Server state machine for general Talk Burst operation initiates the PoC Session release on expiry of the T4 (Inactivity) timer.

The state machines describing the procedures on the PoC Session release are described in subclauses 6.4.4 “PoC Server state transition diagram for general Talk Burst operation” and 6.4.5 “PoC Server state transition diagram for basic Talk Burst operation to the PoC Client”.

6.4.4 PoC Server state transition diagram for general Talk Burst operation

The PoC Server SHALL support the state diagram and the state transitions specified in this subclause.

Figure 11 “PoC Server state transition diagram for general Talk Burst operation” shows the general Talk Burst operation states (G states) and the state transition diagram.



NOTE: T1 is the ‘End of RTP Media’ timer, T2 is the ‘Stop talking’ timer, T3 is the ‘Stop talking grace’ timer, T4 is the ‘Inactivity’ timer and T7 is the ‘Talk Burst Idle’ timer.

Figure 11: PoC Server state transition diagram for general Talk Burst operation

The PoC Server SHALL keep one instance of the general Talk Burst operation state machine per PoC Session.

State details are explained in the following subclauses.

If a TBCP message or RTP Media packet arrives in any state and there is no procedure specified for it in the subclauses below the PoC Server SHALL discard the TBCP message or RTP Media packet and SHALL remain in the current state.

6.4.4.1 State 'Start-stop'

In this state no PoC Session exists.

6.4.4.1.1 PoC Session initialization

When a PoC Session is initiated as specified in [OMA-POC-CP] the PoC Server:

1. SHALL create an instance of the general Talk Burst operation state machine;
2. If the PoC Server is granting the implicit Talk Burst request at PoC Session establishment the PoC Server:
 - a. SHALL perform the actions specified in subclause 6.4.4.2.2 "*Receive TBCP Talk Burst Request message (R: TB_Request)*".
3. If the PoC Server is not granting the implicit Talk Burst request at PoC Session establishment, the PoC Server:
 - a. SHALL start the T4 (Inactivity timer); and, perform the actions specified in the subclause 6.4.4.2.1 "*Enter state 'G: TB_Idle'*".

6.4.4.2 State 'G: TB_Idle'

The 'G: TB_Idle' state is a stable state. The PoC Server is in this state when no PoC User currently has permission to send a Talk Burst.

The timer T4 (Inactivity) and the timer T7 (TB_Idle) may be running when the PoC Server is in this state.

NOTE: During the initialization of the PoC Session Control Plane timers supervise the general state machine.

6.4.4.2.1 Enter state 'G: TB_Idle'

When entering this state from any state except the 'Null state' the PoC Server:

1. SHALL send the TBCP Talk Burst Idle message to all PoC Clients unless otherwise specified in the user specific state machine [6.4.5 '*PoC Server state transition diagram for basic Talk Burst operation to the PoC Client*'];
2. SHALL start T7 (TB_Idle) timer;
3. SHALL start the T4 (Inactivity timer); and,
4. SHALL set the general state to 'G: TB_Idle state'.

6.4.4.2.2 Receive TBCP Talk Burst Request message (R: TB_Request)

Upon receiving a TBCP Talk Burst Request message (from a PoC Client that is permitted to make a request) and

1. if the Talk Burst is not granted the PoC Server:
 - a. SHALL send TBCP Talk Burst Deny message,

The TBCP Talk Burst Deny message

- i. SHALL include the Reason code field:

- a) 1, if another Participant has a Talk Burst permission;
 - b) 2, if PoC Server is not able to grant the Talk Burst due to an internal error;
 - c) 3, if the requesting PoC User is the only Participant in the PoC Session;
 - d) 4, if the retry-after timer is still running; or,
 - e) 5, if the requesting PoC User has only listen only privilege.
- ii. MAY include the Reason phrase field:
- a) “Another PoC User has permission”, if another Participant has a Talk Burst permission;
 - b) “Internal PoC Server error”, if PoC Server is not able to grant the Talk Burst due to an internal error;
 - c) “Only one Participant in the PoC Session”, if the requesting PoC User is the only Participant in the PoC Session;
 - d) “Retry-after timer has not expired”, if the retry-after timer is still running; or,
 - e) “Listen only”, if the requesting PoC User has only listen only privilege.
2. if the Talk Burst is granted the PoC Server:
- a. SHALL stop the T4 (Inactivity) timer;
 - b. SHALL stop the T7 (TB_Idle) timer;
 - c. SHALL store the SSRC of PoC Client requesting a permission to send a Talk Burst until the end of the Talk Burst associated to that Talk Burst Request; and,
 - d. SHALL perform the actions specified in the subclause 6.4.4.3.1 “Enter the state ‘G: TB_Taken’”.

NOTE: An initial SIP INVITE request in an On-demand Session or a SIP REFER request in a Pre-established Session is interpreted as a Talk Burst request.

6.4.4.2.3 T7 (TB_Idle) timer fired

On expiry of the T7 (TB_Idle) timer the PoC Server:

1. SHALL restart timer T7. The TBCP Talk Burst Idle message SHALL be sent only n times (not forever), so the timer SHALL only be restarted, if not yet restarted n times;
2. SHALL send a TBCP Talk Burst Idle message to all PoC Clients in the PoC Session; and,
3. SHALL remain in the ‘G: TB_Idle’ state.

6.4.4.2.4 T4 (Inactivity) timer fired

On expiry of T4 (Inactivity) timer the PoC Server:

1. SHALL disconnect all PoC Clients from the PoC Session as follows:
 - a. SHALL release the PoC Session as specified in [OMA-POC-CP]; and,
2. SHALL enter the ‘Releasing’ state.

6.4.4.2.5 Talk Burst request queue not empty

If the optional TBCP feature, “queuing,” has been negotiated at PoC Session initiation and if the Talk Burst request queue is not empty, the PoC Server:

1. SHALL select the queued PoC Client with the highest priority which has been queued longest;
2. SHALL remove that PoC Client from the Talk Burst request queue; and,
3. SHALL perform the actions described in the subclause 6.4.4.3.1 “*Enter the state ‘G: TB_Taken’*” with respect to that PoC Client.

6.4.4.3 State ‘G: TB_Taken’

The ‘G: TB_Taken’ state is a stable state and the PoC Server uses this state when it has permitted one of the PoC Clients in the PoC Session to send a Talk Burst.

The timer T1 (End of RTP) and the timer T2 (Stop talking) may be running when the PoC Server is in this state.

6.4.4.3.1 Enter the state ‘G: TB_Taken’

When entering this state the PoC Server:

1. SHALL send a TBCP Talk Burst Granted message to the requesting PoC Client;

The TBCP Talk Burst Granted message:

- a. MAY include notification of the number of Participants in the PoC Session; and,
- b. SHALL include information about the stop talking timer;

2. SHALL send TBCP Talk Burst Taken message to all other PoC Clients;

TBCP Talk Burst Taken message:

- a. SHALL include the SSRC of the PoC Client granted a permission to send a Talk Burst, if known by the PoC Server, or alternatively;
- b. SHALL have the SSRC of the PoC Client granted a permission to send a Talk Burst field all 32 bits set to ‘1’; and,
- c. MAY include notification of the number of Participants in the PoC Session.

3. SHALL start the timer T1 (end of RTP Media timer); and,
4. SHALL set the general state to ‘G: TB_Taken’ state.

6.4.4.3.2 T1 (End of RTP Media) timer fired

On expiry of the T1 (End of RTP Media) timer the PoC Server:

1. SHALL stop the T2 (Stop talking) timer; if the timer is running;
2. If the PoC Server does NOT have Media packets in the buffer the PoC Server
 - a. SHALL perform the actions specified in the subclause 6.4.4.2.1 “*Enter the ‘G: TB_Idle state’*”.
3. Otherwise the PoC Server
 - a. SHALL perform the actions specified in the subclause 6.4.4.8.1 “*Enter the ‘G: pending TB_Idle state’*”.

6.4.4.3.3 T2 (Stop talking) timer fired

On expiry of the T2 (Stop talking) timer the PoC Server:

1. SHALL stop the T1 (End of RTP Media) timer;
2. SHALL set the Reason code to "Talk burst too long" and,
3. SHALL perform the actions specified in the subclause 6.4.4.5.1 "Enter the 'G: pending TB_Revoke' state".

6.4.4.3.4 Receive RTP Media packets (R: Media from permitted client)

Upon receiving RTP Media packets from the permitted PoC Client the PoC Server:

1. SHALL start the T2 (Stop talking) timer if not already running;
2. SHALL either
 - a. forward the received RTP Media packets towards either
 - i. all other PoC Clients that are not on hold, if the PoC Session is not a 1-many-1 Session and if the PoC Server does not have Media packets in the Media buffer;or,
 - ii. all Ordinary Participants that are not on hold, if the PoC Session is a 1-many-1 Session and the Media packets are the Distinguished Participant talking and if the PoC Server does not have Media packets in the Media buffer;or,
 - iii. the Distinguished Participant, if the PoC Session is a 1-many-1 Session, the Media packets are an Ordinary Participant talking, the Distinguished Participant is not on hold and if the PoC Server does not have Media packets in the Media buffer;or,
 - b. buffer the received RTP Media packets in case of unconfirmed indication and if RTP Media packet buffering is ongoing.
 3. SHALL restart the T1 (End of RTP Media) timer; and,
 4. SHALL remain in the 'G: TB_Taken' state.

6.4.4.3.5 Receive TBCP Talk Burst Release message (R: TB_Release)

Upon receiving a TBCP Talk Burst Release message and,

1. if the sequence number is not marked as invalid and last RTP Media packet is not received, then the PoC Server:
 - a. SHALL store the sequence number of the last RTP Media packet indicated in the message; and,
 - b. SHALL perform the actions specified in subclause 6.4.4.4.1 "Enter the state 'G: pending TB_Release'".
2. or, if the sequence number is not marked as invalid and last RTP Media packet is already received, then the PoC Server:
 - a. SHALL stop the T2 (Stop talking) timer, if the timer is running; and
 - b. SHALL either
 - i. perform the actions specified in subclause 6.4.4.8.1 "Enter the state 'G: pending TB_Idle'" if RTP Media packet buffering is ongoing;

- or,
- ii. perform the actions specified in the subclause 6.4.4.2.1 “Enter the ‘G: TB_Idle state’” if RTP Media packet buffering is not ongoing.
3. or, if the sequence number is marked as invalid, then the PoC Server:
 - a. SHALL stop the T2 (Stop talking) timer; if the timer is running; and,
 - b. SHALL either
 - i. perform the actions specified in subclause 6.4.4.8.1 "Enter the state ‘G: pending TB_Idle’" if RTP Media packet buffering is ongoing;
 - or,
 - ii. perform the actions specified in the subclause 6.4.4.2.1 “Enter the ‘G: TB_Idle state’” if RTP Media packet buffering is not ongoing.
 4. if ‘queuing’ is used in the PoC Session, the PoC Server:
 - a. SHOULD send a TBCP Talk Burst Request Queue Status Response message to give the updated status to the PoC Clients, which have requested the queue status and whose queue positions have been changed.

6.4.4.3.6 Receive TBCP Talk Burst Request message with pre-emptive priority (R: TB_Request(pre-emptive))

If the optional TBCP feature “priority” has been negotiated, on receipt of a TBCP Talk Burst Request message with the optional parameter, Talk Burst request priority, set to pre-emptive priority, and if the Talk Burst request priority for the PoC Client with permission to send a Talk Burst is not set to pre-emptive priority, the PoC Server:

1. SHALL stop the T1 (End of RTP media) timer;
2. SHALL set the TB_Revoke Reason code field to “Talk Burst Preempted” and,
3. SHALL perform the actions described in the subclause 6.4.4.5.1 “Enter the ‘G: pending TB_Revoke’ state”
4. SHOULD send a TBCP Talk Burst Request Queue Status Response message to give the updated status to the PoC Clients, which have requested queue status and whose queue positions have been changed, , if ‘queuing’ is used in the PoC Session.

NOTE: If the Talk Burst request priority for the PoC Client with permission to send a Talk Burst is set to pre-emptive priority, the PoC Server performs the actions as specified in subclause 6.4.5.2.3 “Receive TBCP Talk Burst Request message (R: TB_Request)”.

6.4.4.3.7 Receive TBCP Talk Burst Request message from permitted PoC Client (R: TB_Request)

Upon receiving a TBCP Talk Burst Request message from the PoC Client that has been granted permission to send a Talk Burst the PoC Server:

1. SHALL send a TBCP Talk Burst Granted message, including information about the stop talking timer, to the previously granted PoC Client; and,
2. SHALL remain in the ‘G: TB_Taken’ state.

6.4.4.3.8 Sending buffered Media packets (S: Buffered Media)

As long as the PoC Server has RTP Media packets buffered the PoC Server SHALL apply the procedures in the subclause 7.8 “Media buffering”.

The PoC Server:

1. SHALL either
 - a. forward the buffered RTP Media packets towards the other PoC Clients that are not on hold, if the PoC Session is not a 1-many-1 Session or the Distinguished Participant is talking;
 - or,
 - b. forward the buffered RTP media packets towards the Distinguished Participant, if the PoC Session is a 1-many-1 Session and if the Distinguished Participant is not on hold.

6.4.4.4 State 'G: pending TB_Release'

The 'G: pending TB_Release' state is a transition state and the PoC Server uses this state after having received a TBCP Talk Burst Release message from the permitted PoC Client.

T1 is running when the PoC Server is in this state. The T2 (Stop talking) timer may be running in this state.

6.4.4.4.1 Enter the state 'G: pending TB_Release'

When entering this state the PoC Server:

1. SHALL set the general state to 'G: pending TB_Release'.

6.4.4.4.2 Receive last RTP Media packets (R: Last media)

Upon receiving a RTP Media packet from the permitted PoC Client with the same (or higher) sequence number as indicated in the TBCP Talk Burst Release message the PoC Server:

1. SHALL stop the T2 (Stop talking) timer, if the timer is running; and,
2. SHALL either
 - a. forward the received last RTP Media packet to all other PoC Clients that are not on hold, if the PoC Session is not a 1-many-1 Session or the Distinguished Participant is talking and if the PoC Server does not have RTP Media packets in the Media buffer;
 - or,
 - b. forward the received last RTP media packets towards the Distinguished Participant, if the PoC Session is a 1-many-1 Session, if the Distinguished Participant is not on hold and if the PoC Server does not have RTP Media packets in the Media buffer;.
 - or,
 - c. buffer the received last RTP Media packets in case of unconfirmed indication and if RTP Media packet buffering is ongoing.
3. SHALL either
 - a. perform the actions specified in subclause 6.4.4.8.1 "*Enter the state 'G: pending TB_Idle'*" if RTP Media packet buffering is ongoing;
 - or,
 - b. SHALL perform the actions specified in the subclause 6.4.4.2.1 "*Enter the 'G: TB_Idle state'*" if RTP Media packet buffering is not ongoing.

6.4.4.4.3 Receive RTP Media packets (R: Media)

Upon receiving a RTP Media packet from the permitted PoC Client with a sequence number lower than the sequence number indicated in the TBCP Talk Burst Release message the PoC Server:

1. SHALL either
 - a. forward the the RTP Media packet to all other PoC Clients that are not on hold, if the PoC Session is not a 1-many-1 Session or the Distinguished Participant is talking and if the PoC Server does not have RTP Media packets in the Media buffer;
 - or,
 - b. forward the received RTP media packets towards the Distinguished Participant, if the PoC Session is a 1-many-1 Session, if the Distinguished Participant is not on hold and if the PoC Server does not have RTP Media packets in the Media buffer;
 - or,
 - c. buffer the received RTP Media packets in case of unconfirmed indication and if RTP Media packet buffering is ongoing
2. SHALL restart the T1 (End of RTP Media) timer; and,
3. SHALL remain in the 'G: pending TB_Release' state.

6.4.4.4.4 T1 (End of RTP Media) timer fired

On expiry of the T1 (End of RTP Media) timer the PoC Server:

1. SHALL stop the T2 (Stop talking) timer, if the timer is running; and,
2. SHALL either
 - a. perform the actions specified in subclause 6.4.4.8.1 "*Enter the state 'G: pending TB_Idle'*" if RTP Media packet buffering is ongoing;
 - or,
 - b. perform the actions specified in the subclause 6.4.4.2.1 "*Enter the 'G: TB_Idle state'*" if RTP Media packet buffering is not ongoing.

6.4.4.4.5 T2 (Stop talking) timer fired

On expiry of the T2 (Stop talking) timer the PoC Server:

1. SHALL perform the actions specified in the subclause 6.4.4.5.1 "*Enter the 'G: pending TB_Revoke' state'*".

6.4.4.4.6 Sending buffered Media packets (S: Buffered Media)

As long as the PoC Server has RTP Media packets buffered the PoC Server SHALL apply the procedures in the subclause 7.8 "*Media buffering'*".

The PoC Server:

1. SHALL either
 - a. forward the buffered RTP Media packets towards the other PoC Clients that are not on hold, if the PoC Session is not a 1-many-1 Session or the Distinguished Participant is talking;
 - or,

- b. forward the buffered RTP media packets towards the Distinguished Participant, if the PoC Session is a 1-many-1 Session and if the Distinguished Participant is not on hold.

6.4.4.5 State 'G: pending TB_Revoke'

The 'G: pending TB_Revoke' state is a transition state and the PoC Server uses this state after having sent a TBCP Talk Burst Revoke message to the permitted PoC Client.

The timer T3 (Talking Grace) is running when the PoC Server use this state.

6.4.4.5.1 Enter the 'G: pending TB_Revoke' state

When entering this state the PoC Server:

1. SHALL send the TBCP Talk Burst Revoke message to the permitted PoC Client.

The TBCP Talk Burst Revoke message:

- a. SHALL include a Reason code field;

NOTE: The value of the Reason code field depends on why the permission to send a Talk Burst is revoked and is described elsewhere in this document.

2. SHALL start the T3 (Stop talking grace) timer; and,
3. SHALL set the general state to 'G: pending TB_Revoke'.

6.4.4.5.2 Receive RTP Media packets (R: Media)

Upon receiving RTP Media packets with a sequence number lower than the sequence number indicated in the TBCP Talk Burst Release message the PoC Server:

NOTE: The sequence number of the last RTP Media packet is received in the TBCP Talk Burst Release message. Prior to the receipt of the TBCP Talk Burst Release message all RTP Media packets are regarded to not be the last RTP Media packet.

1. SHALL either
 - a. forward the received RTP Media packets towards the other PoC Clients that are not on hold, if the PoC Session is not a 1-many-1 Session or the Distinguished Participant is talking and if the PoC Server does not have RTP Media packets in the Media buffer;
 - or,
 - b. forward the received RTP media packets towards the Distinguished Participant, if the PoC Session is a 1-many-1 Session, if the Distinguished Participant is not on hold and if the PoC Server does not have RTP Media packets in the Media buffer;
 - or,
 - c. buffer the received RTP Media packets in case of unconfirmed indication and if RTP Media packet buffering is ongoing.
2. SHALL restart the T1 (End of RTP Media) timer; and,
3. SHALL remain in the 'G: pending TB_Revoke' state.

6.4.4.5.3 Receive TBCP Talk Burst Release message (R: TB_Release (from permitted PoC Client))

Upon receiving a TBCP Talk Burst Release message and,

1. if the sequence number is not marked as invalid and last RTP Media packet is not received, then the PoC Server:
 - a. SHALL store the sequence number of the last RTP Media packet; and,
 - b. SHALL remain in the 'G: pending TB_Revoke' state.
2. or, if the sequence number is not marked as invalid and last RTP Media packet is already received, then the PoC Server:
 - a. SHALL stop the T3 (Stop talking grace) timer; and,
 - b. SHALL either
 - i. perform the actions specified in subclause 6.4.4.8.1 "*Enter the state 'G: pending TB_Idle'*" if RTP Media packet buffering is ongoing;
 - or,
 - ii. perform the actions specified in the subclause 6.4.4.2.1 "*Enter the 'G: TB_Idle state'*" if RTP Media packet buffering is not ongoing.
3. or, if the sequence number is marked as invalid, then the PoC Server:
 - a. SHALL stop the T3 (Stop talking grace) timer; and,
 - b. SHALL
 - i. perform the actions specified in subclause 6.4.4.8.1 "*Enter the state 'G: pending TB_Idle'*" if RTP Media packet buffering is ongoing if RTP Media packet buffering is not ongoing;
 - or,
 - ii. perform the actions specified in the subclause 6.4.4.2.1 "*Enter the 'G: TB_Idle state'*".

6.4.4.5.4 Receive last RTP Media packets (R: Last media)

Upon receiving a RTP Media packet from the permitted PoC Client with the same (or higher) sequence number as indicated in the TBCP Talk Burst Release message the PoC Server:

1. SHALL either
 - a. forward the RTP Media packet to all other PoC Clients that are not on hold, if the PoC Session is not a 1-many-1 Session or the Distinguished Participant is talking and if the PoC Server does not have RTP Media packets in the Media buffer;
 - or,
 - b. forward the received RTP media packet towards the Distinguished Participant, if the PoC Session is a 1-many-1 Session and if the Distinguished Participant is not on hold and if the PoC Server does not have RTP Media packets in the Media buffer;
 - or,
 - c. buffer the received last RTP Media packets in case of unconfirmed indication and if RTP Media packet buffering is ongoing.
2. SHALL stop T3 (Stop talking grace) timer; and,

3. SHALL either

- a. perform the actions specified in subclause 6.4.4.8.1 "*Enter the state 'G: pending TB_Idle'*" if RTP Media packet buffering is ongoing;
- or,
- b. perform the actions specified in the subclause 6.4.4.2.1 "*Enter the 'G: TB_Idle state'*" if RTP Media packet buffering is not ongoing.

6.4.4.5.5 T3 (Stop talking grace) timer fired

On expiry of the T3 (Stop talking grace) timer the PoC Server:

1. SHALL either

- a. perform the actions specified in subclause 6.4.4.8.1 "*Enter the state 'G: pending TB_Idle'*" if RTP Media packet buffering is ongoing;
- or,
- b. perform the actions specified in the subclause 6.4.4.2.1 "*Enter the 'G: TB_Idle state'*" if RTP Media packet buffering is not ongoing.

6.4.4.5.6 Sending buffered Media packets (S: Buffered Media)

As long as the PoC Server has RTP Media packets buffered the PoC Server SHALL apply the procedures in the subclause 7.8 "*Media buffering'*".

The PoC Server:

1. SHALL

- a. forward the buffered RTP Media packets towards the other PoC Clients that are not on hold, if the PoC Session is not a 1-many-1 Session or the Distinguished Participant is talking;
- or,
- b. forward the buffered RTP media packets towards the Distinguished Participant, if the PoC Session is a 1-many-1 Session and if the Distinguished Participant is not on hold.

6.4.4.6 State: Any state

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.

6.4.4.6.1 Receive PoC Session release - 1

Upon receiving a PoC Session release stage 1 request from the Control Plane, the PoC Server:

1. SHALL stop sending TBCP messages and RTP media towards all PoC Clients; and,
2. SHALL enter the 'Releasing' state.

6.4.4.7 State: 'Releasing'

The 'Releasing' state is a transition state. The PoC Server uses this state while waiting for the Control Plane to finalize the disconnection of a PoC Session.

6.4.4.7.1 Receive PoC Session release - 2

Upon receiving a PoC Session release stage 2 request from the Control Plane, the PoC Server:

1. SHALL release all resources reserved in the User Plane including the instances used for the general state machine, and basic state machines and any running timers associated with the general and basic state machines; and,
2. SHALL enter the 'Start-stop' state and terminate the PoC Session control state machine.

6.4.4.8 State: 'G: pending TB_Idle'

The 'G: pending TB_Release' state is a transition state. The PoC Server uses this state when buffered RTP Media packets are sent to Participants in the PoC Session before entering the 'G: TB_Idle' state.

This state is optional and only supported if the PoC Server supports RTP Media buffering.

6.4.4.8.1 Enter the state 'G: pending TB_Idle'

When entering this state the PoC Server:

1. SHALL set the general state to 'G: pending TB_Idle'.

6.4.4.8.2 Sending buffered Media packets (S: Buffered Media)

As long as the PoC Server has RTP Media packets buffered the PoC Server SHALL apply the procedures in the subclause 7.8 "Media buffering".

The PoC Server:

1. SHALL
 - a. forward the buffered RTP Media packets towards the other PoC Clients that are not on hold, if the PoC Session is not a 1-many-1 Session or the Distinguished Participant is talking;
 - or,
 - b. forward the buffered RTP media packets towards the Distinguished Participant, if the PoC Session is a 1-many-1 Session and if the Distinguished Participant is not on hold.
2. SHALL
 - a. remain in the 'pending TB_Idle' state as long as Media packets are buffered;
 - or,
 - b. perform the actions specified in the subclause 6.4.4.8.3 "The last RTP Media packet is sent (S: Last Media in buffer)" when the last buffered Media packet is sent.

6.4.4.8.3 The last RTP Media packet is sent (S: Last Media in buffer)

When the last RTP Media packet is sent the PoC Server:

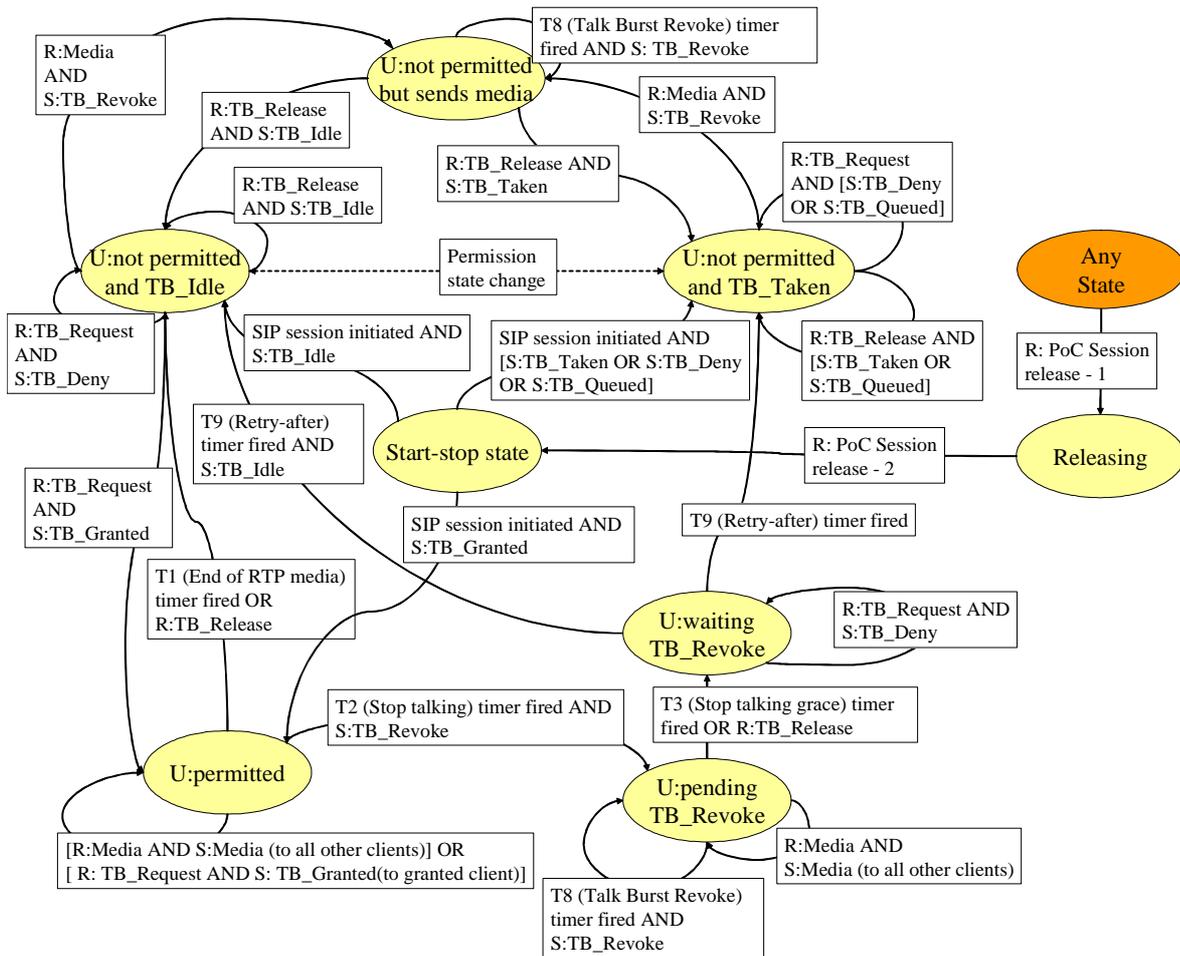
1. SHALL perform the actions specified in the subclause 6.4.4.2.1 "Enter the 'G: TB_Idle state'".

6.4.5 PoC Server state transition diagram for basic Talk Burst operation to the PoC Client

The PoC Server SHALL support the state diagram and the state transitions specified in this subclause.

NOTE 1: In this subclause the sending of TBCP messages are described, but they are not sent, if they are already sent according to the subclause 6.4.4 "PoC Server state transition diagram for general Talk Burst operation".

Figure 12 "PoC Server state transition diagram for normal Talk Burst operation to the PoC Client" shows the states and state transitions for Talk Burst Control for a specific PoC User (U states) in the PoC Server.



NOTE 2: T1 is the ‘End of RTP’ media timer, T2 is the ‘Stop talking’ timer and T3 is the ‘Stop talking’ grace timer, T8 is the ‘Talk Burst Revoke’ timer, T9 is the ‘Retry-after’ timer.

NOTE 3: PoC Server state transition diagram for basic Talk Burst operation to the PoC Client (U) states are either stable states (‘U: not permitted and TB_Idle’, ‘U: not permitted and TB_Taken’, ‘U: permitted’, ‘U: waiting TB_Revoke’) or transition states (‘U: pending TB_Revoke’, ‘U: not permitted but sends media’).

Figure 12: PoC Server state transition diagram for normal Talk Burst operation to the PoC Client

The PoC Server SHALL create one instance of the state machine for every PoC Client served by the PoC Server, when the PoC Session is established, as follows:

In case of an originating PoC Client, the PoC Session SHALL be established when the PoC Server sends the SIP 200 “OK” response to the originating PoC Client.

NOTE 4: The originating PoC Client might receive a TBCP message before the SIP 200 “OK” response, because of processing delays of the SIP 200 “OK” in the SIP/IP Core.

In case of a terminating PoC Client, the PoC Session SHALL be established when the PoC Server receives the SIP 200 “OK” response sent from the terminating PoC Client.

The PoC Client associated to the PoC Server state transition diagram for basic Talk Burst operation to the PoC Client is here referred to as the associated PoC Client.

State details are explained in the following subclauses.

If a TBCP message or RTP Media packet arrives in any state and there is no procedure specified for it in the subclauses below the PoC Server SHALL discard the TBCP message or RTP Media packet and SHALL remain in the current state.

6.4.5.1 State 'Start-stop'

In this state no SIP Session exists between the PoC Server and an associated PoC Client.

6.4.5.1.1 SIP Session initiated

When a SIP Session is established and:

1. if the associated PoC Client initiates a PoC Session other than a Chat PoC Group Session, and
 - if no PoC Client has the permission to send a Talk Burst, the PoC Server:
 - a. SHALL send a TBCP Talk Burst Granted message, including information about the stop talking timer, to the PoC Client; and,
 - b. SHALL perform the actions specified in the subclause 6.4.5.4.1 "*Enter the state 'U: permitted' state*" if a PoC Session is initiated by the associated PoC Client;
 - if another PoC Client has the permission to send a Talk Burst, the PoC Server:
 - c. SHALL send a TBCP Talk Burst Taken message to the PoC Client; and,
 - d. SHALL perform the actions specified in the subclause 6.4.5.3.1 "*Enter the 'U: not permitted and TB_Taken' state*".
2. if the associated PoC Client rejoins an ongoing PoC Session or initiates or joins a Chat PoC Session, and
 - if no PoC Client has the permission to send a Talk Burst, the PoC Server:
 - a. SHOULD send a TBCP Talk Burst Idle message to the PoC Client, and
 - b. SHALL perform the actions specified in the subclause 6.4.5.4.1 "*Enter the state 'U: not permitted and TB_Idle' state*"
 - if another PoC Client has the permission to send a Talk Burst, the PoC Server:
 - c. SHOULD send a TBCP Talk Burst Taken message to the PoC Client; and,
 - d. SHALL perform the actions specified in the subclause 6.4.5.3.1 "*Enter the 'U: not permitted and TB_Taken' state*".
3. if the optional feature "priority" has been negotiated at PoC Session initiation and if the priority level is pre-emptive and if the current PoC Client with permission to send a Talk Burst does not have the pre-emptive priority, the PoC Server:
 - a. SHALL send TBCP Talk Burst Granted message, including information about the stop talking timer, to the PoC Client;
 - b. SHALL perform the action in subclause 6.4.4.3.6 "*Receive TBCP Talk Burst Request message with pre-empt priority (R: TB_Request(pre-emptive))*"; and,
 - c. SHALL perform the actions specified in the subclause 6.4.5.4.1 "*Enter the state 'U: permitted' state*".

4. if the optional TBCP feature, “queuing,” has been negotiated at PoC Session initiation and if the associated PoC Client joins an ongoing PoC Session and if another PoC Client has the permission to send a Talk Burst, the PoC Server:
 - a. SHALL set the priority of the implicit TBCP Talk Burst Request message, to the maximum priority that the PoC Client is permitted to request, except if maxpriority=3 (pre-emptive priority), then the priority will be set to 2 (high priority);

NOTE: The initial implicit TB_Request will not result in pre-emption, when a PoC Client is joining an ongoing PoC Session. If the PoC Uses wants to pre-empt the current talker, an explicit TB_Request with pre-emptive priority is required.

- b. SHALL place the PoC Client in the Talk Burst request queue immediately following all queued requests at the same priority level.
- c. SHALL send a TBCP Talk Burst Request Queue Status Response message to the PoC Client.

The TBCP Talk Burst Request Queue Status Response message

- i. SHALL indicate that the PoC Client has been placed in the Talk Burst request queue;
- ii. MAY do so by giving the position of the PoC Client in the Talk Burst request queue; and,
- iii. MAY give the priority granted to the TBCP Talk Burst Request message in the queue.
- d. SHALL perform the actions described in the subclause 6.4.5.3.1 “Enter the ‘U: not permitted and TB_Taken’ state”.

5. If the PoC Client is invited to a PoC Session and

if another PoC Client has permission to send a Talk Burst, the PoC Server:

- a. SHOULD send a TBCP Talk Burst Taken message to the PoC Client; and,
- b. SHALL perform the actions specified in the subclause 6.4.5.3.1 “Enter the ‘U: not permitted and TB_Taken’”.

if no other PoC Client has the permission to send a Talk Burst; the PoC Server:

- c. SHOULD send a TBCP Talk Burst Idle message to the PoC Client; and,
- d. SHALL perform the actions specified in the subclause 6.4.5.2.1 “Enter the ‘U: not permitted and TB_Idle’ state”.

6.4.5.2 State U: not permitted and TB_Idle

The ‘U: not permitted and TB_Idle’ state is a stable state and the PoC Server uses this state when the associated PoC Client is not permitted to send a Talk Burst.

6.4.5.2.1 Enter the ‘U: not permitted and TB_Idle’ state

When entering this state the PoC Server:

1. SHALL set the state for the associated PoC Client to ‘U: not permitted and TB_Idle’.

6.4.5.2.2 Permission state change

If another PoC Client than the associated PoC Client in the PoC Session is granted the permission to send a Talk Burst, the PoC Server

1. SHALL perform the actions specified in the subclause 6.4.5.3.1 “Enter the ‘U: not permitted and TB_Taken’ state”.

6.4.5.2.3 Receive TBCP Talk Burst Request message (R: TB_Request)

Upon receiving a TBCP Talk Burst Request:

1. if there is only one Participant in the PoC Session and the PoC Server chooses to send a TBCP Talk Burst Deny message the PoC Server:
 - a. SHALL send a TBCP Talk Burst Deny message to the PoC Client; and,
 - b. SHALL remain in the state 'U: not permitted and TB_Idle' state.
2. if there is only one Participant in the PoC Session and the PoC Server did not choose to send a TBCP Talk Burst Deny message to the PoC Client or there is more than one Participant in the PoC Session the PoC Server:
 - a. SHALL perform the actions in the subclause 6.4.4.2.2 "*Receive TBCP Talk Burst Request message (R: TB_Request)*".
 - b. SHALL perform the action in the subclause 6.4.5.4.1 "*Enter the state 'U: permitted'*".

6.4.5.2.4 Receive TBCP Talk Burst Release message (R: TB_Release)

Upon receiving a TBCP Talk Burst Release message from the associated PoC Client the PoC Server:

1. SHALL send a TBCP Talk Burst Idle message to the PoC Client; and,
2. SHALL remain in the state 'U: not permitted and TB_Idle' state.

6.4.5.2.5 Receive RTP Media packets (R: Media)

Upon receiving RTP Media packets from the associated PoC Client the PoC Server:

1. SHALL NOT forward the received RTP Media packets to other PoC Clients in the PoC Session.
2. SHALL send a TBCP Talk Burst Revoke message to the associated PoC Client.

The TBCP Talk Burst Revoke message:

- a. SHALL include the Reason code field 'No permission to send a Talk Burst'.
3. SHALL perform the actions specified in the subclause 6.4.5.7.1 "*Enter the 'U: not permitted but sending RTP Media packets' state*".

6.4.5.3 State U: not permitted and TB_Taken

The 'U: not permitted and TB_Taken' state is a stable state and the PoC Server uses this state when another PoC Client (not the associated PoC Client) has been given permission to send a Talk Burst.

6.4.5.3.1 Enter the 'U: not permitted and TB_Taken' state

When entering this state the PoC Server:

1. SHALL set the basic state to 'U: not permitted and TB_Taken'.

6.4.5.3.2 Permission state change

When the general state machine changes its state to 'G: TB_Idle' the PoC Server:

1. SHALL perform the actions specified in the subclause 6.4.5.2.1 "*Enter the 'U: not permitted and TB_Idle' state*".

6.4.5.3.3 Receive TBCP Talk Burst Request message (R: TB_Request)

Upon receiving a TBCP Talk Burst Request message from the associated PoC Client, if the optional TBCP features, “queuing” or “tb_priority” has not been negotiated at PoC Session initiation, the PoC Server

1. SHALL send a TBCP Talk Burst Deny message to the associated PoC Client.

The TBCP Talk Burst Deny message:

- a. SHALL include the Reason code field ‘Another PoC User has permission’.
2. SHALL remain in the ‘U: not permitted and TB_Taken’ state.

Upon receiving a TBCP Talk Burst Request message from the associated PoC Client, if the optional TBCP features, “queuing” or “tb_priority” has been negotiated at PoC Session initiation, the PoC Server either

3. if the requesting PoC Client has a maxpriority = ‘00 - listen only’, the PoC Server:

- a. SHALL send a TBCP Talk Burst Deny message to the PoC Client.

The TBCP Talk Burst Deny message:

- i. SHALL include the Reason code field ‘Listen only’.
- b. SHALL remain in the ‘U: not permitted and TB_Taken’ state.

or,

4. if the priority level is pre-emptive and there are no other pre-emptive requests in the queue and the current PoC Client with permission to send a Talk Burst does not have the pre-emptive priority, the PoC Server:

- a. SHALL perform the action in the subclause 6.4.5.2.3 “Receive Talk Burst Request (R: TB_Request)”;

or,

5. if the optional TBCP features, “queuing” and “tb_priority” has been negotiated at PoC Session initiation, the PoC Server SHALL store the SSRC of PoC Client requesting a permission to send a Talk Burst until the end of the Talk Burst associated to that request and then the PoC Server SHALL place the PoC Client in the Talk Burst request queue as follows:

- a. The PoC Server SHALL determine the priority to be granted to the TBCP Talk Burst Request message, which SHALL be the lower of the priority requested by the PoC Client and the maximum priority the PoC Client is permitted to request. If the optional priority based queuing is not supported by the PoC Server or agreed with the PoC Client then the normal priority SHALL be used;

- b. either

- i. If the queued request timestamp option is requested by the PoC Client and this option is supported by the PoC Server then the PoC Server SHALL place the PoC Client in the Talk Burst request queue immediately following all queued requests at the same priority level ahead with an earlier timestamp and immediately after all queued requests at the same priority level with a later timestamp. The position of the request relative to other requests at the same priority which were not time-stamped SHALL be determined according to the policy of the PoC Server;

or,

- ii. The PoC Server SHALL place the PoC Client in the Talk Burst request queue immediately following all queued requests at the same priority level.

- c. The PoC Server SHALL send a TBCP Talk Burst Request Queue Status Response message to the PoC Client.

The TBCP Talk Burst Request Queue Status Response message:

- i. SHALL indicate that the PoC Client has been placed in the Talk Burst request queue;
- ii. MAY do so by giving the position of the PoC Client in the Talk Burst request queue; and,
- iii. MAY give the priority granted to the TBCP Talk Burst Request message in the queue;
- d. The PoC Server SHALL remain in the 'U: not permitted and TB_Taken' state.

NOTE: If a second request is received from a PoC Client when a request is already queued, the PoC Server removes the first request and queue the second request.

6.4.5.3.4 Receive TBCP Talk Burst Release message (R: TB_Release)

Upon receiving a TBCP Talk Burst Release message from the associated PoC Client, if the optional TBCP feature, "queuing," has not been negotiated at PoC Session initiation, the PoC Server:

1. SHALL send a TBCP Talk Burst Taken message, showing the identity of the PoC User that has been given permission to send a Talk Burst, to the associated PoC Client.

The TBCP Talk Burst Taken message:

- a. SHALL include the identity of the PoC User that has been given permission to send a Talk Burst.
2. SHALL remain in the 'U: not permitted and TB_Taken' state.

Upon receiving a TBCP Talk Burst Release from the associated PoC Client, if the optional TBCP feature, "queuing," has been negotiated at PoC Session initiation, the PoC Server:

3. SHALL remove the PoC Client from the Talk Burst request queue, if the PoC Client was in the Talk Burst request queue;
4. SHALL send a TBCP Talk Burst Request Queue Status Response message to the PoC Client, giving a indication that the PoC Client is not in the Talk Burst request queue; and,
5. SHALL remain in the 'U: not permitted and TB_Taken' state.

6.4.5.3.5 Receive RTP Media packets (R: Media)

Upon receiving RTP Media packets from the associated PoC Client, the PoC Server:

1. SHALL NOT forward the RTP Media packets to the other PoC Clients in the PoC Session; and,
2. SHALL send a TBCP Talk Burst Revoke message to the associated PoC Client.

The TBCP Talk Burst Revoke message:

- a. SHALL include the Reason code field 'No permission to send a Talk Burst'; and,
3. SHALL perform the actions specified in the subclause 6.4.5.7.1 "Enter the 'U: not permitted but sends RTP Media packets' state".

6.4.5.4 State U: permitted

The 'U: permitted' state is a stable state and the PoC Server uses this state when the associated PoC Client has been given permission to send a Talk Burst.

The timer T1 (End of RTP Media) is running in this state. The timer T2 (Stop talking) may be running in this state.

6.4.5.4.1 Enter the state 'U: permitted'

When entering this state the PoC Server:

1. SHALL start the T1 (End of RTP Media) timer; and
2. SHALL set the state for the associated PoC Client to 'U: Permitted'.

NOTE: The T1 and T2 timers above are started and stopped by the general state machine procedure but added in the list above for readability and completeness reasons.

6.4.5.4.2 Receive TBCP Talk Burst Release message (R: TB_Release)

Upon receiving a TBCP Talk Burst Release message from the associated PoC Client the PoC Server, (the message includes an indication of the sequence number of the last RTP Media packet):

1. and, if last RTP Media packet is not received the PoC Server:
 - a. SHALL store last sequence number indicated in the message; and,
 - b. SHALL remain in the state 'U: permitted'.
2. or, if last RTP Media packet is already received the PoC Server:
 - a. SHALL stop the T2 (Stop talking) timer, if the timer is running; and
 - b. SHALL perform the actions specified in the 6.4.5.2.1 "Enter the 'U: not permitted and TB_Idle' state".
3. or, if the sequence number was set to invalid in the TBCP Talk Burst Release message, the PoC Server:
 - a. SHALL stop the T2 (Stop talking) timer, if the timer is running; and
 - b. SHALL perform the actions specified in the 6.4.5.2.1 "Enter the 'U: not permitted and TB_Idle' state".

6.4.5.4.3 T1 (End of RTP Media) timer fired

On expiry of T1 (End of RTP Media) timer, the PoC Server:

1. SHALL stop the T2 (Stop talking) timer, if the timer is running; and,
2. SHALL perform the actions specified in the subclause 6.4.5.2.1 "Enter the 'U: not permitted TB_Idle' state".

NOTE: The T2 timer above is started and stopped by the general state machine procedure but added in the list above for readability and completeness reasons.

6.4.5.4.4 T2 (Stop talking) timer fired

On expiry of the T2 (Stop talking) timer, the PoC Server:

1. SHALL send a TBCP Talk Burst Revoke message to the associated PoC Client.

The TBCP Talk Burst Revoke message:

- a. SHALL include the Reason code field 'Talk burst too long'; and,
2. SHOULD include the retry-after time.
3. SHALL perform the actions specified in the subclause 6.4.5.5.1 "Enter the 'U: pending TB_Revoke' state".

6.4.5.4.5 Receive RTP Media packets (R: Media)

Upon receiving RTP Media packets from the associated PoC Client the PoC Server:

1. SHALL forward the RTP Media packets to the other PoC Clients in the PoC Session that are not on hold; and,
 - a. SHALL start the T2 (Stop talking) timer if not already running; and,
 - b. SHALL maintain the 'U: permitted' state.
2. if the PoC Server detects the last RTP Media packet of the talk burst, the PoC Server:
 - a. SHALL stop the T2 (Stop talking) timer; and,
 - b. SHALL perform the actions specified in the subclause 6.4.5.2.1 "Enter the 'U: not permitted TB_Idle' state".

6.4.5.4.6 Receive TBCP Talk Burst Request message (R: TB_Request)

Upon receiving a TBCP Talk Burst Request message from the associated PoC Client the PoC Server:

1. SHALL send a TBCP Talk Burst Granted message, including information about the stop talking timer, to the associated PoC Client;
2. SHALL store the SSRC of PoC Client requesting a permission to send a Talk Burst until the end of the Talk Burst associated to that Talk Burst Request; and,
3. SHALL remain in the 'U: permitted' state.

6.4.5.5 State 'U: pending TB_Revoke'

The 'U: pending TB_Revoke' state is a transition state and the PoC Server uses this state during the grace period after sending the TBCP Talk Burst Revoke message.

6.4.5.5.1 Enter the state 'U pending TB_Revoke'

When entering this state the PoC Server:

1. SHALL start the T3 (Stop Talking grace) timer;
2. SHALL start the T8 (Talk Burst Revoke) timer; and,
3. SHALL set the state for the associated PoC Client to 'U: pending TB_Revoke'.

6.4.5.5.2 T8 (Talk Burst Revoke) timer fired

On expiry of the T8 (Talk Burst Revoke) timer the PoC Server:

1. SHALL retransmit the TBCP Talk Burst Revoke message to the associated PoC Client.

The TBCP Talk Burst Revoke message:

- a. SHALL include the Reason code field "Talk burst too long"; and,
 - b. SHOULD include the previous retry after time, which MAY be decremented by T8 (Talk Burst Revoke) seconds.
2. SHALL start the T8 (Talk Burst Revoke) timer; and,
 3. SHALL remain in the 'U: pending TB_Revoke' state.

6.4.5.5.3 T3 (Stop Talking grace) timer fired

On expiry of the T3 (Stop talking grace) timer the PoC Server:

1. SHALL perform the actions specified in the 6.4.5.6.1 “Enter the ‘U: waiting TB_Revoke’ state”.

6.4.5.5.4 Receive RTP Media packets (R: Media)

Upon receiving a RTP Media packet from the associated PoC Client different from the last RTP Media packet the PoC Server:

NOTE 1: Prior to the reception of the TBCP Talk Burst Release message the PoC Server cannot determine if the received RTP Media packet is the last RTP Media packet and handles all received RTP Media packets as being not the last.

1. SHALL forward RTP Media packet to the other PoC Clients in the PoC Session;
2. SHALL restart T1 (End of RTP Media) timer; and,
3. SHALL remain in the ‘U: pending TB_Revoke’ state.

NOTE 2: The T1 timer above is started and stopped by the general state machine procedure but added in the list above for readability and completeness reasons.

6.4.5.5.5 Receive TBCP Talk Burst Release message (R: TB_Release)

Upon receiving a TBCP Talk Burst Release message (the message includes an indication of the sequence number of the last RTP Media packet) either

1. if last RTP Media packet is not received the PoC Server:
 - a. SHALL store last sequence number indicated in the message; and,
 - b. SHALL remain in the state ‘U: pending TB_Revoke’.or,
2. if last RTP Media packet is already received the PoC Server:
 - a. SHALL stop the timer T3 (Stop talking grace) timer; and,
 - b. SHALL perform the actions specified in the 6.4.5.6.1 “Enter the ‘U: waiting TB_Revoke’ state”.or,
3. if the sequence number was set to invalid in the TBCP Talk Burst Release message, the PoC Server:
 - a. SHALL stop the T3 (Stop talking grace) timer; and,
 - b. SHALL perform the actions specified in the 6.4.5.6.1 “Enter the ‘U: waiting TB_Revoke’ state”.

6.4.5.5.6 Receive last RTP Media packet (R: Last media)

Upon receiving a RTP Media packet with the same sequence number as indicated by the TBCP Talk Burst Release message to be the last RTP Media packet the PoC Server:

1. SHALL stop the timer T3 (Stop talking grace) timer; and,
2. SHALL perform the actions specified in the 6.4.5.6.1 “Enter the ‘U: waiting TB_Revoke’ state”.

6.4.5.5.7 T1 (End of RTP Media) timer fired

On expiry of the T1 (End of RTP Media) timer the PoC Server:

1. SHALL stop the timer T3 (Stop talking grace) timer; and,
2. SHALL perform the actions specified in the 6.4.5.6.1 “Enter the ‘U: waiting TB_Revoke’ state”.

6.4.5.6 State ‘U: waiting TB_Revoke’

The ‘U: waiting TB_Revoke’ state is a stable state and during the time the PoC Client is not allowed to request for the permission to send a Talk Burst as a penalty for misusing its permission to send a Talk Burst.

Timer T9 (retry-after) is running in this state.

NOTE: This state is required in order to not destroy a PoC Session in the case a PoC Client is misbehaving and requests for permission to send a Talk Burst all the time.

6.4.5.6.1 Enter the ‘U: waiting TB_Revoke’ state

When entering this state the PoC Server:

1. SHALL start the T9 (Retry-after) timer; and,
2. SHALL set the state for the associated PoC Client to ‘U: waiting TB_Revoke’.

During the time the PoC Server is in this state, the PoC Server:

3. SHALL NOT send the TBCP Talk Burst Idle message to the associated PoC Client;
4. SHALL send TBCP Talk Burst Taken messages to the associated PoC Client if another PoC Client is granted the permission to send a Talk Burst; and,
5. SHALL forward RTP Media packets from another PoC Client to the associated PoC Client.

6.4.5.6.2 Receive Talk Burst Request message (R: TB_Request)

Upon receiving a TBCP Talk Burst Request message from the associated PoC Client the PoC Server:

1. SHALL send a TBCP Talk Burst Deny message to the PoC Client.

The TBCP Talk Burst Deny message:

- a. SHALL include the Reason code field “Retry-after timer has not expired”.
2. SHALL remain in the ‘U: waiting TB_Revoke’ state.

6.4.5.6.3 T9 (Retry-after) timer fired

On expiry of the T9 (Retry-after) timer either,

1. if the general state is ‘G: TB_Idle’, the PoC Server:
 - a. SHALL send the TBCP Talk Burst Idle message; and,
 - b. SHALL perform the actions specified in the subclause 6.4.5.2.1 “Enter the ‘U: not permitted and TB_Idle’ state”.
- or,
2. if the general state is ‘G: TB_Taken’, the PoC Server:

- a. SHALL perform the actions specified in the subclauses 6.4.5.3.1 “*Enter the ‘U: not permitted and TB_Taken’ state*”.

6.4.5.7 State U: not permitted but sends media

The ‘U: not permitted but sends media’ state is a transition state and the PoC Server uses this state when it receives RTP Media packets from the associated PoC Client and the associated PoC Client is not permitted to send a Talk Burst.

Timer T8 (Talk Burst Revoke) is running in this state.

6.4.5.7.1 Enter the ‘U: not permitted but sends media’ state

When entering this state the PoC Server:

1. SHALL start the T8 (Talk Burst Revoke) timer; and,
2. SHALL set the state for the associated PoC Client to ‘U: not permitted but sends media’.

When the PoC Server is in this state, the PoC Server:

3. SHALL NOT forward the RTP Media packet to the other PoC Clients in the PoC Session.

6.4.5.7.2 T8 (Talk Burst Revoke) timer fired

On expiry of T8 (Talk Burst Revoke) timer, the PoC Server:

1. SHALL send a TBCP Talk Burst Revoke message to the associated PoC Client.

The TBCP Talk Burst Revoke message:

- a. SHALL include the Reason code field “No permission to send a Talk Burst”.
- b. SHALL restart T8 (Talk Burst Revoke) timer; and,
- c. SHALL remain in the ‘U: not permitted but sends media’ state.

NOTE: The number of times the PoC Server retransmits the TBCP Talk Burst Revoke message and the action to take when the PoC Server gives up is an implementation issue. However, it is recommended that the PoC Client is disconnected from the PoC Session.

6.4.5.7.3 Receive TBCP Talk Burst Release message (R: TB_Release)

Upon receiving a TBCP Talk Burst Release message from the associated PoC Client the PoC Server either:

1. if the general state is ‘G: TB_Idle’, the PoC Server:
 - a. SHALL send the TBCP Talk Burst Idle message; and,
 - b. SHALL perform the actions specified in the subclause 6.4.5.2.1 “*Enter the ‘U: not permitted and TB_Idle’ state*”.

or,

2. if the general state is ‘G: TB_Taken’, the PoC Server:
 - a. SHALL send a TBCP Talk Burst Taken message with the talker identity as specified in clause 8.2 “*Talker Identification*”; and,
 - b. SHALL perform the actions specified in the subclauses 6.4.5.3.1 “*Enter the ‘U: not permitted and TB_Taken’ state*”.

6.4.5.7.4 State: Any state

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.

6.4.5.7.5 Receive PoC Session release – 1

Upon receiving a PoC Session release stage 1 request from the Control Plane for either this PoC Client or the PoC Session, the PoC Server:

1. SHALL stop sending TBCP messages and RTP Media towards to the PoC Client;
2. SHALL ignore any TBCP messages received from the PoC Client;
3. SHALL stop forwarding RTP Media received from the PoC Client;
4. SHALL perform the actions specified in 6.4.4.2.1 “Enter state ‘G: TB_Idle’”, if the releasing PoC Client is currently transmitting RTP Media; and,
5. SHALL enter the ‘Releasing’ state.

6.4.5.8 State: ‘Releasing’

The ‘Releasing’ state is a transition state. The PoC Server uses this state while waiting for the Control Plane to finalize the disconnection of a PoC Session.

6.4.5.9 Receive PoC Session release - 2

Upon receiving a PoC Session release stage 2 request from the Control Plane, the PoC Server:

1. SHALL release all User Plane resources and any running timers associated with the general and basic state machines associated with this PoC Client for this PoC Session; and,
2. SHALL enter the ‘Start-stop’ state and terminate the PoC Server state machine for normal Talk Burst operation to the PoC Client.

6.5 Talk Burst Control Protocol (TBCP) messages

The Talk Burst Control Protocol (TBCP) is based on the RTCP Application Packets (RTCP: APP), as defined in [RFC3550], but TBCP messages do not conform to the rules for compound RTCP packets or RTCP packet transmission. Each TBCP message SHALL be one RTCP: APP packet. These RTCP: APP packets SHALL not be sent in compound RTCP packets, but more than one TBCP Talk Burst Control message MAY be sent in a single IP packet. The structure of each TBCP message is defined below.

6.5.1 RTCP: APP message format

The definition of the fields in the RTCP APP packet is found in [RFC3550].

Table 1 “RTCP: APP message format” shows the RTCP APP packet format.

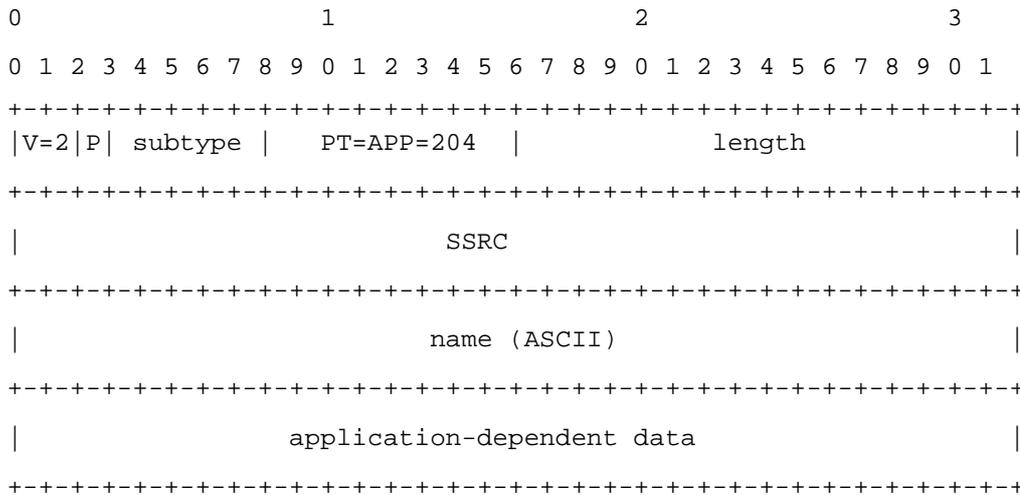


Table 1: RTCP: APP message format

The padding bit P SHALL be set to 0.

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 may indicate message size longer than specified in this version of the protocol. This may be the case e.g. if message is of later version of this protocol.

The 4-byte ASCII string in the RTCP header SHALL be used to define the set of TBCP Talk Burst Control messages to be unique with respect to other APP packets that the application might receive.

For PoC the ASCII name string SHALL be: PoC1.

The use of application dependent data is specified in the subclauses following. If the length of the application dependent data is not a multiple of 4 bytes, the application dependent data SHALL be padded to a multiple of 4 bytes. The value of the padding bytes SHOULD be set to zero. The PoC Client SHALL ignore the value of the padding bytes.

When a message is received the PoC Client and the PoC Server SHALL:

- ignore whole the message, if the subtype is unknown
- ignore the unspecified fields in the message (e.g. specified in future versio of the PoC Enabler Release) and,
- ignore the syntactically incorrect optional fields.

6.5.2 TBCP Talk Burst Request message

The TBCP Talk Burst Request message is a request from a PoC Client to get permission to send a talk-burst.

Table 2 “TBCP Talk Burst Request message” shows the content of the message.

3 – pre-emptive priority

All other values are reserved and SHALL NOT be used.

6.5.2.2 Talk Burst request timestamp

The Talk Burst request timestamp option SHALL be included if the PoC Client and the PoC Server performing the Controlling PoC Function have agreed to support time stamping of TBCP Talk Burst request messages and if the PoC Client wishes to timestamp a particular TBCP Talk Burst Request message.

The Talk Burst request timestamp option SHALL indicate when the original TBCP Talk Burst Request message was sent, if the PoC Client repeats the TBCP Talk Burst Request message.

If a timestamp is included in a TBCP Talk Burst Request message and the request is queued, the PoC Server SHALL use the value of the timestamp to determine the position of the request in the Talk Burst request queue.

The request SHOULD be queued according to the timestamp value, after all other requests associated with an earlier timestamp at the same level of priority and before all other requests associated with a later timestamp at the same level of priority.

The position of the request relative to other requests at the same priority, which were not time stamped, and relative to requests at different priority levels, SHALL be determined according to the policy of the PoC Server.

The Time-stamp field SHALL have the value 103 (decimal).

The Time-stamp-length field SHALL have the value 8 (decimal) indicating the length of this item.

The Time-stamp-value field SHALL consist of 8 bytes giving an NTP timestamp as specified in [RFC1305].

The timestamp option requires time synchronization between the PoC Clients in the PoC Session. However, the PoC network does not define any entity that performs time synchronization between the PoC Clients. Therefore, if a PoC Client supports the timestamp option, it SHALL be provided the NTP timestamp by a timeserver located outside the PoC network (for definition of a timeserver, see [RFC1305]).

NOTE: The timeserver may be the GPS time provided by the protocols of the underlying access network.

6.5.3 TBCP Talk Burst Granted message

The TBCP Talk Burst Granted message is an action from the PoC Server performing the Controlling PoC Function to inform the requesting PoC Client that it has been granted the permission to send a Talk Burst.

Table 3 “*TBCP Talk Burst Granted message*” shows the content of the message.

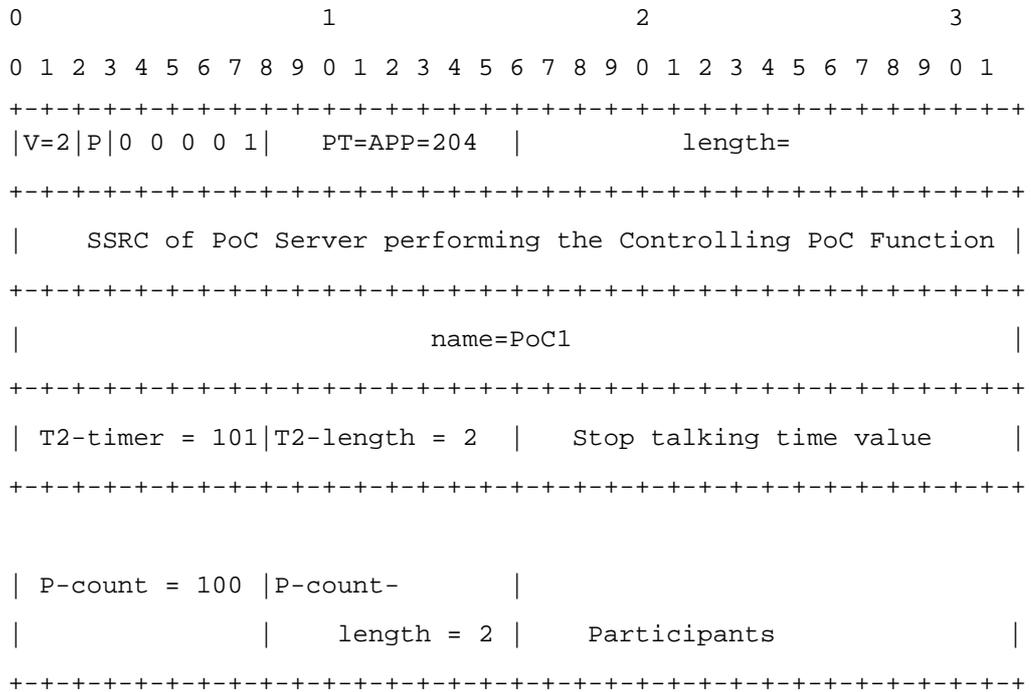


Table 3: TBCP Talk Burst Granted message

The following bit pattern in the subtype field SHALL be used for the TBCP Talk Burst Granted message: 00001.

The TBCP Talk Burst Granted message SHALL consist of the mandatory 12 bytes of header information and of 4 bytes of additional information used for the stop talking timer item, and MAY consist of another 4 bytes of additional information used for Participants item.

The value of the length field varies from 3 to 4 depending if optional additional information field is included or not.

The Stop talking time item SHALL consist of the 8 bits T2-timer field and the 8 bits T2-length field indicating the length of the following additional information in bytes (8 bits) and the 16 bits Stop talking time value field as an integer number (x) giving the time of Stop talking (T2) timer.

The T2-timer field SHALL include the value 101 (decimal) indicating that this additional information field is used to indicate the Stop talking time value.

The T2-length field SHALL include the value 2 indicating the length of this item.

The value of the Stop talking time value SHALL be a 16 bits integer and it SHALL be used as follows:

- 0 = The value of timer T2 is unknown
- 1 ... 65534 = The value of timer T2 in seconds,
- 65535 = The value of T2 is infinity.

The Stop talking timer value in the TBCP Talk Burst Granted message corresponds to the value of timer T2 at the time the timer is started, and therefore the value does not change during the Talk Burst.

In case the optional Participants item is included, it SHALL consist of the 8 bits P-count indication and the 8 bits P-count-length field indicating the length of the following additional information in bytes (8 bits) and the 16 bits Participants field as an integer number (x) giving the number of the Participants currently in the PoC Session.

The P-count field SHALL include the value 100 (decimal) indicating that this additional information field is used to indicate the amount of Participants in the PoC Session.

The P-count-length field SHALL include the value 2 indicating the length of this item.

The Participant field SHALL be a 16 bits integer and it SHALL be used as follows:

- 0 = The number of Participant is not known.
- 1 ... 65534 = The number of Participants in the PoC Session including the speaker.
- 65535 = 65535 or more Participants in the PoC Session including the speaker.

The SSRC field SHALL carry the SSRC of the PoC Server performing the Controlling PoC Function.

6.5.4 TBCP Talk Burst Deny message

The TBCP Talk Burst Deny message is sent as an action from the PoC Server performing the Controlling PoC Function to the requesting PoC Client to inform it that permission to send a Talk Burst was rejected.

Table 4 “TBCP Talk Burst Deny message” shows the content of the message.

0	1	2	3
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9 0 1
+++++			
V=2 P 0 0 0 1 1		PT=APP=204	length
+++++			
SSRC of PoC Server performing the Controlling PoC Function			
+++++			
name=PoC1			
+++++			
Reason code		Length	Reason Phrase
+++++			
			:
:			
+++++			

Table 4: TBCP Talk Burst Deny message

The following bit pattern in the subtype field SHALL be used for the TBCP Talk Burst Deny message: 00011.

Application-dependent data for the TBCP Talk Burst Deny message includes a reason in the Reason code field and possibly followed by a text-string in the Reason Phrase field describing why the request was rejected. Therefore the length of the packet will vary depending on the size of the application dependent field.

The SSRC field SHALL carry the SSRC of the PoC Server performing the Controlling PoC Function.

The first 8 bits in the application-dependent data field is used for the Reason code field.

The Length field gives the length of the Reason Phrase field in bytes. If the Length field is set to 0, there is no reason in the Reason Phrase field. The Reason Phrase field may contain a text string with additional information. The text string SHALL use the same encoding as the text strings in the SDES item CNAME as specified in [RFC3550].

6.5.4.1 Reason codes

6.5.4.1.1 Another PoC User has permission

Indicates that another PoC User has permission to send a Talk Burst.

The value of the Reason code field SHALL be: 1.

6.5.4.1.2 Internal PoC Server Function error

Indicates that the PoC Server performing the Controlling PoC Function cannot grant the Talk Burst request due to an internal error.

The value of the Reason code field SHALL be: 2.

6.5.4.1.3 Only one Participant in the PoC Session

Indicates that the PoC Server performing the Controlling PoC Function cannot grant the talk request, because the requesting party is the only Participant in the PoC Session.

The value of the Reason code field SHALL be: 3.

6.5.4.1.4 Retry-after timer has not expired

Indicates that the PoC Server performing the Controlling PoC Function cannot grant the talk request, because timer T9 (Retry-after) has not expired after permission to send a Talk Burst has been revoked.

The value of the Reason code field SHALL be: 4.

6.5.4.1.5 Listen only

Indicates that the PoC Server performing the Controlling PoC Function cannot grant the talk request, because the requesting party only has listen only privilege.

The value of the Reason code field SHALL be: 5.

6.5.5 TBCP Talk Burst Release message

The TBCP Talk Burst Release message is sent as an action from the PoC Client that has permission to send a Talk Burst to the PoC Server performing the Controlling PoC Function to inform it that the Talk Burst is completed.

The Talk Burst Release message MAY also be sent if the PoC Client and the PoC Server performing the Controlling PoC Function have agreed to support queuing of Talk Burst requests and if the PoC Client has a request in the Talk Burst request queue. In this case, the TBCP Talk Burst Release message is sent as an action from the PoC Client that has requested permission to send a Talk Burst to the PoC Server performing the Controlling PoC Function to inform it that the request for a Talk Burst is cancelled. The message is used to cancel the request regardless of whether the request has been granted.

Table 5 “*TBCP Talk Burst Release message*” shows the content of the message.

0												1												2												3											
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1																
V=2 P 0 0 1 0 1												PT=APP=204												length=2																							
SSRC of PoC Server performing the Controlling PoC Function																																															
name=PoC1																																															

Table 6: TBCP Talk Burst Idle message

The following bit pattern in the subtype field SHALL be used for the TBCP Talk Burst Idle message: 00101.

No valid application-dependent data is defined for TBCP Talk Burst Idle for this version of PoC. Therefore, the TBCP Talk Burst Idle message SHALL only consist of the mandatory 12 bytes of header information and the length field SHALL be set to two.

The SSRC field SHALL carry the SSRC of the PoC Server performing the Controlling PoC Function.

6.5.7 TBCP Talk Burst Taken message

The TBCP Talk Burst Taken message is sent as an action from the PoC Server performing the Controlling PoC Function to inform non-requesting PoC Client(s) that someone has been granted permission to send a Talk Burst.

Table 7 “TBCP Talk Burst Taken message” shows the content of the message.

0										1										2										3									
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
V=2 P subtype										PT=APP=204										length																			
										SSRC of PoC Server performing the Controlling PoC Function																													
										name=PoC1																													
										SSRC of PoC Client granted a permission to send a Talk Burst																													
										SDES item CNAME followed by SDES item NAME																													
:																				:																			
P-count = 100										P-count-																													
										length = 2										Participants																			

Table 7: TBCP Talk Burst Taken message

The following bit pattern in the subtype field SHALL be used for the TBCP Talk Burst Taken message:

- 00010, when no acknowledgement reply is expected; and,
- 10010, when the sender of the TBCP Talk Burst Taken message expects an acknowledgement reply.

In the application dependent data, the TBCP Talk Burst Taken message SHALL carry a SSRC field and SDDES items, CNAME and MAY carry SDDES item NAME to identify the PoC Client that has been granted permission to send a Talk Burst.

If the PoC Client that has been granted permission to send a Talk Burst has requested privacy an anonymous URI SHALL be included instead of the PoC User's PoC Address in CNAME. The anonymous URI SHALL follow the guidelines defined in [RFC3323] for anonymous URIs and be the same as in Participant information specified in [OMA-CP] "Generating a SIP NOTIFY request".

The SDDES item NAME SHALL be included if it is known by the PoC Server. The TBCP Talk Burst Taken message MAY also carry Participants item indicating the number of the Participants in the PoC Session. Therefore the length of the packet will vary depending on number of SDDES items and the size of the SDDES items and existence of the optional Participants indication.

The CNAME identifier SHALL carry the URI of the PoC User that has been granted permission to send a Talk Burst, while the NAME identifier, if included and privacy is not requested, SHALL carry the Nick Name of the PoC User that has been granted permission to send a Talk Burst. The SDDES items and the proper encoding of the URI and the Nick Name are specified in [RFC3550]. The format of the SIP URI is defined in [RFC2396] and [RFC3261].

6.5.8.1 Reason codes

The first 16 bits in the application-dependent data field is used for the Reason code field. Thereafter additional information is added. Depending on the value of the Reason code field, the number of octets conveying additional information differs.

6.5.8.1.1 Only one PoC User

Indicates that the PoC Client is the only PoC Client in the Session.

The value of the Reason code field SHALL be: 1.

No additional information SHALL be included. Hence, the first 16 bits in the additional information field SHALL be populated with zeros.

6.5.8.1.2 Talk burst too long

Indicates that the PoC User has talked too long, i.e. the stop-talking timer has expired.

The value of the Reason code field SHALL be: 2.

As additional information the additional information field carries a retry-after field where the 16 bits in the additional information field is an integer number giving the time in seconds when the PoC Client can request permission to send a Talk Burst again. The timer length should be a few seconds longer than the timer value for the retry-after timer in the PoC Server performing the Controlling PoC Function.

NOTE 1: $T12 = T9 + \Delta$ (a few seconds) where $[T3 - (\text{average round trip time from PoC Client to Controlling PoC Function} + \text{average round trip time from Controlling PoC Function to PoC Client})] \leq \Delta \leq T3$

Thus, a PoC Client that receives a TBCP Talk Burst Revoke message with a retry-after field that is non-zero SHOULD NOT try to transmit anything before the time given in the retry-after field has expired. Therefore, a retry-after timer in the PoC Client is needed.

NOTE 2: The retry-after timer functionality in the PoC Server performing the Controlling PoC Function and in the PoC Client is used to prevent a PoC User to immediately request permission to send a Talk Burst after it has received a TBCP Talk Burst Revoke message.

6.5.8.1.3 No permission to send a Talk Burst

Indicates that the PoC Client does not have permission to send a Talk Burst even though the PoC Client is in the "has permission state" and transmits RTP Media packets.

Temporary loss of coverage for a PoC Client with permission to send a Talk Burst may result in this case of different states in the PoC Client and the PoC Server performing the Controlling PoC Function. This happens when the loss of coverage is longer than the timer value of the T1 (End of RTP Media) timer".

The value of the Reason code field SHALL be: 3.

No additional information SHALL be included. Hence, the first 16 bits in the additional information field SHALL be populated with zeros.

6.5.8.1.4 Talk Burst pre-empted

Indicates that the PoC Client's permission to send a Talk Burst is being pre-empted.

The value of the Reason code field SHALL be: 4.

No additional information SHALL be included. Hence, the first 16 bits in the additional information field SHALL be populated with zeros.

6.5.9 TBCP Talk Burst Acknowledgement message

The TBCP Talk Burst Acknowledgement message is a response from a PoC Client to a message that has been sent.

Table 9 “*TBCP Talk Burst Acknowledgement*” shows the content of the message.

0										1										2										3										
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	
V=2 P 0 0 1 1 1										PT=APP=204										length=3																				
SSRC of PoC Client sending the acknowledgement message																																								
																				name=PoC1																				
subtype										reason code										!										padding										

Table 9: TBCP Talk Burst Acknowledgement

The following bit pattern in the subtype field SHALL be used for the TBCP Talk Burst Acknowledgement message: 00111.

The application dependent data area contains one or two defined fields: subtype followed by 11 bits of reason code field followed by 16 padding bits. If the reason code field is not used the corresponding field is filled by padding bits as specified in subclause 6.5.1 ‘RTCP: APP message format’.

The application dependent data subtype field SHALL be the value of the subtype field found in the message that is being acknowledged.

The SSRC field shall carry the SSRC of the PoC Client that is sending the acknowledgement.

6.5.9.1 Reason codes

6.5.9.1.1 Accepted

Indicates that the PoC Client has accepted the incoming PoC Session.

The reason code SHALL be: 0 (decimal value).

6.5.9.1.2 Busy

Indicates that the PoC Client has not accepted the incoming PoC Session, because it is busy.

The reason code SHALL be: 1 (decimal value).

6.5.9.1.3 Not accepted

Indicates that the PoC Client has not accepted the incoming PoC Session.

The reason code SHALL be: 2 (decimal value).

6.5.10 TBCP Talk Burst Request Queue Status Request message

The TBCP Talk Burst Request Queue Status Request message is a request from a PoC Client to get information about the PoC Client’s position in the Talk Burst request queue.

Table 10 “*Talk Burst Request Queue Status Request message*” shows the content of the message.

0												1												2												3											
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1																
V=2 P 0 1 0 0 0												PT=APP=204												length=2																							
SSRC of PoC Client requesting queue status information																																															
name=PoC1																																															

Table 10: Talk Burst Request Queue Status Request message

The following bit pattern in the subtype field SHALL be used for the Talk Burst Request Queue Status Request message: 01000.

The SSRC field SHALL carry the SSRC of the PoC Client that is requesting information about its position in the Talk Burst request queue.

No valid application-dependent data is defined for the TBCP Talk Burst Request Queue Status Request message for this version of PoC. Therefore, the TBCP Talk Burst Request Queue Status Request message SHALL only consist of the mandatory 12 bytes of header information and the length field SHALL be set to two.

6.5.11 TBCP Talk Burst Request Queue Status Response message

The TBCP Talk Burst Request Queue Status Response message is sent by the PoC Server performing the Controlling PoC Function to notify the PoC Client of its position in the Talk Burst request queue. The message is sent in response to a TBCP Talk Burst Request message if the request is queued, and in response to a TBCP Talk Burst Request Queue Status Request message. It may be sent at other times, e.g. if the PoC Client is removed from the Talk Burst request queue or if the position or priority of the request is changed.

Table 11 “*TBCP Talk Burst Request Queue Status Response message*” shows the content of the message.

0										1										2										3									
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
V=2 P 0 1 0 0 1										PT=APP=204										length=3																			
SSRC of PoC Server performing the Controlling PoC Function																																							
name=PoC1																																							
Priority										Queue position										padding																			

Table 11: TBCP Talk Burst Request Queue Status Response message

The following bit pattern in the subtype field SHALL be used for the TBCP Talk Burst Request Queue Status Response message: 01001.

The SSRC field SHALL carry the SSRC of the PoC Server performing the Controlling PoC Function.

The application-dependent data area contains two defined fields in this version of PoC: the priority level and the queue position.

The priority level field is a 1 byte field which defines the priority level that is currently held by the last request received. The defined priority levels that can be included in a TBCP Talk Burst Request Queue Status Response message are:

- 1 – normal priority
- 2 – high priority
- 3 – pre-emptive priority

The default value if the TBCP priority option was not negotiated at PoC Session setup shall be 1 – normal priority.

All other values are reserved.

The queue position field defines the number of PoC Clients in the TBCP Talk Burst Request Queue Status Response message that are ahead of the PoC Client. The queue position field SHALL have the value 0 if the PoC Client is un-queued. The queue position field SHALL have the max value (65535) if the PoC Client is queued but the PoC Server is unable to determine the queue position or if PoC Server policy is not to release information of the queue position to the PoC Client.

The last 8 bits are padding bits and SHALL be set to zero.

6.5.12 TBCP Disconnect message

The TBCP Disconnect message is sent by the PoC Server performing the Participating PoC Function to the PoC Client to indicate that the PoC Session using a Pre-established Session has been released.

Table 12 “TBCP Disconnect message” shows the content of the message.

0												1												2												3																							
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1																												
V=2												P												0 1 0 1 1												PT=APP=204												length=2											
SSRC of PoC Server performing the Participating PoC function																																																											
name=PoC1																																																											

Table 12: TBCP Disconnect message

The following bit pattern in the subtype field SHALL be used for the TBCP Disconnect message: 01011.

No valid application-dependent data is defined for TBCP Disconnect for this version of PoC. Therefore, the TBCP Disconnect message SHALL only consist of the mandatory 12 bytes of header information and the length field SHALL be set to two.

The SSRC field SHALL carry the SSRC of the PoC Server performing the Participating PoC Function.

6.5.13 TBCP Connect message

The TBCP Connect message is sent as an action from the PoC Server performing the Participating PoC Function to inform PoC Client(s) using Pre-established Session that it has been connected to a PoC Session.

Using the Pre-established Session procedure, the TBCP Connect message informs a terminating PoC Client(s) that it has been invited to a PoC Session and provides the PoC Session Identity, or an originating PoC Client that it has successfully established a PoC Session.

Table 13 “TBCP Connect message” shows the content of the message.

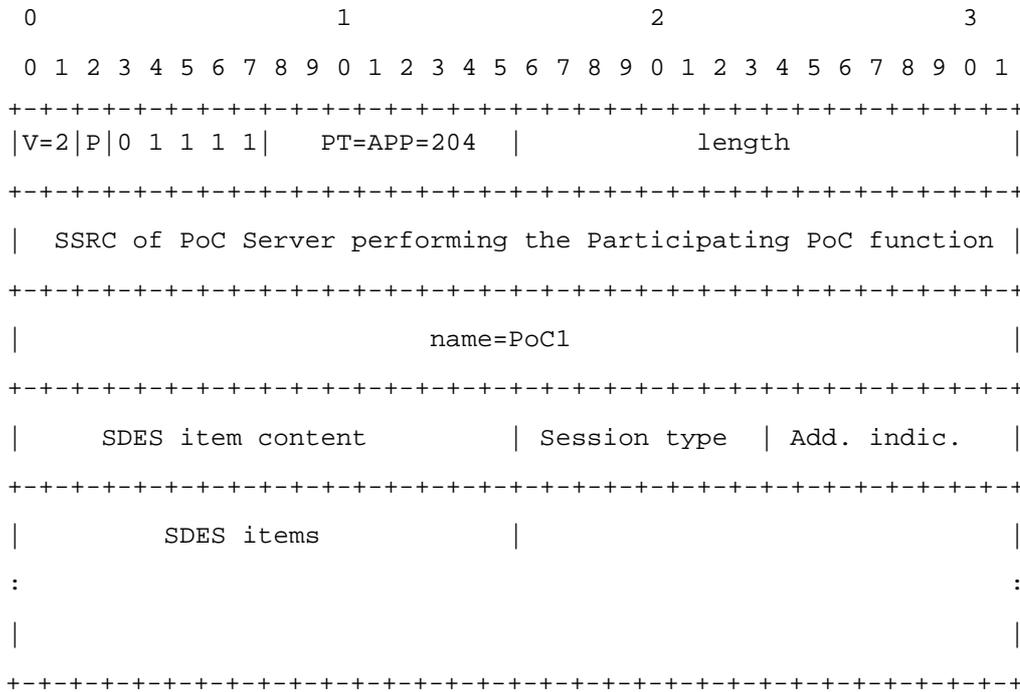


Table 13: TBCP Connect message

The following bit pattern in the subtype field SHALL be used for the TBCP Connect message: 01111.

In the application dependent data, the TBCP Connect message SHALL carry SDES item content, Additional indications (Add. indic.) and one to four SDES items. The SDES items field (in the order presented)

- SHALL include a CNAME item to identify the PoC Client initiating the PoC Session, if privacy was not requested;
- MAY include a NAME item to identify the Nick Name of the PoC Client initiating the PoC Session, if privacy was not requested;
- SHALL include a CNAME item to identify the PoC Session Identity;
- MAY include a NAME item to identify the PoC Group Name, if the PoC Session is of type prearranged or chat;
- SHALL include a CNAME of the PoC Group Identity, if the PoC Session is of type pre-arranged or chat.

If the PoC Client that initiated the PoC Session has requested privacy an anonymous URI SHALL be included instead of the PoC User's PoC Address in CNAME. The anonymous URI SHALL follow the guidelines defined in [RFC3323] for anonymous URIs and be the same as in Participant information specified in [OMA-CP] "Generating a SIP NOTIFY request". SDES item content size SHALL always be two bytes and Additional indications size SHALL always be two bytes. The length of the whole packet MAY vary depending on the amount and size of the SDES items.

SDES item content includes the bit pattern ABCDEXXXXXXXXXXXX, where each bit indicates if the optional SDES item is included or not (1= included, 0=not included) according to the description below:

- A= Identity of the Inviting PoC Client.
- B= The Nick Name provided by the Inviting PoC Client.
- C= PoC Session Identity.

NOTE: The PoC Session Identity matches the PoC Session Identity the PoC Server performing the Controlling PoC Function returns in the contact header of the SIP 200 "OK" to the PoC Server performing the Participating PoC Function.

D= The PoC Group Name.

E=PoC Group Identity.

X= for future use (set to 0).

Session type indicates the Session Type uri parameter as follows:

00000000 = no session type

00000001 = 1-1

00000010 = adhoc

00000011 = prearranged

00000100 = chat

The rest of the values are reserved for future use.

Additional indications includes the bit pattern axxxxxxx, where each bit indicates if the additional indication is included or not (1= included, 0=not included) according to the description below:

a= Manual Answer Override Indication.

x= for future use (set to 0).

The SDES items and the proper encoding of the URI are specified in [RFC3550].

The SSRC field SHALL carry the SSRC of the PoC Server performing the Participating PoC function.

6.5.14 Subtype bit pattern reserved for future use

All bit patterns in the subtype field that have not been specified above are reserved for future use.

7. Media control

7.1 Quality feed back

7.1.1 General

The PoC Client and the PoC Server performing the Controlling PoC Function MAY send quality feedback reports for the RTP Media packet transmission. The quality feedback SHALL be done according to [RFC3550] with the clarifications in this subclause. If supported, the quality feedback reporting:

- SHALL be performed by the transmission of RTCP Receiver Reports (RR) packets and Sender Reports (SR) packets; and,
- SHALL send the SR packets and the RR packets as RTCP SR compound packets and RTCP RR compound packets.

7.1.2 Procedures at the PoC Client

The PoC Client:

- SHALL act as an RTP endpoint according to [RFC3550];
- MAY support the transmission of RTCP SR/RR compound packets;

NOTE 1: Some PoC Clients may utilize radio bearers that prohibit the possibility to collect sender and reception statistics. Such PoC Client doesn't have to send any RTCP SR/RR compound packets, e.g. Service Option 60, see [3GPP2 C.S0047-0].

- SHALL support the reception of RTCP SR/RR compound packets;
- SHOULD NOT schedule transmission of RTCP SR compound packets during a Talk Burst (to reduce potential degradation of the quality of the RTP Media packet transmission); and,
- SHOULD NOT schedule the transmission of RTCP RR compound packets during a Talk Burst (to save bandwidth).

NOTE 2: Periodic transmission of RTCP RR compound packets during RTP Media packet transfer may be used as 'heart beat' indication from the listening PoC Clients to the PoC Server. One of the functions RTCP SR compound packets perform is synchronize multiple data streams, e.g. audio and video, and if synchronization is performed the transmission of RTCP SR compound packets during the RTP Media packet transfer is required.

7.1.2.1 PoC Client sending RTP Media packets

A PoC Client that supports quality feedback and has sent RTP Media packets:

- SHALL send a RTCP SR compound packet, when it ends the Talk Burst by sending the TBCP Talk Burst Release message.

7.1.2.2 PoC Client receiving media packets

A PoC Client that supports quality feedback and has received RTP Media packets:

- SHALL send a RTCP RR compound packet, when it gets an indication to trigger the transmission of the RTCP RR compound packet; and,

NOTE 1: Which indication the PoC Client uses to trigger the transmission of the RTCP RR compound packet is an implementation option but it may be the reception of a RTCP SR compound packet, an indication that the Talk Burst has ended, i.e. the reception of a TBCP Talk Burst Idle message or the expiry of the 'PoC Client end of RTP Media timer'.

- SHOULD use the reception of the RTCP SR compound packet as an indication to trigger the transmission of the RTCP RR compound packet.

NOTE 2: Quality feedback is an implementation option and a PoC Client cannot rely on the other PoC Clients in the PoC Session to send RTCP SR compound packets. Therefore, a PoC Client that waits for a RTCP SR compound packet before sending a RTCP RR compound packet must have a fallback option.

A PoC Client using the reception of the RTCP SR compound packet as indication to trigger the transmission of the RTCP RR compound packet:

- SHOULD implement a timer that supervises the reception of the RTCP SR compound packet.

NOTE 3: This timer should be started when the PoC Client gets an indication that the Talk Burst has ended. On expiry of the timer the PoC Client should conclude that the RTCP SR compound packet is not sent or is lost. On expiry the PoC Client should send the RTCP RR compound packet to the PoC Server even though it hasn't received the RTCP SR compound packet.

NOTE 4: Specification of this timer is outside the scope of this specification.

7.1.3 Procedures at the PoC Server performing the Participating PoC Function

The PoC Server performing the Participating PoC Function:

- SHALL be a 'translator' according to [RFC3550] for the RTP/RTCP flows;
- SHALL forward all RTCP compound packets from the PoC Client(s) to the PoC Server performing the Controlling PoC Function;
- SHALL forward all RTCP compound packets from the PoC Server performing the Controlling PoC Function to the PoC Client(s);
- SHALL modify the content of the RTCP compound packets if it is required by the translation, e.g. due to repacketizing;
- MAY modify the content of the RTCP SR compound packet send by the PoC Client in an interrupted PoC Session to reflect that the PoC Server has discarded RTP Media packets (if the ongoing Talk Burst in a PoC Session was interrupted due to a Talk Burst from the another PoC Session); and,
- SHALL NOT forward RTCP SR compound packets to a PoC Client that did not receive any RTP Media packets of the previously sent Talk Burst in the PoC Session because the PoC Client has received or sent another Talk Burst in another PoC Session (in a Simultaneous PoC Session case).

7.1.4 Procedures at the PoC Server performing the Controlling PoC Function

The PoC Server performing the Controlling PoC Function:

- SHALL be a 'translator' according to [RFC3550] for the RTP/RTCP flows;
- SHALL forward (and in a Group communication, multiply) the RTCP SR compound packet sent from the PoC Client that transmitted the most recent Talk Burst to all other PoC Clients in the PoC Session;

- SHALL modify the content of the RTCP SR compound packets if it is required by the translation, e.g. due to repacketizing;
- SHALL NOT forward RTCP RR compound packets sent from a PoC Client to all other PoC Clients in the PoC Session;
- MAY be implemented as a ‘monitor’ according to [RFC3550] for the RTP flow and use the reported statistics to estimate the current quality of service for fault diagnosis, User Plane adaptation and charging purposes;
- MAY generate and send a RTCP RR compound packet for the Talk Burst that it recently received from a PoC Client; and,

NOTE: [RFC3550] states that a translator may require an SSRC identifier of its own for the purpose of sending reception reports about what it has received. These would be multicast to all PoC Clients in the Session.

- SHALL NOT forward RTCP SR compound packets to a PoC Client that did not receive any RTP Media packets of the previously sent Talk Burst in a PoC Session because the PoC Client has put the RTP Media packets component on hold.

7.2 Media Parameter Negotiation

When inviting, being invited or joining a PoC Session, the PoC Clients SHALL negotiate the codec(s) and Media Parameters with the PoC Server by using SDP within SIP messages as specified in [OMA-POC-CP].

The PoC Server performing the Controlling PoC Function SHALL determine the codec(s) and Media Parameters that SHOULD be used in the PoC Session. The preferred Media Parameters SHOULD be determined according to the lowest negotiated Media Parameters (e.g. bandwidth) of the PoC Client’s that have joined the PoC Session.

The Media Parameter re-negotiation during a PoC Session (User Plane adaptation), see subclause 7.3 “*User Plane adaptation*” is optional in both PoC Client and PoC Server.

Media Parameters in addition to the codec(s) are

- codec modes which are indicated in the preferred order as specified in [RFC 3264], [RFC3267] and [RFC3558];
- band width parameter used to indicate the maximum desired data rate supported by the PoC Client for the PoC Session as specified in [RFC3264]; and,
- ptime and maxptime parameters as specified in [RFC2327], [RFC3267] and [RFC 35580].

7.2.1 Procedures at the PoC Client

7.2.1.1 Inviting PoC Client

The PoC Client SHALL offer supported codecs and corresponding Media Parameters intended for PoC Service in the SDP offer payload to the PoC Server, when initiating a PoC Session.

When PoC Client receives the invitation response that contains a SDP answer including the granted codec(s) and Media Parameters, the PoC Client SHALL use the granted codec(s) and Media Parameters.

7.2.1.2 Invited PoC Client

When the PoC Client is invited to a PoC Session, the SIP message contains the SDP offer with the codec(s) and Media Parameters offered for the PoC Session.

The Invited PoC Client SHALL respond with supported codec(s) and Media Parameters to the PoC Server in the SDP answer of the invitation response (e.g. in the SIP 200 “OK” response).

If more than one codec is granted in the SDP answer the invited PoC Client SHOULD be able to identify the used codec(s) from the Payload Type field of the RTP header.

7.2.2 Procedures at the PoC Server performing the Participating PoC Function

The PoC Server performing the Participating PoC Function SHALL either forward the received PoC Client Media Parameters directly to the PoC Server performing the Controlling PoC Function or make changes to include the PoC Server performing the Participating PoC Function in the transport path.

If the PoC Server performing the Participating PoC Function is able to perform the speech transcoding, it MAY indicate additional codec(s) in the SDP offer that is sent to the terminating PoC Client(s). In case the PoC Server performing the Participating PoC Function adds new codec(s) in the SDP offers, the PoC Server SHALL be able to perform transcoding between the new added codec(s) and the codec(s) that were in the original SDP offer.

The PoC Server performing the Controlling PoC Function responds to the invitation with a final response that contains a SDP answer indicating the selected codec(s) and granted Media Parameters that SHOULD be used by the PoC Client. The PoC Server performing the Participating PoC Function SHALL either forward the invitation response to the PoC Client or make changes to include the PoC Server performing the Participating PoC Function in the transport path.

If the PoC Server performing the Participating PoC Function is able to perform the speech transcoding and it has offered additional codec(s) than those contained in the original SDP offer, it SHALL include in the SDP answer only from those codec(s) contained in the original SDP offer.

7.2.3 Procedures at the PoC Server performing the Controlling PoC Function

The PoC Server performing the Controlling PoC Function receives the offered codec(s) and Media Parameters of the Inviting PoC Client in the invitation request containing an SDP offer. The PoC Server performing the Controlling PoC Function SHALL select the Media Parameters the way that all PoC Clients in the PoC Session can use the same set. The Media Parameters SHALL be selected according to the PoC Client, which has the lowest Media Parameters.

The PoC Server performing the Controlling PoC Function SHALL respond to the invitation with a message containing a SDP answer that reports the used codec(s) and Media Parameters that SHOULD be used by the PoC Client.

When the PoC Server performing the Controlling PoC Function invites the PoC Client, the invitation request from the PoC Server performing the Controlling PoC Function to the PoC Server performing the Participating PoC Function SHALL contain the SDP offer with the codec(s) and Media Parameters.

The PoC Server performing the Controlling PoC Function receives the Invited PoC Client(s) supported codec(s) and Media Parameters in the invitation response containing SDP offer.

If the PoC Server performing the Controlling PoC Function is able to perform the speech transcoding, it MAY add to an SDP offer codec(s) which can be transcoded to those contained in the original SDP offer from the originating network or PoC Client before sending it towards the terminating PoC Client.

If the PoC Server performing the Controlling PoC Function is able to perform the speech transcoding and it has offered more codec(s) than those contained in the original SDP offer, it SHALL include in the SDP answer only from those codecs contained in the original SDP offer.

7.3 User Plane adaptation

User Plane adaptation is a re-negotiation of the Media Parameters during a PoC Session. The initiation of the User Plane adaptation is optional for both PoC Client and the PoC Server performing the Controlling PoC Function.

User Plane adaptation MAY be triggered e.g. by roaming or when a new PoC Client with lower Media Parameters enters the PoC Session.

During the PoC Session, PoC Client MAY change the voice frame packetization or voice codec mode by

Out-band signaling using SDP payload within SIP messages.

When a new PoC Client enters a PoC Group Session the new PoC Client sends a SIP message as specified in [OMA-POC-CP] with SDP payload that indicates the initial Media Parameters of the PoC Client to the PoC Server performing the Controlling PoC Function.

7.3.1 Procedures at the PoC Client

The PoC Client SHALL re-negotiate the Media Parameters, if initiated by the PoC Server, as specified in [OMA-POC-CP] "*PoC Session modification*".

The PoC Client MAY initiate the User Plane adaptation (out-band) triggered by e.g roaming to the system with different Media Parameters.

7.3.2 Procedures at the PoC Server performing the Participating PoC Function

The PoC Server SHALL support the Media Parameter re-negotiation, when initiated by the PoC Server performing the Controlling PoC Function or the PoC Client by forwarding the SIP/SDP payloads between the PoC Server performing the Controlling PoC Function and the PoC Client.

7.3.3 Procedures at the PoC Server performing the Controlling PoC Function

The PoC Server SHALL re-negotiate the Media Parameters, when initiated by the PoC Client (out-band).

The PoC Server MAY initiate the User Plane adaptation (Media Parameter re-negotiation during a PoC Session) when a new PoC Client with lower Media Parameters enters or leaves the PoC Session.

When determining the Media Parameters the PoC Server SHOULD take into account the highest common Media Parameters provided by both the new and the existing Participants in the PoC Session (i.e. the negotiation procedure should make all Participants of the PoC Session adapt to the common highest denominator in terms of bandwidth usage).

In the case that the Media Parameters of the new Participant force the PoC Server to update all other PoC Session Participants, the PoC Server SHALL update the Media Parameters in the Control Plane as specified in [OMA-POC-CP] to all other PoC Clients in the PoC Session.

7.4 Media on and off hold

7.4.1 Procedures at the PoC Client

The PoC Client MAY place the media on hold as specified in [OMA-POC-CP] "*PoC Client placing media on hold*".

When media is on hold the Talk Bursts are not transferred to the PoC Client, but the PoC Client SHALL be able to receive TBCP messages when on hold.

The PoC Client MAY send Talk Bursts, when the media is on hold.

The PoC Client MAY place the media off hold as specified in [OMA-POC-CP] "*PoC Client placing media off hold*".

When media is placed off hold the PoC Client SHALL be able to send and receive Talk Bursts and send and receive TBCP messages.

7.4.2 Procedures at the PoC Server performing the Participating PoC Function

The PoC Server SHOULD forward the Talk Bursts and TBCP messages between the PoC Client and the PoC Server performing the Controlling PoC Function.

7.4.3 Procedures at the PoC Server performing the Controlling PoC Function

When the media is on hold the PoC Server SHALL NOT transfer RTP Media packets to the PoC Client, who has put the media on hold. The media is not buffered while the media is on hold, but it is discarded. When media is placed off hold, RTP Media packets SHALL be transferred to the PoC Client.

When the media is on hold the PoC Server SHALL be able to receive RTP Media packets and TBCP messages from the PoC Client on hold.

When the media is on hold the PoC Server SHALL send TBCP messages to the PoC Client.

When the media is on hold the PoC Server MAY send RTCP SR/RR message to the PoC Client on hold.

7.5 Simultaneous PoC Sessions

7.5.1 Procedures at the PoC Client

If the PoC Client supports Simultaneous PoC Sessions the following SHALL apply:

The PoC Client SHALL be able to receive the RTP Media packets of any Simultaneous PoC Sessions sent by the PoC Server.

The PoC Client SHALL be able to receive the TBCP messages of any of the Simultaneous PoC Sessions sent by the PoC Server.

The received TBCP messages SHOULD be indicated to the PoC User.

PoC Client SHOULD be able to send RTP Media packets to any of the Simultaneous PoC Sessions according to the PoC User selection.

When the PoC Client participates in Simultaneous PoC Sessions and there are RTP Media packet activity in several PoC Sessions, the PoC Client SHALL expect the PoC Session it receives the RTP Media packets from, is selected by the Participating PoC Function according to principles described in the subclause 7.5.2 "*Procedures at the PoC Server performing the Participating PoC Function*". When changing reception from one PoC Session to another the PoC Client SHALL release the Talk Burst if requested, granted or queued.

7.5.2 Procedures at the PoC Server performing the Participating PoC Function

If the PoC Server supports Simultaneous PoC Sessions the following SHALL apply:

When there are RTP Media packets in more than one PoC Session in which the PoC Client is a Participant at the same time, the participating PoC Function of the home PoC Server SHALL filter the Talk Bursts so that the PoC User hears a single Conversation.

When PoC Client participates in Simultaneous PoC Sessions and there is RTP Media packet activity in several PoC Sessions, the PoC Server SHALL select the PoC Session to forward the RTP Media packets to the PoC Client according to principles, in the order presented below:

1. select the PoC Session where the PoC Client has the permission to speak.
2. select the PoC Session where the PoC User is locked.
3. select the Primary PoC Session if RTP Media packets are received.
4. select the PoC Session where the PoC Client has transmitted within the inactivity period (in order to maintain a Conversation).
5. select the PoC Session which starts first.
6. select among the on-going PoC Sessions according to the PoC Server local policy.

When started to forward Talk Bursts of one PoC Session to the PoC Client the PoC Server SHALL continue forwarding Talk Burst of this same PoC Session until any of the following happens:

- PoC Session is released;
- PoC Session is put on hold;
- Higher priority PoC Session is activated;
- User locks himself to another PoC Session;
- The PoC Client is granted the permission to send Media in another PoC Session; or,
- Conversation timer expires (see the “Conversation timer (T14)” in subclause 9.2 “Timers in the PoC Server performing the Participating PoC Function”).

The PoC Server SHOULD forward the TBCP messages of all PoC Sessions from the PoC Server(s) performing the Controlling PoC Function to PoC Client.

The PoC Server MAY send a RTCP SR message to the PoC Client concerning the PoC Session, which was interrupted due to activity in another PoC Session. The PoC Server MAY modify the RTCP RR and SR messages sent between the PoC Client and the PoC Server to improve the accuracy of the quality feedback in the case of interrupted Talk Burst.

In the case of changing from one PoC Session to another and starting to transfer RTP Media packets during an on-going Talk Burst the PoC Server MAY send a TBCP Talk Burst Taken message prior to the first RTP packet being sent to the PoC Client.

7.5.3 Procedures at the PoC Server performing the Controlling PoC Function

There are no related Simultaneous PoC Session procedures in the PoC Server performing the Controlling PoC Function.

7.6 RTP Media session release of the Pre-established Session

RTP Media session release on the User Plane is made either by PoC Server sending the TBCP Disconnect message to the PoC Client as specified in subclauses 6.2.6 “*PoC Session control state diagram – Pre-established Session*” and 6.3.6 “*Pre-established Session state diagram –basic*” or by the PoC Client sending the SIP REFER request to the PoC Server as specified in the [OMA-POC-CP] “*Leaving a PoC Session – Pre-established case*”.

7.7 Media transfer

7.7.1 Procedures at the PoC Client

The PoC Client SHALL transfer RTP Media as specified in subclause 7.2 “*Media Parameter Negotiation*” and according to rules and procedures specified in [RFC3550].

7.7.2 Procedures at the PoC Server performing the Participating PoC Function

The PoC Server performing the Participating PoC Function SHALL transfer RTP Media according to rules and procedures specified in [RFC3550].

In case of Simultaneous PoC Sessions the PoC Server SHALL discard RTP Media of the PoC Sessions not selected for transmitting to the PoC Client.

7.7.3 Procedures at the PoC Server performing the Controlling PoC Function

The PoC Server performing the Controlling PoC Function SHALL transfer RTP Media according to rules and procedures specified in [RFC3550].

PoC Server MAY also buffer the RTP Media as specified in the subclause 7.8.3 “Procedures at the PoC Server performing the Controlling PoC Function”.

7.8 Media buffering

7.8.1 Procedures at the PoC Client

The PoC Client SHOULD cope with the variable latency in the incoming RTP Media packets to achieve acceptable QoS.

7.8.2 Procedures at the PoC Server performing the Participating PoC Function

Not applicable.

7.8.3 Procedures at the PoC Server performing the Controlling PoC Function

The PoC Server MAY support RTP Media buffering.

If the PoC Server supports RTP Media buffering and sends Talk Burst granted to the originating PoC Client after it has received an Unconfirmed Indication for one or more terminating PoC Clients, the PoC Server SHALL support RTP Media buffering until at least one PoC Client has responded accepting the invitation. There SHALL only be one buffer for a PoC Session and when the PoC Server begins to forward the RTP Media packets to the PoC Clients, it SHALL discard the RTP Media packets after they have been forwarded. The buffer details including the buffer depth are not defined in this specification. When transmitting buffered RTP Media packets, PoC Server SHOULD transmit the packets at a bit rate that avoids overload in the receiving PoC Client(s).

NOTE: In the case of manual answer, the PoC Server begins sending RTP Media packets when the first PoC Client answers and does not retain those RTP Media packets for PoC Clients that answer later.

7.9 Codecs

3GPP2 mandates the EVRC speech codec as the default speech codec for PoC see [3GPP2 S.R0100-0]. Therefore, the PoC Server SHALL support the usage of EVRC specific Media Parameters.

The Media Parameters and the RTP payload format for the EVRC speech codec are described in [RFC3558].

3GPP mandates the AMR narrowband speech codec as the default speech codec for PoC see [TS26.235]. Further, 3GPP mandates support of the AMR wideband speech codec, if the terminal on which the PoC Client is implemented uses 16 kHz sampling frequency of the speech see [TS26.235]. Therefore, the PoC Server SHALL support the usage of both AMR narrowband and AMR wideband specific Media Parameters.

The Media Parameters for the AMR narrowband speech codec and the AMR wideband speech codec are described together with the RTP payload format for the speech codecs in [RFC3267]. The AMR and AMR-WB RTP payload format offers a number of options that can be used for the RTP Media transport. The options that should be used in PoC are specified in [TS26.236], with the exception of the explicit requirement in Annex X.

8. Talker Identification

This subclause describes the procedures to provide Talker Identification.

Talker Identification is the process of conveying the PoC Address and the Nick Name from the PoC Server performing the Controlling PoC Function to the PoC Client. The PoC Address conveyed may either be the address of the PoC User or an anonymous PoC Address, if the Participant chooses to be anonymous.

8.1 Talker Identification information in the PoC Server performing the Controlling PoC Function

This subclause describes the procedure for the PoC Server to collect the information about Talker Identification.

The PoC Addresses of the Participants engaged in the PoC Session SHALL be collected by the PoC Server in the process of establishing the SIP Sessions with the PoC Clients, it SHALL include the initiator PoC Address, which was received in the initial SIP INVITE request or in the SIP 200 "OK" response.

The Nick Names of the Participants engaged in the PoC Session SHALL be obtained as specified in [OMA-POC-CP] "*Nick Name*" when used.

The PoC Server SHALL keep a list of all Participants' PoC Addresses and Nick Names.

The PoC Server SHALL include the PoC Address and Nick Name of the Participant who has been permitted to send a Talk Burst in the TBCP Talk Burst Taken message, if privacy is not requested.

NOTE: Subclause [OMA-CP] "*PoC Session initiation*" and subclause [OMA-CP] "*PoC Client invited to a PoC Session*" describes how privacy is requested.

The PoC Server SHALL record the SSRC identifier of the RTP stream of the PoC Clients in the PoC Session and associate the SSRC identifier to the identities of the Participants. The SSRC identifier becomes known to the PoC Server when:

- It receives RTP Media packets from the PoC Client.
- It receives TBCP packets from the PoC Client.
- It receives a RTCP compound packet from the PoC Client.

The PoC Server SHALL preserve the SSRC identifier, of the PoC Client that are sending the Talk Burst, in the RTP Media packets sent to the PoC Clients that are receiving the Talk Burst. This allows the PoC Clients to use the SSRC identifier to identify the Participant sending the Talk Burst in the case when the TBCP Talk Burst Taken message is lost.

8.2 Talker Identification information in the PoC Client

This subclause describes the procedure in the PoC Client for identifying the talking Participant.

The PoC Client SHALL receive the PoC Address and MAY receive the Nick Name of the Participant that who has been permitted to send a Talk Burst in the TBCP Talk Burst Taken message and it MAY display this information to the Participant.

The PoC Client MAY collect information about the other Participants, their identities and the SSRC identifiers used by their PoC Clients in the PoC Session in order to be able to map a RTP Media packet in case the TBCP Talk Burst Taken message is lost.

If the PoC Client collects information about the other Participants, it SHOULD keep itself updated with the information provided by the PoC Server performing the Controlling PoC Function. It should for instance store the latest mapping between the Participants PoC Address, the Nick Name and SSRC identifier.

9. Timers

9.1 Timers in the PoC Server performing the Controlling PoC Function

TIMER	TIMER VALUE	CAUSE OF START	NORMAL STOP	ON EXPIRY
T1 'End of RTP Media timer'	Configurable Max: 6 seconds Default value: 4 Seconds NOTE: The minimum value should be greater than the expected round trip delay from PoC Server to remote PoC Client. Special consideration should be given to over-the-air connections that introduce significant transmission latency due to low bandwidth.	Transmission of a TBCP Talk Burst Granted message to the PoC Client that is given permission to send a Talk Burst. If the TBCP Talk Burst Request message is re-transmitted from the PoC Client that has permission to send a Talk Burst, a new TBCP Talk Burst Granted message is sent to the PoC Client, then T1 is reset and started again. T1 restarts again every time a RTP packet from the PoC Client that has permission to send a Talk Burst reaches the PoC Server performing the Controlling PoC Function.	The reception of the last RTP packet in a Talk Burst and then a TBCP Talk Burst Release message. NOTE: If the TBCP Talk Burst Release message doesn't include the sequence number of the last RTP packet the T1 is stopped on the reception of the TBCP Talk Burst Release message.	When T1 expires it is concluded that the Talk Burst, which it was started for, has been completed.
T2 'Stop talking timer'	Configurable May be different for different PoC Users and thus dependent on subscription. Default value: 30 seconds.	Detection of the start of a Talk Burst.	Detection of the completion of a Talk Burst.	When T2 expires it is concluded that the PoC Client that has permission to send a Talk Burst has talked too long.
T3 'Stop talking grace timer'	Configurable Dependent on T8 Default value: T3 = T8 x 'allowed number of retransmissions of the TBCP Talk Burst Revoke message'. T3 shall only permit an allowed number of retransmissions of the TBCP Talk Burst Revoke message. The value range for the counter is configurable between 1 ... 10. Default value: 3.	Expiry of T2.	Reception of a TBCP Talk Burst Release message from the PoC Client that has permission to send a Talk Burst.	When T3 expires, the PoC Client that talked too long is penalized and put in a waiting state in which it cannot be granted the right to speak.
T4 'Inactivity timer'	Configurable May be different for different type of PoC Sessions. Default value: 30 seconds.	The current Talk Bursts end and the PoC Server performing the Controlling PoC Function enters the 'G: TB_Idle' state.	A PoC Client requests the right to speak.	The PoC Session is released.

T7 'Talk Burst Idle timer'	Configurable Should use exponential back off mechanism Default value: The Fibonacci number series $F_1 = 1, F_2 = 1, F_{n+2} = F_n + F_{n+1}, 1 \leq n \leq 11$ This means that the time interval between the TBCP Talk Burst Idle messages will be: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89 seconds. If the PoC Session still is running after the time series above has passed, it is recommended that TBCP Talk Burst Idle message be transmitted every 89 second until the PoC Server performing the Controlling PoC Function detects a Talk Burst request or start of a Talk Burst.	The transmission of a TBCP Talk Burst Idle message to the PoC Clients in the PoC Session.	Detection of start of a Talk Burst. T7 is also stopped when the 'inactivity timer' expires.	When T7 expires the PoC Server performing the Controlling PoC Function sends another TBCP Talk Burst Idle message to the PoC Clients.
T8 'Talk Burst Revoke timer'	Configurable. Default value: 1 second.	A TBCP Talk Burst Revoke message is sent to a PoC Client.	Expiry of T3 or reception of a TBCP Talk Burst Release message from the PoC Client the TBCP Talk Burst Revoke message was sent to.	Send another TBCP Talk Burst Revoke message to the PoC Client and reset and start T8 again.
T9 'Retry-after timer'	Configurable. 5-30 seconds. Default value: 5 seconds.	The PoC Server performing the Controlling PoC Function enters the 'U: waiting TB_Revoke' state when either T3 expires or it receives a TBCP Talk Burst Release message from the revoked PoC Client.		When T9 expires the PoC Server performing the Controlling PoC Function permits the PoC Client to have permission to send a Talk Burst if the PoC Client sends a TBCP Talk Burst Request message.

Table 14: Talk Burst Control timers

9.2 Timers in the PoC Server performing the Participating PoC Function

TIMER	TIMER VALUE	CAUSE OF START	NORMAL STOP	ON EXPIRY
T14 'Conversation timer'	Configurable. 3-10 Seconds. May be different for different type of PoC Sessions. Default value: 5 seconds.	Reception of the TBCP Talk Burst Release message from the PoC Client or a TBCP Talk Burst Idle message from the PoC Server performing the Controlling PoC Function.	Reception of another Talk Burst in the same PoC Session.	When T14 expires is concluded that the Conversation in the PoC Session has completed and PoC Server is allowed to reselect the RTP Media packet stream for forwarding to the PoC Client.

Table 15: Simultaneous PoC Session timers

TIMER	TIMER VALUE	CAUSE OF START	NORMAL STOP	ON EXPIRY
T15 'Connect message re-transmit timer'	Up to implementation T15 only permits a certain number of retransmissions of the TBCP Connect messages. The total time during which the PoC Server retransmits TBCP Connect messages shall be less than 6 seconds	The PoC Server sends a TBCP Connect message that expect a TBCP Talk Burst Acknowledgement message reply.	The reception of a TBCP Talk Burst Acknowledgement message.	Repeat the sending of the TBCP Connect message to PoC Client.
T16 'Disconnect message re-transmit timer'	Up to implementation T16 only permits a certain number of retransmissions of the TBCP Disconnect messages. The total time during which the PoC Server retransmits TBCP Disconnect messages shall be less than 6 seconds.	The PoC Server sends a TBCP Disconnect message.	The reception of a TBCP Talk Burst Acknowledgement message.	When T16 expires, a new TBCP Disconnect message is sent.

Table 16: Talk Burst Control timers

9.3 Timers in the PoC Client

TIMER	TIMER VALUE	CAUSE OF START	NORMAL STOP	ON EXPIRY
T10 'Talk Burst Release timer'	Configurable as specified in [OMA-PoC-CP] " <i>PoC Device Management general</i> ". T10 shall only permit a certain number of retransmissions of the TBCP Talk Burst Release message. The total time during which the PoC Client retransmits TBCP Talk Burst Release messages shall be less than 6 seconds.	The PoC Client sends a TBCP Talk Burst Release message.	The reception of a TBCP Talk Burst Idle message or when the PoC Client detects the start of a Talk Burst.	When T10 expires, a new TBCP Talk Burst Release message is sent.
T11 'Talk Burst Request timer'	Configurable as specified in [OMA-PoC-CP] " <i>PoC Device Management general</i> ". T11 shall only permit a certain number of retransmissions of the TBCP Talk Burst Request message. The total time during which the PoC Client retransmits TBCP Talk Burst Request messages should be less than 6 seconds	The PoC Client initiates the PoC Session and sends a SIP message that serves as an implicit TBCP Talk Burst Request message. T11 is also started when the PoC Client sends a TBCP Talk Burst Request message.	The reception of a TBCP Talk Burst Granted message, a TBCP Talk Burst Taken message, a TBCP Talk Burst Deny message or when the PoC Client detects the start of a Talk Burst from another PoC Client.	When T11 expires, a new TBCP Talk Burst Request message is sent.
T12 'PoC Client retry-after timer'	Delivered by PoC Server as specified in subclause 6.2.5.4.3 " <i>Receive TBCP Talk Burst Revoke message (R: TB_Revoke)</i> ". Dependent on T9 since the value should be as specified in the retry-after field of the received TBCP Talk Burst Revoke message.	The PoC Server performing the Controlling PoC Function enters the 'U: waiting TB_Revoke' state and the possibility for the PoC Client to send a TBCP Talk Burst Request message is disabled		When T12 expires the PoC Client enables the possibility to send a TBCP Talk Burst Request message.
T13 'PoC Client end of RTP Media timer'	Configurable as specified in [OMA-PoC-CP] " <i>PoC Device Management general</i> ". Should be equal to T1.	Reception of a TBCP Talk Burst Taken message or an RTP packet. T13 is reset and started again every time a RTP packet is received.	The reception of a TBCP Talk Burst Idle message.	When T13 expires the PoC Client concludes that the Talk Burst, which it was started for, has completed.
T22 'end of encoded Media timer'	Should be equal or greater to T13.	When receiving a TBCP Talk Burst Granted message. T22 is reset and started again every time a RTP packet is received or encoded voice is received.	When a TBCP Talk Burst Release is sent.	When T22 expires the PoC Client concludes that the Talk Burst, which it was started for, has completed.

Table 17: Talk Burst Control timers

Appendix A. Static Conformance Requirement (SCR) (Normative)

The SCRs defined in the following tables include SCR for:

- The PoC Client;
- The PoC Server performing the Participating PoC Function; and,
- The PoC Server performing the Controlling PoC Function.

Each SCR table identifies a list of supported features as:

Item: Identifier for a feature.

Function: Short description of the feature.

Reference: Subclause(s) of this specification with more details on the feature.

Status: Whether support for the feature is mandatory or optional. “M” indicates mandatory support and “O” optional support in this column.

Requirement: This column identifies other features required by this feature. If no other features are required, this column is left empty.

This section describes the dependency grammar notation to be used in the Requirement column of the SCR and SCR tables using ABNF [RFC4234].

TerminalExpression = ScrReference / NOT TerminalExpression / TerminalExpression LogicalOperator
TerminalExpression / (“ TerminalExpression “)”

ScrReference = ScrItem / ScrGroup

ScrItem = SpecScrName “-“ GroupType “-“ DeviceType “-“ NumericId / SpecScrName “-“ DeviceType
“-“ NumericId

ScrGroup = SpecScrName “:” FeatureType / SpecScrName “-“ GroupType “-“ DeviceType “-“
FeatureType

SpecScrName = 1*Character;

GroupType = 1*Character;

DeviceType = “C” / “S”; C – client, S – server

NumericId = Number Number Number

LogicalOperator = “AND” / “OR”; AND has higher precedence than OR and OR is inclusive

FeatureType = “MCF” / “OCF” / “MSF” / “OSF”; See Section A.1.6

Character = %x41-5A ; A-Z

Number = %x30-39 ; 0-9

A.1 PoC Client

A.1.1 Transport

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV 1-UTR-C-001	Support of the Internet Protocol defined by the SIP/IP Core.	Subclause 5.1	M	
PoC_UserPlaneV 1-UTR-C-002	Support of UDP according to rules and procedures specified in Error! Reference source not found.	Subclause 5.2	M	

PoC_UserPlaneV 1-UTR-C-003	Handling of Port Numbers.	Subclause 5.2.1	M	
PoC_UserPlaneV 1-UTR-C-004	Support of RTP according to rules and procedures as specified in [RFC3550].	Subclause 5.3	M	
PoC_UserPlaneV 1-UTR-C-005	Support of RTCP according to the rules and procedures specified in [RFC3550] with the clarifications in the subclause 5.4 “ <i>RTCP</i> ” including support of the creation, modification and/or processing of the content in TBCP packets.	Subclause 5.4	M	
PoC_UserPlaneV 1-UTR-C-006	Support the creation and/or processing of the content in RTCP packets, other than those used for TBCP messages, to provide means for User Plane adaptation, feedback of the quality of the media transmission and give a persistent transport-level identifier for the RTP source.	Subclause 5.4	O	
PoC_UserPlaneV 1-UTR-C-007	Support of sending of TBCP messages to the same UDP port as the other RTCP packets.	Subclause 5.4	O	
PoC_UserPlaneV 1-UTR-C-008	Does not send TBCP messages as compound packets.	Subclause 5.4	O	
PoC_UserPlaneV 1-UTR-C-009	Supports the creation and/or processing of the content in RTCP packets.	Subclause 5.4	O	
PoC_UserPlaneV 1-UTR-C-010	To reduce potential degradation of the quality of the media transmission, the PoC Client does not schedule transmission of RTCP packets a Talk Burst.	Subclause 5.4	O	
PoC_UserPlaneV 1-UTR-C-011	void			
PoC_UserPlaneV 1-UTR-C-012	Does not send RTCP BYE packets when the PoC Session is released.	Subclause 5.4	O	

A.1.2 Talk Burst Control

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV 1-UTB-C-001	Supports basic Talk Burst control.	Subclause 6.2.5	M	
PoC_UserPlaneV 1-UTB-C-002	Provides Talk Burst idle notifications to the PoC User.	Subclause 6.2.5.2.1	O	
PoC_UserPlaneV 1-UTB-C-003	Provides the Talker Identification to the PoC User if available.	Subclauses 6.2.5.2.2, 6.2.5.3.2, 6.2.5.5.4 6.2.5.6.3, 6.2.5.6.4.	O	PoC_UserPlaneV1- UID-C-001
PoC_UserPlaneV	Supports the T13 (end of RTP Media) timer.	Subclauses	O	PoC_UserPlaneV1-

1-UTB-C-004		6.2.5.2.2, 6.2.5.2.3, 6.2.5.3.2, 6.2.5.3.6, 6.2.5.5.4, 6.2.5.5.5, 6.2.5.6.3, 6.2.5.6.4, 6.2.9.7.1		UTI-C-004
PoC_UserPlaneV 1-UTB-C-007	Displays the reason provided in the TBCP Talk Burst Deny message to the User.	Subclause 6.2.5.3.3	O	
PoC_UserPlaneV 1-UTB-C-008	Starts the T13 (end of RTP Media) timer based on reception on RTP Media packets.	Subclause 6.2.5.3.6	O	
PoC_UserPlaneV 1-UTB-C-009	Provide a Talk Burst request timeout notification to the PoC User;	Subclause 6.2.5.3.5	O	
PoC_UserPlaneV 1-UTB-C-010	Informs the User of the reason in the Reason code field contained in the TBCP Talk Burst Revoke message;	Subclauses 6.2.5.4.3 and 6.2.5.5.6	O	
PoC_UserPlaneV 1-UTB-C-011	Starts the T12 (PoC Client retry-after) timer, if a retry after time is contained in the TBCP Talk Burst Revoke message;	Subclauses 6.2.5.4.3 and 6.2.5.5.6	O	PoC_UserPlaneV1- UTI-C-003
PoC_UserPlaneV 1-UTB-C-012	Includes the sequence number of the last RTP Media packet that was sent, if at least 1 RTP Media packet was sent.	Subclauses 6.2.5.5.1 and 6.2.5.6.5	O	
PoC_UserPlaneV 1-UTB-C-013	Informs the User that permission to send a Talk Burst is being revoked.	Subclause 6.2.5.5.6	O	
PoC_UserPlaneV 1-UTB-C-014	Supports extensions to basic Talk Burst control necessary for the support of Pre-established Sessions.	Subclause 6.2.6	O	PoC_UserPlaneV1- UMC-C-014
PoC_UserPlaneV 1-UTB-C-015	Supports extensions to basic Talk Burst control necessary for the support of Simultaneous PoC Sessions.	Subclause 6.2.7 and 6.2.8	O	
PoC_UserPlaneV 1-UTB-C-016	Sends and acts upon received TBCP messages for a PoC Session in the dormant state.	Subclause 6.2.8.3.1	O	PoC_UserPlaneV1- UTB-C-015
PoC_UserPlaneV 1-UTB-C-017	Supports extensions to Talk Burst control necessary for the support of queuing of Talk Burst requests.	Subclause 6.2.9	O	
PoC_UserPlaneV 1-UTB-C-018	Provides the queue position (if available) to the User.	Subclause 6.2.9.3.7	O	PoC_UserPlaneV1- UTB-C-017
PoC_UserPlaneV 1-UTB-C-019	Starts/restarts the T13 (end of RTP media) timer when receiving RTP Media packets.	Subclause 6.2.9.7.1	O	PoC_UserPlaneV1- UTB-C-018 AND PoC_UserPlaneV1- UTI-C-004
PoC_UserPlaneV 1-UTB-C-020	Displays the reason provided in the TBCP Talk Burst Deny message, if it is included, to	Subclause 6.2.9.7.4	O	PoC_UserPlaneV1- UTB-C-017

	the User.			
PoC_UserPlaneV1-UTB-C-021	Provides notification of the number of Participants, receiving Talk Bursts in the PoC Session, to the PoC User, if included in the TBCP Talk Burst Granted message.	Subclause 6.2.5.3.1	O	
PoC_UserPlaneV1-UTB-C-022	Provides notification of the number of Participants, receiving Talk Bursts in the PoC Session, to the PoC User, if included in the TBCP Talk Burst Granted message.	Subclause 6.2.5.3.1,6.2.7.2.6, 6.2.7.4.6, 6.2.7.4.7, 6.2.8.3.10	O	PoC_UserPlaneV1-UTB-C-015
PoC_UserPlaneV1-UTB-C-023	Provides notification of the number of Participants, receiving Talk Bursts in the PoC Session, to the PoC User, if included in the TBCP Talk Burst Granted message.	6.2.9.7.3	O	PoC_UserPlaneV1-UTB-C-017
PoC_UserPlaneV1-UTB-C-024	Performs the mapping between the SSRC of the PoC Client granted a permission to send a Talk Burst and the PoC Address and/or Nick Name, if they are included in the TBCP Taken message;	Subclause 6.2.5.2.2, 6.2.5.3.2, 6.2.5.5.4, 6.2.5.6.3, 6.2.6.2.6, 6.2.9.3.2, 6.2.9.7.2.	O	
PoC_UserPlaneV1-UTB-C-025	Displays the PoC Address and/or Nick Name based on SSRC of the sending PoC Client.	Subclause 6.2.5.2.3, 6.2.5.3.6, 6.2.5.5.4, 6.2.5.5.5, 6.2.5.6.3, 6.2.5.6.4, 6.2.6.2.6, 6.2.9.3.6, 6.2.9.7.1, 6.2.9.7.2.	O	PoC_UserPlaneV1-UTB-C-024

A.1.3 Media control

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV1-UMC-C-001	Support of quality feed back according to rules and procedures specified in [RFC3550].	Subclause 7.1	O	
PoC_UserPlaneV1-UMC-C-002	Supports the transmission of RTCP SR/RR compound packets.	Subclause 7.1.2	O	PoC_UserPlaneV1-UMC-C-001
PoC_UserPlaneV1-UMC-C-003	Uses the reception of the RTCP SR compound packet as indication to trigger the transmission of the RTCP RR compound packet.	Subclause 7.1.2.2	O	PoC_UserPlaneV1-UMC-C-002
PoC_UserPlaneV1-UMC-C-004	Implement a timer that supervises the reception of the RTCP SR compound packet.	Subclause 7.1.2.2	O	PoC_UserPlaneV1-UMC-C-003
PoC_UserPlaneV1-UMC-C-005	Support of Media Parameter negotiation.	Subclause 7.2, 7.2.1.1 and 7.2.1.2	M	

PoC_UserPlaneV1-UMC-C-006	Support of User Plane adaptation.	Subclause 7.3	O	
PoC_UserPlaneV1-UMC-C-007	Changes the voice frame packetization or voice codec mode by Out-band signaling using SDP payload within SIP messages.	Subclause 7.3	O	PoC_UserPlaneV1-UMC-C-006
PoC_UserPlaneV1-UMC-C-008	void			
PoC_UserPlaneV1-UMC-C-009	Initiate User Plane adaptation (out-band) triggered by e.g roaming to the system with different media capabilities.	Subclause 7.3.1	O	PoC_UserPlaneV1-UMC-C-006
PoC_UserPlaneV1-UMC-C-010	Supports Media on and off hold.	Subclause 7.4.1	O	
PoC_UserPlaneV1-UMC-C-011	Sends Talk Bursts, when the Media is on hold.	Subclause 7.4	O	PoC_UserPlaneV1-UMC-C-010
PoC_UserPlaneV1-UMC-C-012	Supports Simultaneous PoC Sessions	Subclause 7.5.1	O	
PoC_UserPlaneV1-UMC-C-013	Supports the sending of RTP Media packets to any of the Simultaneous PoC Sessions according to the PoC User selection.	Subclause 7.5.1	O	PoC_UserPlaneV1-UMC-C-012
PoC_UserPlaneV1-UMC-C-014	Supports RTP Media Session release of the Pre-established Session.	Subclause 7.6	O	PoC_UserPlaneV1-UTB-C-014
PoC_UserPlaneV1-UMC-C-015	Support of Media transfer	Subclause 7.7.1	M	
PoC_UserPlaneV1-UMC-C-016	Supports media buffering for handling of variable latency in incoming RTP Media packets.	Subclause 7.8.1	O	
PoC_UserPlaneV1-UMC-C-017	Support coding and decoding of Media	Subclause 7.9	M	PoC_UserPlaneV1-UMC-C-018 OR PoC_UserPlaneV1-UMC-C-019
PoC_UserPlaneV1-UMC-C-018	Supports codecs recommended by 3GPP	Subclause 7.9	O	
PoC_UserPlaneV1-UMC-C-019	Supports codecs recommended by 3GPP2	Subclause 7.9	O	

A.1.4 Talker identification

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV1-UID-C-001	Support of Talker Identification	Clause 8.2	O	PoC_UserPlaneV1-UTB-C-003 OR PoC_UserPlaneV1-UID-C-002
PoC_UserPlaneV1-UID-C-002	Collects information about the other Participants in the PoC Session in order to be able to map a RTP Media packet in case the	Subclause 8.2	O	PoC_UserPlaneV1-UID-C-001

	TBCP Talk Burst Taken message is lost.			
PoC_UserPlaneV1-UID-C-003	The PoC Client keep itself updated with the information provided by the PoC Server performing the Controlling PoC Function.	Subclause 8.2	O	PoC_UserPlaneV1-UID-C-002

A.1.5 Timers

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV1-UTI-C-001	Talk Burst Release timer (T10)	Subclause 9.3	M	
PoC_UserPlaneV1-UTI-C-002	Talk Burst Request timer (T11)	Subclause 9.3	M	
PoC_UserPlaneV1-UTI-C-003	PoC Client retry-after timer (T12)	Subclause 9.3	O	PoC_UserPlaneV1-UTB-C-011
PoC_UserPlaneV1-UTI-C-004	PoC Client end of RTP Media timer (T13)	Subclause 9.3	O	PoC_UserPlaneV1-UTB-C-004 OR POC-UTB-C-019

A.1.6 Talk Burst Control messages

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV1-UME-C-001	Talk Burst Control (TBCP) messages	Subclause 6.5 and 6.1	M	
PoC_UserPlaneV1-UME-C-002	Sending of more than one TBCP Talk Burst Control message MAY be sent in a single IP packet.	Subclause 6.5 and 6.1	O	
PoC_UserPlaneV1-UME-C-003	TBCP Talk Burst Request message	Subclause 6.5.2 and 6.1	M	
PoC_UserPlaneV1-UME-C-004	Talk Burst request priority level	Subclause 6.5.2.1	O	PoC_UserPlaneV1-UTB-C-017
PoC_UserPlaneV1-UME-C-005	Talk Burst request timestamp	Subclause 6.5.2.2	O	PoC_UserPlaneV1-UTB-C-017
PoC_UserPlaneV1-UME-C-006	TBCP Talk Burst Granted message	Subclause 6.5.2.2 and 6.1	M	
PoC_UserPlaneV1-UME-C-007	TBCP Talk Burst Deny message	Subclause 6.5.4 and 6.1	M	
PoC_UserPlaneV1-UME-C-008	TBCP Talk Release message	Subclause 6.5.5 and 6.1	M	
PoC_UserPlaneV1-UME-C-009	TBCP Talk Burst Idle message	Subclause 6.5.6 and 6.1	M	
PoC_UserPlaneV1-UME-C-010	TBCP Talk Burst Taken message	Subclause 6.5.7 and 6.1	M	
PoC_UserPlaneV1-UME-C-011	TBCP Talk Burst Revoke message	Subclause 6.5.7 and 6.1	M	

PoC_UserPlaneV1-UME-C-012	TBCP Talk Burst Acknowledgment message	Subclause 6.5.9 and 6.1	O	PoC_UserPlaneV1-UTB-C-014
PoC_UserPlaneV1-UME-C-013	TBCP Talk Burst Request Queue Status Request message	Subclause 6.5.10 and 6.1	O	PoC_UserPlaneV1-UTB-C-017
PoC_UserPlaneV1-UME-C-014	TBCP Talk Burst Request Queue Status Response message	Subclause 6.5.11 and 6.1	O	PoC_UserPlaneV1-UTB-C-017
PoC_UserPlaneV1-UME-C-015	TBCP Disconnect message	Subclause 6.5.12	O	PoC_UserPlaneV1-UTB-C-014

A.2 PoC Server performing the Participating PoC Function

A.2.1 User Plane Routing

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV1-PPR-S-001	Support of the Participating PoC Function in the PoC Server.	Subclause 4.2	M	PoC_UserPlaneV1-UPR-S-002 OR PoC_UserPlaneV1-UPR-S-003
PoC_UserPlaneV1-PPR-S-002	The PoC Server stays in the Media path (Option 1).	Subclause 4.2	O	PoC_UserPlaneV1-PTR-S001 AND PoC_UserPlaneV1-PTR-S002 AND PoC_UserPlaneV1-PTR-S003 AND PoC_UserPlaneV1-PTR-S004 AND PoC_UserPlaneV1-PTR-S005 AND PoC_UserPlaneV1-PTB-S001 AND PoC_UserPlaneV1-PMC-S003 AND PoC_UserPlaneV1-PMC-S-013 AND PoC_UserPlaneV1-PME-S-001
PoC_UserPlaneV1-PPR-S-003	The PoC Server does not stay in the Media path (Option 2)	Subclause 4.2	O	

A.2.2 Transport

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV1-PTR-S-001	Support of the Internet Protocol defined by the SIP/IP Core.	Subclause 5.1	O	PoC_UserPlaneV1-PPR-S-002
PoC_UserPlaneV1-PTR-S-002	Support of UDP according to the rules and procedures as specified in Error! Reference source not found.	Subclause 5.2	O	PoC_UserPlaneV1-PPR-S-002
PoC_UserPlaneV1-PTR-S-003	Handling of port numbers.	Subclause 5.2.1	O	PoC_UserPlaneV1-PPR-S-002

PoC_UserPlaneV1-PTR-S-004	Support of RTP according to the rules and procedures specified in [RFC3550].	Subclause 5.3	O	PoC_UserPlaneV1-PPR-S-002
PoC_UserPlaneV1-PTR-S-005	Support of RTCP according to the rules and procedures specified in [RFC3550] with the clarifications in the subclause 5.4 “ <i>RTCP</i> ” including support of the creation, modification and/or processing of the content in TBCP packets.	Subclause 5.4	O	PoC_UserPlaneV1-PPR-S-002
PoC_UserPlaneV1-PTR-S-006	Support of sending of TBCP messages to the same UDP port as the other RTCP packets.	Subclause 5.4	O	PoC_UserPlaneV1-PTR-S-002
PoC_UserPlaneV1-PTR-S-007	Does not send TBCP messages as compound packets.	Subclause 5.4	O	PoC_UserPlaneV1-PTR-S-002
PoC_UserPlaneV1-PTR-S-008	Support the creation, modification and/or processing of the content in RTCP packets to provide means for User Plane adaptation and feedback of the quality of the RTP Media transmission.	Subclause 5.4	O	PoC_UserPlaneV1-PTR-S-002
PoC_UserPlaneV1-PTR-S-009	To reduce potential degradation of the quality of the media transmission, the PoC Server does not schedule transmission of RTCP packets during a Talk Burst.	Subclause 5.4	O	PoC_UserPlaneV1-PPR-S-002
PoC_UserPlaneV1-PTR-S-010	void			
PoC_UserPlaneV1-PTR-S-011	Does not send RTCP BYE packets when the PoC Session is released.	Subclause 5.4	O	PoC_UserPlaneV1-PTR-S-002

A.2.3 Talk Burst Control

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV1-PTB-S-001	Supports basic Talk Burst control.	Subclause 6.3.5	O	PoC_UserPlaneV1-PPR-S-002
PoC_UserPlaneV1-PTB-S-002	Supports extensions to Talk Burst control necessary for the support of Pre-established Sessions.	Subclause 6.2.6	O	PoC_UserPlaneV1-PPR-S-002 AND PoC_UserPlaneV1-UME-C-016 AND PoC_UserPlaneV1-PME-C-017
PoC_UserPlaneV1-PTB-S-003	Supports extensions to Talk Burst control necessary for the support of Simultaneous PoC Sessions.	Subclause 6.2.7 and 6.3.8	O	PoC_UserPlaneV1-PPR-S-002 AND PoC_UserPlaneV1-PMC-S-007
PoC_UserPlaneV1-PTB-S-004	Sends TBCP Talk Burst Taken message to the PoC Client, if a Talk Burst is on-going.	Subclause 6.4.5.1.1.	O	PoC_UserPlaneV1-PTB-S-003
PoC_UserPlaneV1-PTB-S-005	Discards the PoC Client terminated TBCP packets of the PoC Sessions in ‘S: Dormant’ state.	Subclause 6.3.8.3.1	O	PoC_UserPlaneV1-PTB-S-003

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A.2.4 Media Control

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV1-PMC-S-001	Support of quality feed back according to rules and procedures specified in [RFC3550].	Subclause 7.1.1	O	PoC_UserPlaneV1-PPR-S-002
PoC_UserPlaneV1-PMC-S-002	Modify the content of the RTCP SR compound packet send by the PoC Client in an interrupted PoC Session according to rules and procedures specified in [RFC3550].	Subclause 7.1.3	O	PoC_UserPlaneV1-UMC-S-001
PoC_UserPlaneV1-PMC-S-003	Media parameter negotiation	Subclause 0	O	PoC_UserPlaneV1-PPR-S-002
PoC_UserPlaneV1-PMC-S-004	Support for putting Media on/off hold	7.4.2	O	PoC_UserPlaneV1-PPR-S-002
PoC_UserPlaneV1-PMC-S-005	User Plane adaptation	Subclause 7.3	O	PoC_UserPlaneV1-PPR-S-002
PoC_UserPlaneV1-PMC-S-006	Forward the Talk Bursts and TBCP messages between the PoC Client and the PoC Server performing the Controlling PoC Function while Media is placed on hold for a PoC Session.	Subclause 7.4.2	O	PoC_UserPlaneV1-PMC-S-004
PoC_UserPlaneV1-PMC-S-007	Simultaneous PoC Sessions	Subclause 7.5.2	O	PoC_UserPlaneV1-PTB-S-003
PoC_UserPlaneV1-PMC-S-008	Forwards the TBCP messages of all PoC Sessions from the PoC Server(s) performing the Controlling PoC Function to PoC Client.	Subclause 7.5.2	O	PoC_UserPlaneV1-PMC-S-007
PoC_UserPlaneV1-PMC-S-009	Sends a RTCP SR message to the PoC Client concerning the PoC Session, which was interrupted due to activity in another PoC Session.	Subclause 7.5.2	O	PoC_UserPlaneV1-PMC-S-007
PoC_UserPlaneV1-PMC-S-010	Modifies the RTCP RR and SR messages sent between the PoC Client and the PoC Server to improve the accuracy of the quality feedback in the case of interrupted Talk Burst.	Subclause 7.5.2	O	PoC_UserPlaneV1-PMC-S-007
PoC_UserPlaneV1-PMC-S-011	Sends a TBCP Talk Burst Taken message prior to the first RTP packet being sent to the PoC Client.	Subclause 7.5.2	O	PoC_UserPlaneV1-PMC-S-007
PoC_UserPlaneV1-PMC-S-013	Supports Media transfer.	Subclause 7.7.2	O	PoC_UserPlaneV1-PPR-S-002 AND (PoC_UserPlaneV1-PMC-S-015 OR PoC_UserPlaneV1-PMC-S-016)

PoC_UserPlaneV1-PMC-S-014	Discards RTP Media of the PoC Sessions not selected for transmitting to the PoC Client.	Subclause 7.7.2	O	PoC_UserPlaneV1-PTB-S-003
PoC_UserPlaneV1-PMC-S-015	Supports codecs recommended by 3GPP	Subclause 7.9	O	PoC_UserPlaneV1-PMC-S-013
PoC_UserPlaneV1-PMC-S-016	Supports codecs recommended by 3GPP2	Subclause 7.9	O	PoC_UserPlaneV1-PMC-S-013

A.2.5 Talk Burst Control messages

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV1-PME-S-001	Talk Burst Control (TBCP) messages	Subclause 6.5 and 6.1	O	PoC_UserPlaneV1-PPR-S-002 AND PoC_UserPlaneV1-PME-S-003 AND PoC_UserPlaneV1-PME-S-004 AND PoC_UserPlaneV1-PME-S-005 AND PoC_UserPlaneV1-PME-S-006 AND PoC_UserPlaneV1-PME-S-007 AND PoC_UserPlaneV1-PME-S-008 AND PoC_UserPlaneV1-PME-S-009 AND PoC_UserPlaneV1-PME-S-011 AND PoC_UserPlaneV1-PME-S-012
PoC_UserPlaneV1-PME-S-002	Sending of more than one TBCP Talk Burst Control message MAY be sent in a single IP packet.	Subclause 6.5	O	PoC_UserPlaneV1-PME-S-001
PoC_UserPlaneV1-PME-S-003	TBCP Talk Burst Request message	Subclause 6.5.2 and 6.1	O	PoC_UserPlaneV1-PME-S-001
PoC_UserPlaneV1-PME-S-004	TBCP Talk Burst Granted message	Subclause 6.5.2.2 and 6.1	O	PoC_UserPlaneV1-PME-S-001
PoC_UserPlaneV1-PME-S-005	TBCP Talk Burst Deny message	Subclause 6.5.4 and 6.1	O	PoC_UserPlaneV1-PME-S-001
PoC_UserPlaneV1-PME-S-006	TBCP Talk Release message	Subclause 6.5.5 and 6.1	O	PoC_UserPlaneV1-PME-S-001
PoC_UserPlaneV1-PME-S-007	TBCP Talk Burst Idle message	Subclause 6.5.6 and 6.1	O	PoC_UserPlaneV1-PME-S-001
PoC_UserPlaneV1-PME-S-008	TBCP Talk Burst Taken message	Subclause 6.5.7 and 6.1	O	PoC_UserPlaneV1-PME-S-001
PoC_UserPlaneV1-PME-S-009	TBCP Talk Burst Revoke message	Subclause 6.5.7 and 6.1	O	PoC_UserPlaneV1-PME-S-001

PoC_UserPlaneV1-PME-S-010	TBCP Talk Burst Acknowledgment message	Subclause 6.5.9 and 6.1	O	PoC_UserPlaneV1-PME-S-001
PoC_UserPlaneV1-PME-S-011	TBCP Talk Burst Request Queue Status Request message	Subclause 6.5.10 and 6.1	O	PoC_UserPlaneV1-PME-S-001
PoC_UserPlaneV1-PME-S-012	TBCP Talk Burst Request Queue Status Response message	Subclause 6.5.11	O	PoC_UserPlaneV1-PME-S-001
PoC_UserPlaneV1-PME-C-016	TBCP Disconnect message	Subclause 6.5.12 and 6.1	O	PoC_UserPlaneV1-PME-S-010 AND PoC_UserPlaneV1-PTB-S-002 AND PoC_UserPlaneV1-PTI-S-003
PoC_UserPlaneV1-PME-C-017	TBCP Connect message	Subclause 6.5.13 and 6.1	O	PoC_UserPlaneV1-PME-S-010 AND PoC_UserPlaneV1-PTB-S-002

A.2.6 Timers

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV1-PTI-S-001	Support of the T14 'Conversation' timer.	Subclause 9.2	O	PoC_UserPlaneV1-PMC-S-007
PoC_UserPlaneV1-PTI-S-002	Support of the T15 'Connect message retransmit' timer.	Subclause 9.2	O	PoC_UserPlaneV1-PME-S-008
PoC_UserPlaneV1-PTI-S-003	Support of the T16 'Disconnect message re-transmit timer'	Subclause 9.2	O	PoC_UserPlaneV1-PME-C-016

A.3 PoC Server performing the Controlling PoC Function

A.3.1 Transport

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV1-CTR-S-001	Support of the Internet Protocol defined by the SIP/IP Core.	Subclause 5.1	M	
PoC_UserPlaneV1-CTR-S-002	Support of UDP according to the rules and procedures as specified in Error! Reference source not found.	Subclause 5.2	M	
PoC_UserPlaneV1-CTR-S-003	Handling of port numbers.	Subclause 5.2.1	M	
PoC_UserPlaneV1-CTR-S-004	Support of RTP according to the rules and procedures as specified in [RFC3550].	Subclause 5.3	M	
PoC_UserPlaneV1-CTR-S-005	Support of RTCP according to the rules and procedures specified in [RFC3550] with the clarifications in subclause 5.4 "RTCP" including support of the creation, modification and/or processing of the content in TBCP packets .	Subclause 5.4	M	

PoC_UserPlaneV1-CTR-S-006	void			
PoC_UserPlaneV1-CTR-S-007	Support of sending of TBCP messages to the same UDP port as the other RTCP packets.	Subclause 5.4	O	
PoC_UserPlaneV1-CTR-S-008	Does not send TBCP messages as compound packets.	Subclause 5.4	O	
PoC_UserPlaneV1-CTR-S-009	Supports the creation, modification and/or processing of the content in RTCP packets to provide means for User Plane adaptation and feedback of the quality of the RTP Media transmission.	Subclause 5.4	O	
PoC_UserPlaneV1-CTR-S-010	To reduce potential degradation of the quality of the media transmission, the PoC Server does not schedule transmission of RTCP packets during a Talk Burst.	Subclause 5.4	O	PoC_UserPlaneV1-CTR-S-009
PoC_UserPlaneV1-CTR-S-011	void			
PoC_UserPlaneV1-CTR-S-012	Does not send RTCP BYE packets when the PoC Session is released.	Subclause 5.4	O	PoC_UserPlaneV1-CTR-S-009

A.3.2 Talk burst control

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV1-CTB-S-001	Supports basic Talk Burst control.	Subclause 6.4.4 and 6.4.4.8	M	
PoC_UserPlaneV1-CTB-S-002	Supports early right to speak indication to the PoC Client.	Subclause 6.4.2	O	PoC_UserPlaneV1-CMC-S-011
PoC_UserPlaneV1-CTB-S-003	Includes a Reason phrase field	Subclause 6.4.4.2.2	O	PoC_UserPlaneV1-CTB-S-004 OR PoC_UserPlaneV1-CTB-S-005 OR PoC_UserPlaneV1-CTB-S-006 OR PoC_UserPlaneV1-CTB-S-007 OR PoC_UserPlaneV1-CTB-S-008
PoC_UserPlaneV1-CTB-S-004	The Reason phrase field “Another PoC User has permission” is include, if another Participant has a Talk Burst permission.	Subclause 6.4.4.2.2	O	PoC_UserPlaneV1-CTB-S-003
PoC_UserPlaneV1-CTB-S-005	The Reason phrase field “Internal PoC Server error” is include, if PoC Server is not able to grant the Talk Burst due to an internal error.	Subclause 6.4.4.2.2	O	PoC_UserPlaneV1-CTB-S-003

PoC_UserPlaneV1-CTB-S-006	The Reason phrase field “Only one Participant in the PoC Session” is included, if the requesting PoC User is the only Participant in the PoC Session.	Subclause 6.4.4.2.2	O	PoC_UserPlaneV1-CTB-S-003
PoC_UserPlaneV1-CTB-S-007	The Reason phrase field “Retry-after timer has not expired” is include, if the retry-after timer is still running.	Subclause 6.4.4.2.2	O	PoC_UserPlaneV1-CTB-S-003
PoC_UserPlaneV1-CTB-S-008	The Reason phrase field“Listen only” is included, if the requesting PoC User has only listen only privilege.	Subclause 6.4.4.2.2	O	PoC_UserPlaneV1-CTB-S-003
PoC_UserPlaneV1-CTB-S-009	if the associated PoC Client rejoins an ongoing PoC Session or initiates or joins a Chat PoC Session, and if no PoC Client has the permission to send a Talk Burst, the PoC Server sends a TBCP Talk Burst Idle message to the PoC Client	Subclause 6.4.4.2.2	O	
PoC_UserPlaneV1-CTB-S-010	Indicates when the PoC Client has been placed in the Talk Burst request queue by giving the position of the PoC Client in the Talk Burst request queue when sending a TBCP Talk Burst Request Queue Status Response message to the PoC Client.	Subclause 6.4.4.2.2	O	PoC_UserPlaneV1-CTB-S-014
PoC_UserPlaneV1-CTB-S-011	Indicates when the PoC Client has been placed in the Talk Burst request queue the priority granted to the TBCP Talk Burst Request message in the queue when sending a TBCP Talk Burst Request Queue Status Response message to the PoC Client.	Subclause 6.4.4.2.2	O	PoC_UserPlaneV1-CTB-S-0014
PoC_UserPlaneV1-CTB-S-012	Sends a TBCP Talk Burst Deny message to the PoC Client; and, remains in the state ‘U: not permitted and TB_Idle’ state if there is only one Participant in the PoC Session.	Subclause 6.4.5.2.3	O	
PoC_UserPlaneV1-CTB-S-013	Supports extensions to basic Talk Burst control necessary for the support of 1-many-1 Session.	Subclause 6.4.4.3.4, 6.4.4.4.2, 6.4.4.4.3, 6.4.4.5.2 and 6.4.4.5.4	O	
PoC_UserPlaneV1-CTB-S-014	Supports extensions to basic Talk Burst control necessary for the support of queuing of Talk Burst requests.	Subclause 6.4.4 and 6.4.4.8	O	PoC_UserPlaneV1-CME-S-011
PoC_UserPlaneV1-CTB-S-015	Honors the Time Stamp and inserts the PoC Client in the queue accordingly.	Subclause 6.4.5.3.3	O	PoC_UserPlaneV1-CTB-S-005
PoC_UserPlaneV1-CTB-S-016	Include notification of the number of Participants, receiving Talk Bursts, in the PoC Session, in the TBCP Talk Burst	Subclause 6.4.4.3.1	O	

	Granted message.			
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A.3.3 Talk Burst Control messages

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV1-CME-S-001	Talk Burst Control (TBCP) messages	Subclause 6.5 and 6.1	M	
PoC_UserPlaneV1-CME-S-002	Sending of more than one TBCP Talk Burst Control message MAY be sent in a single IP packet.	Subclause 6.5	O	
PoC_UserPlaneV1-CME-S-003	TBCP Talk Burst Request message	Subclause 6.5.2 and 6.1	M	
PoC_UserPlaneV1-CME-S-004	TBCP Talk Burst Granted message	Subclause 6.5.2.2 and 6.1	M	
PoC_UserPlaneV1-CME-S-005	Includes the number of Participants in TBCP Talk Burst Granted message	Subclause 6.4.4.3.1	O	
PoC_UserPlaneV1-CME-S-006	TBCP Talk Burst Deny message	Subclause 6.5.4 and 6.1	M	
PoC_UserPlaneV1-CME-S-007	TBCP Talk Release message	Subclause 6.5.5 and 6.1	M	
PoC_UserPlaneV1-CME-S-008	TBCP Talk Burst Idle message	Subclause 6.5.6 and 6.1	M	
PoC_UserPlaneV1-CME-S-009	TBCP Talk Burst Taken message	Subclause 6.5.7 and 6.1	M	
PoC_UserPlaneV1-CME-S-0010	TBCP Talk Burst Revoke message	Subclause 6.5.7 and 6.1	M	
PoC_UserPlaneV1-CME-S-011	TBCP Talk Burst Request Queue Status Request message	Subclause 6.5.10 and 6.1	O	PoC_UserPlaneV1-CTB-S-005 AND PoC_UserPlaneV1-CME-S-012
PoC_UserPlaneV1-CME-S-012	TBCP Talk Burst Request Queue Status Response message	Subclause 6.5.11 and 6.1	O	PoC_UserPlaneV1-CME-S-011
PoC_UserPlaneV1-CME-S-013	Supports the sending of priority in the TBCP Talk Burst Request Queue Status Response message	Subclause 6.5.11	O	PoC_UserPlaneV1-CME-S-012
PoC_UserPlaneV1-CME-S-014	Supports the sending of queue Position in the TBCP Talk Burst Request Queue Status Response message.	Subclause 6.5.11	O	PoC_UserPlaneV1-CME-S-012

A.3.4 Media control

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV1-CMC-S-001	Support of quality feed back according to rules and procedures specified in [RFC3550].	Subclause 7.1	O	

PoC_UserPlaneV1-CMC-S-002	Acts as a 'monitor' according to the rules and procedures specified in [RFC3550] for the RTP Media flow and use the reported statistics to estimate the current quality of service.	Subclause 7.1.4	O	PoC_UserPlaneV1-CMC-S-001
PoC_UserPlaneV1-CMC-S-003	Generates and sends a RTCP RR compound packet for the Talk Burst that it recently received from a PoC Client.	Subclause 7.1.4	O	PoC_UserPlaneV1-CMC-S-001
PoC_UserPlaneV1-CMC-S-004	Media parameter negotiation	Subclause 7.2 and 7.2.3	M	
PoC_UserPlaneV1-CMC-S-005	Determines the preferred Media capabilities based on the lowest negotiated Media capability of the PoC Client's that have joined the PoC Session.	Subclause 7.2	O	
PoC_UserPlaneV1-CMC-S-006	User Plane adaptation	Subclause 7.3 and 7.3.3	O	PoC_UserPlaneV1-CTI-S-005 AND PoC_UserPlaneV1-CTI-S-006
PoC_UserPlaneV1-CMC-S-007	When determining the Media Parameters the PoC Server SHOULD take into account the highest common media capabilities provided by both the new and the existing members in the Group.	Subclause 7.3.3	O	PoC_UserPlaneV1-CMC-S-006
PoC_UserPlaneV1-CMC-S-008	Media on and off hold	Subclause 7.4.3	M	
PoC_UserPlaneV1-CMC-S-009	Send RTCP SR/RR message to the PoC Client when Media is on hold.	Subclause 7.4.3	O	PoC_UserPlaneV1-CTR-S-009
PoC_UserPlaneV1-CMC-S-010	Supports transfer of Media	Subclause 7.7.3	M	
PoC_UserPlaneV1-CMC-S-011	Supports buffering of Media	Subclause 7.8.3	O	PoC_UserPlaneV1-CTB-S-003
PoC_UserPlaneV1-CMC-S-012	When transmitting buffered RTP Media packets, the PoC Server transmits the packets at a bit rate that avoids overload in the receiving PoC Client(s).	Subclause 7.8.3	O	PoC_UserPlaneV1-CMC-S-011

A.3.5 Talker identification

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV1-CID-S-001	Support of Talker Identification	Subclause 8.1	M	

A.3.6 Timers

Item	Function	Reference	Status	Requirement
PoC_UserPlaneV1-CTI-S-001	Support of T1 'End of RTP media' timer	Subclause 9.1	M	

PoC_UserPlaneV1-CTI-S-002	Support of T2 'Stop talking, timer	Subclause 9.1	M	
PoC_UserPlaneV1-CTI-S-003	Support of T3 'Stop talking grace, timer	Subclause 9.1	M	
PoC_UserPlaneV1-CTI-S-004	Support of T4 'Inactivity' timer	Subclause 9.1	M	
PoC_UserPlaneV1-CTI-S-007	Support of T7 'Talk Burst Idle' timer	Subclause 9.1	M	
PoC_UserPlaneV1-CTI-S-008	Support of T8 'Talk Burst Revoke' timer	Subclause 9.1	M	
PoC_UserPlaneV1-CTI-S-009	Support of T9 'Retry-after' timer	Subclause 9.1	M	

Appendix B. Message flows (Informative)

This Annex shows some examples of TBCP message and Quality feedback message flows.

The PoC Client and the PoC Server performing the Controlling PoC Function and the PoC Server performing the Participating PoC Function are supporting the following Talk Burst Control procedures, which are shown as example flows in the following subclauses:

- Talk Burst request at PoC Session initialization;
- Talk Burst idle procedure;
- Talk Burst request during a PoC Session;
- Talk Burst revoke procedure;
- Talk Burst release procedure;
- Quality feedback flows;
- Talker Identification flow; and,
- PoC Session release in the Pre-established Session case.

B.1 Talk burst request at PoC Session initialization

A PoC Session is established as specified in the [OMA-POC-CP].

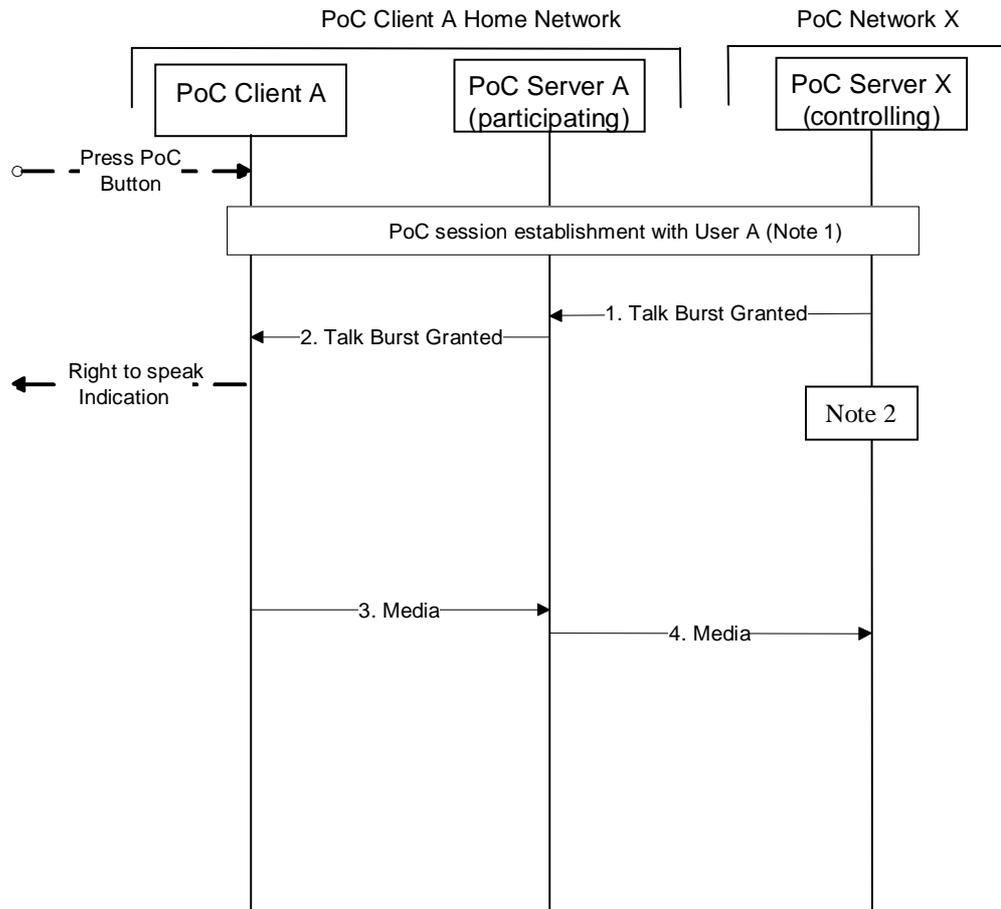
As stated in subclause 6.4.2 “*Controlling PoC Function procedures at PoC Session initialization*” the PoC Server performing the Controlling PoC Function interprets the initial SIP INVITE request (in case of an On-demand Session) or the SIP REFER request (in case of an Pre-established Session) as an implicit Talk Burst request.

B.1.1 Message flows in the originating PoC network

B.1.1.1 Talk Burst request procedure at PoC Session establishment – On demand Session case

This subclause describes what happens when a PoC User initiates a PoC Session using an On-demand Session.

Figure 13 “*Talk burst request procedure at PoC Session establishment – On-demand Session case*” shows the message flow for the scenario.



NOTE 1: The PoC Session establishment is an On-demand Session (initiated by a SIP INVITE request). While this scenario shows the TBCP Talk Burst Granted message being sent after the PoC Session is established, it may be transmitted before or during the PoC Session establishment depending on whether the PoC Session establishment is confirmed or unconfirmed.

NOTE 2: For TBCP message flow for Invited PoC Users see Figure 19 “Inviting a PoC User to a PoC Session using On-demand Session establishment”.

Figure 13: Talk Burst request procedure at PoC Session establishment – On-demand Session case

A PoC User A at a PoC Client A has pressed the PoC button and the PoC Client A has initiated a PoC Session with a PoC Server X (controlling). This creates an implicit TBCP Talk Burst Request message at the PoC Server X (controlling).

A PoC Server A (participating) has inserted itself in the media stream and all TBCP messages and RTP Media packets will go through the PoC Server A (participating).

The steps of the flow are as follows:

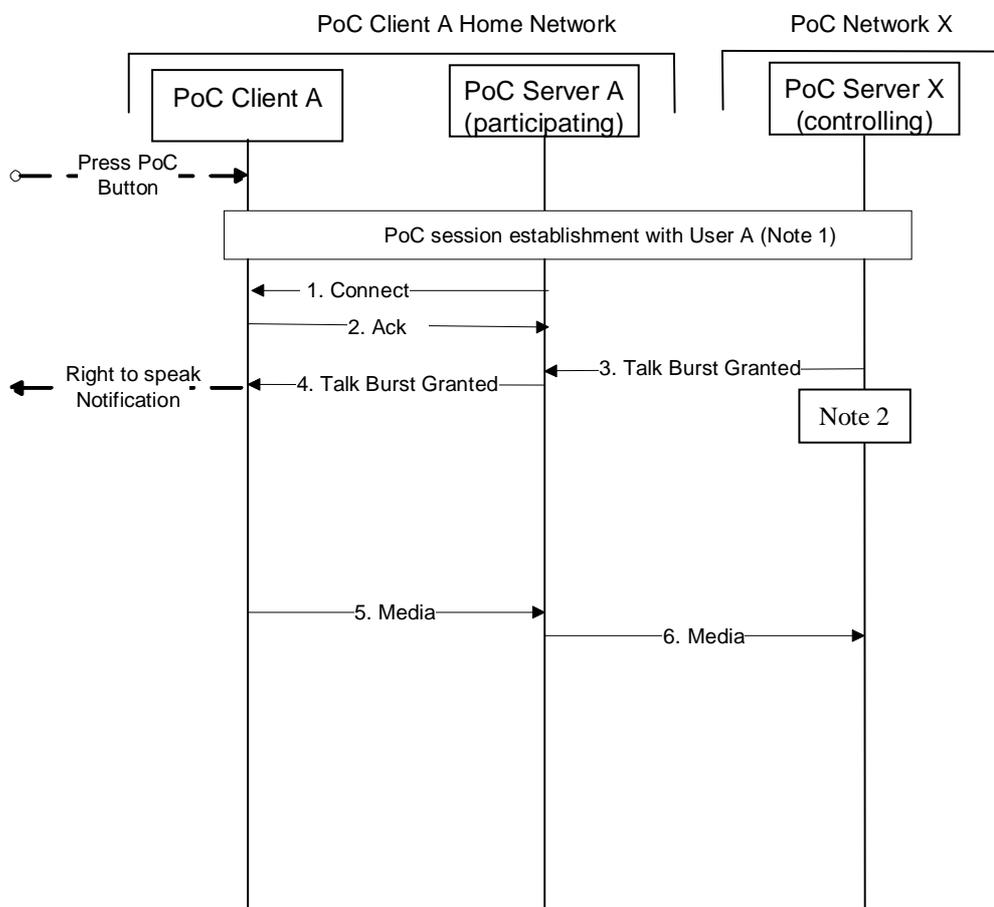
1. The PoC Server X (controlling) sends a TBCP Talk Burst Granted message towards the PoC Client.
2. The PoC Server A (participating) modifies the IP address and port and sends the TBCP Talk Burst Granted message to PoC Client A.

3. When PoC Client A receives the TBCP Talk Burst Granted message, it provides a Talk Burst granted notification, including information about the stop talking timer, to the PoC User A. The PoC Client A then begins to send RTP Media packets towards the PoC Server X (controlling).
4. PoC Server (participating) A modifies the IP address and port and forwards the RTP Media packet to PoC Server X (controlling).

B.1.1.2 Talk Burst request procedure at PoC Session establishment – Pre-established Session case

This subclause describes what happens when a PoC User initiates a PoC Session using Pre-established Session.

Figure 14 “Talk burst request procedure at PoC Session establishment- Pre-established Session case” shows the message flow for the scenario.



NOTE: For TBCP message flow for Invited PoC Users see Figure 20 “Inviting a PoC User to a PoC Session using Pre-established Session establishment”.

Figure 14: Talk Burst request procedure at PoC Session establishment – Pre-established Session case

A PoC User A at a PoC Client A has pressed the PoC button and the PoC Client A has initiated a PoC Session with a PoC Server X (controlling). This creates an implicit TBCP Talk Burst Request message at the PoC Server X (controlling).

A PoC Server A (participating) has inserted itself in the media stream and all TBCP messages and RTP Media packets will go thru the PoC Server A (participating).

The steps of the flow are as follows:

1. The PoC Server A (participating) sends the TBCP Connect message to the PoC Client A to indicate the PoC Session establishment and to indicate the PoC Session Identity.
2. The PoC Client A sends TBCP Talk Burst Acknowledgment to acknowledge the TBCP Connect.
3. The PoC Server X (controlling) sends a TBCP Talk Burst Granted message, including information about the T2 (Stop talking) timer, to the PoC Client.

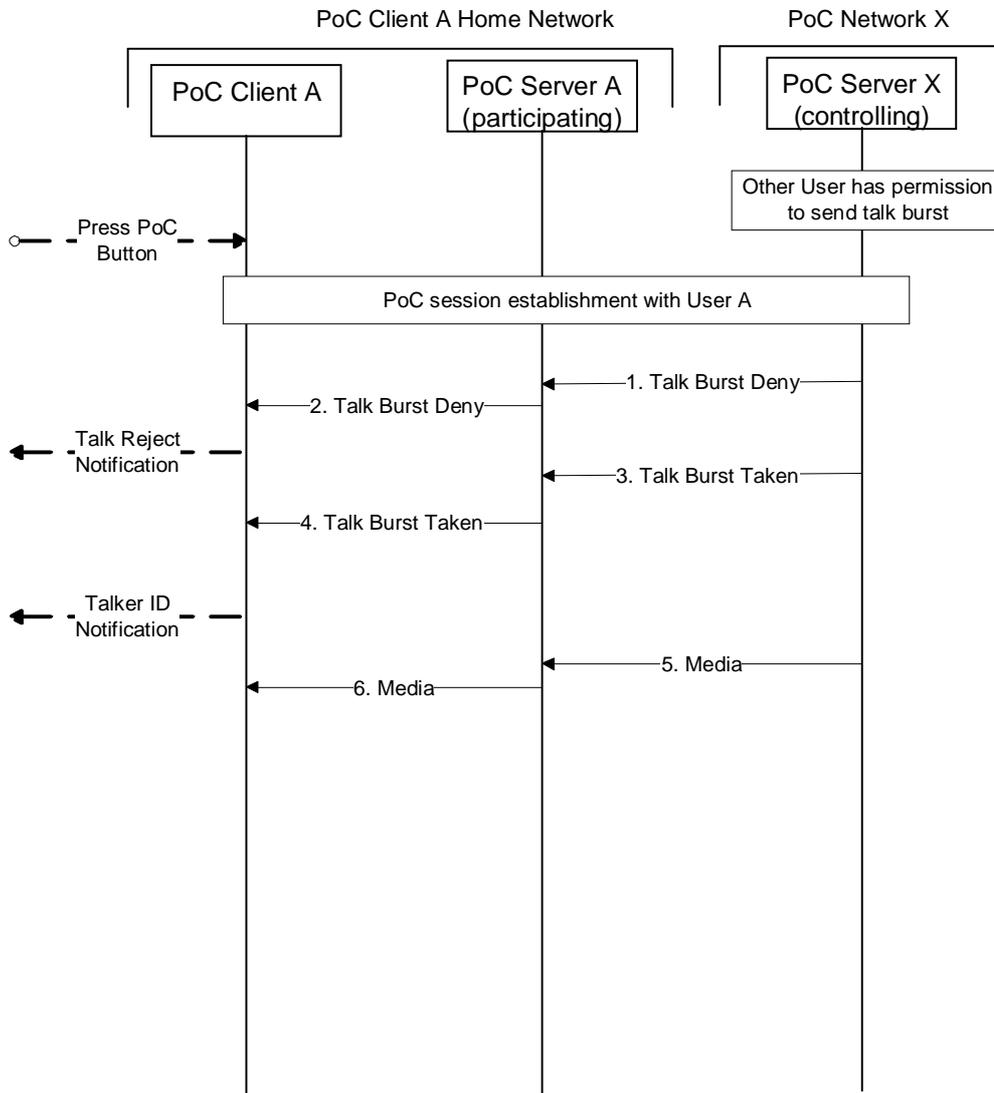
NOTE: TBCP Messages TBCP Connect and TBCP Talk Burst Granted can be sent in the same IP message.

4. When PoC Client A receives the TBCP Talk Burst Granted message, it provides a Talk Burst granted notification, including information about the stop talking timer, to the PoC User A. The PoC Client A then begins to send RTP Media packets towards the PoC Server X (controlling).
5. PoC Server (participating) A modifies the IP address and port and forwards the RTP Media packet to PoC Server X (controlling).

B.1.1.3 A PoC User joins a PoC Group during an ongoing Talk Burst

This subclause describes what happens when a PoC User joins a Group communication during an ongoing Talk Burst.

Figure 15 “A PoC User joins a PoC Group during an ongoing Talk Burst” shows the message flow for the scenario.



NOTE: The PoC Session may be an On-demand Session (initiated by a SIP INVITE request) or a PoC Session over a Pre-established Session (initiated by a SIP REFER request).

Figure 15: A PoC User joins a PoC Group during an ongoing Talk Burst

The PoC User at a PoC Client A has pressed the PoC button and the PoC Client A has initiated a PoC Session with a PoC Server X (controlling). This creates an implicit TBCP Talk Burst Request message at the PoC Server X (controlling).

A PoC Server A (participating) has inserted itself in the media stream and all TBCP messages and RTP Media packets will go thru the PoC Server A (participating).

The steps of the flow are as follows:

1. The PoC Server X (controlling) sends a TBCP Talk Burst Deny message towards the PoC Client A.

2. The PoC Server A (participating) modifies the IP address and port and sends the TBCP Talk Burst Deny message to PoC Client A. The PoC Client A sends a Talk Burst deny notification to the PoC User A.
3. The PoC Server X (controlling) sends the TBCP Talk Burst Taken message to the PoC Client A. The message includes the identity of the PoC User that currently has permission to send a Talk Burst.

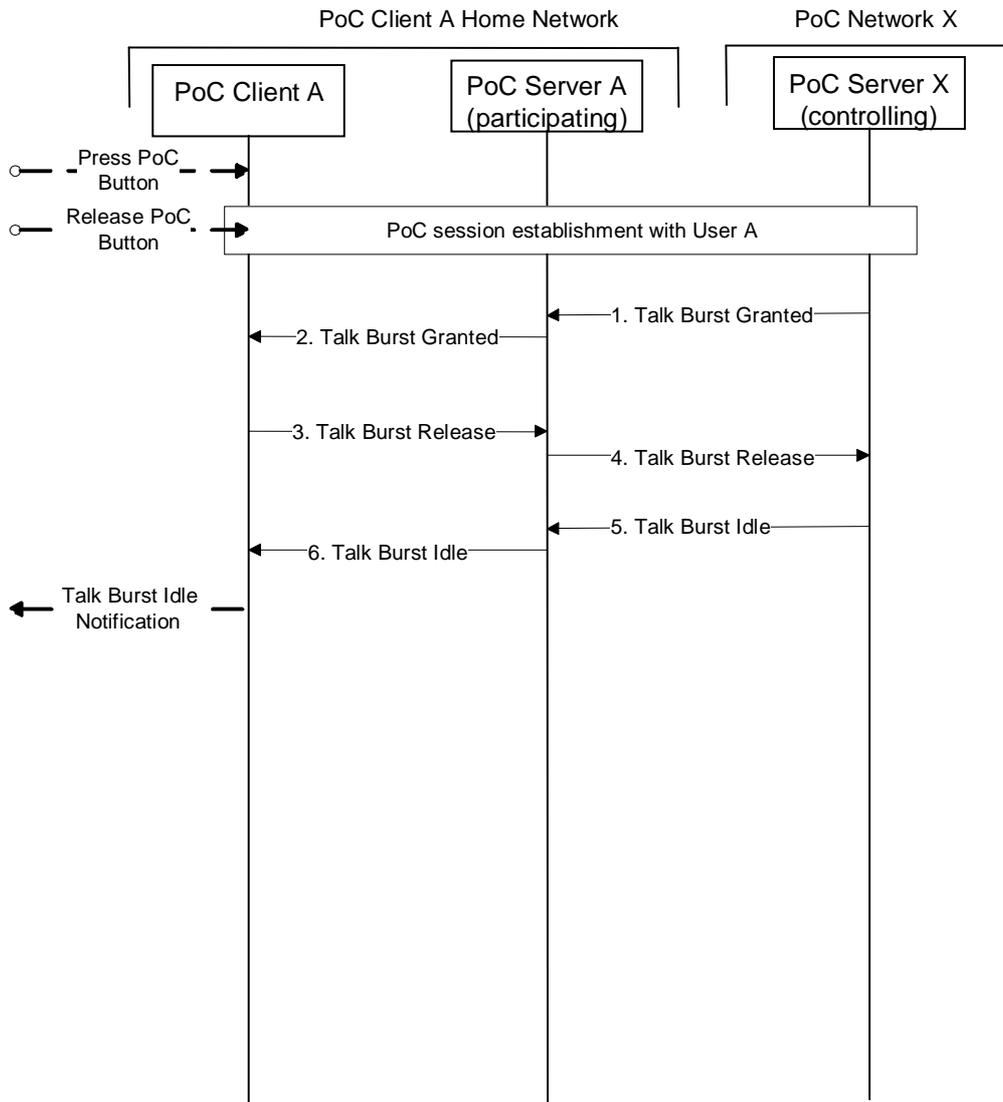
NOTE: The TBCP Talk Burst Deny message and TBCP Talk Burst Taken message can be sent in the same IP packet.

4. The PoC Server A (participating) modifies the IP address and port and sends the TBCP Talk Burst Taken message to PoC Client A. PoC Client A presents the talker identity to the PoC User A.
5. The PoC Server X (controlling) begins to transmit RTP Media packets towards PoC Client A.
6. PoC Server A (participating) modifies the IP address and port of the RTP Media packet and sends it to PoC Client A. The PoC Client A plays the media to the PoC User A.

B.1.1.4 PoC User releases PoC button before the PoC Session establishment is completed

This subclause shows an example of when a PoC User wishes to start a PoC Session as a listener, instead of a talker.

Figure 16 “*PoC User releases PoC button before the PoC Session establishment is completed*” shows the message flow for the scenario.



NOTE 1: The PoC Session may be an On-demand Session (initiated by a SIP INVITE request) or a PoC Session over a Pre-established Session (initiated by a SIP REFER request).

NOTE 2: While this scenario shows the TBCP Talk Burst Granted message being sent after the PoC Session is established, it may be transmitted before or during the PoC Session establishment depending on whether the PoC Session establishment is confirmed or unconfirmed.

Figure 16: PoC User releases PoC button before the PoC Session establishment is completed

A PoC User A at a PoC Client A has pressed the PoC button and the PoC Client A has initiated a PoC Session with the PoC Server X (controlling). This creates an implicit TBCP Talk Burst Request message at the PoC Server X (controlling). The PoC Server X (controlling) grants the PoC Client A the permission to send a Talk Burst when the PoC User A releases the PoC button.

A PoC Server A (participating) has inserted itself in the media stream and all TBCP messages and RTP Media packets will go thru the PoC Server A (participating).

The steps of the flow are as follows:

1. The PoC Server X (controlling) sends a TBCP Talk Burst Granted message, including information about the stop talking timer, towards the PoC Client A.
2. The PoC Server A (participating) modifies the IP address and port and sends the message to PoC Client A.
3. When the PoC Client A receives the TBCP Talk Burst Granted message, it immediately sends a TBCP Talk Burst Release message towards the PoC Server X (controlling).
4. The PoC Server A (participating) modifies the IP address and port and sends the TBCP Talk Burst Release message to the PoC Server X (controlling).
5. The PoC Server X (controlling) sends a TBCP Talk Burst Idle message towards all PoC Clients connected to the PoC Session.
6. The PoC Server A (participating) modifies the IP address and port and sends the TBCP Talk Burst Idle message to PoC Client A.

B.1.1.5 PoC Session establishment failure – Pre-established Session case

This subclause describes what happens when a PoC User initiates a PoC Session using Pre-established Session and the PoC Server refuses the PoC Session.

Figure 17 “*PoC Session establishment is rejected - Pre-established Session case*” shows the message flow for the scenario.

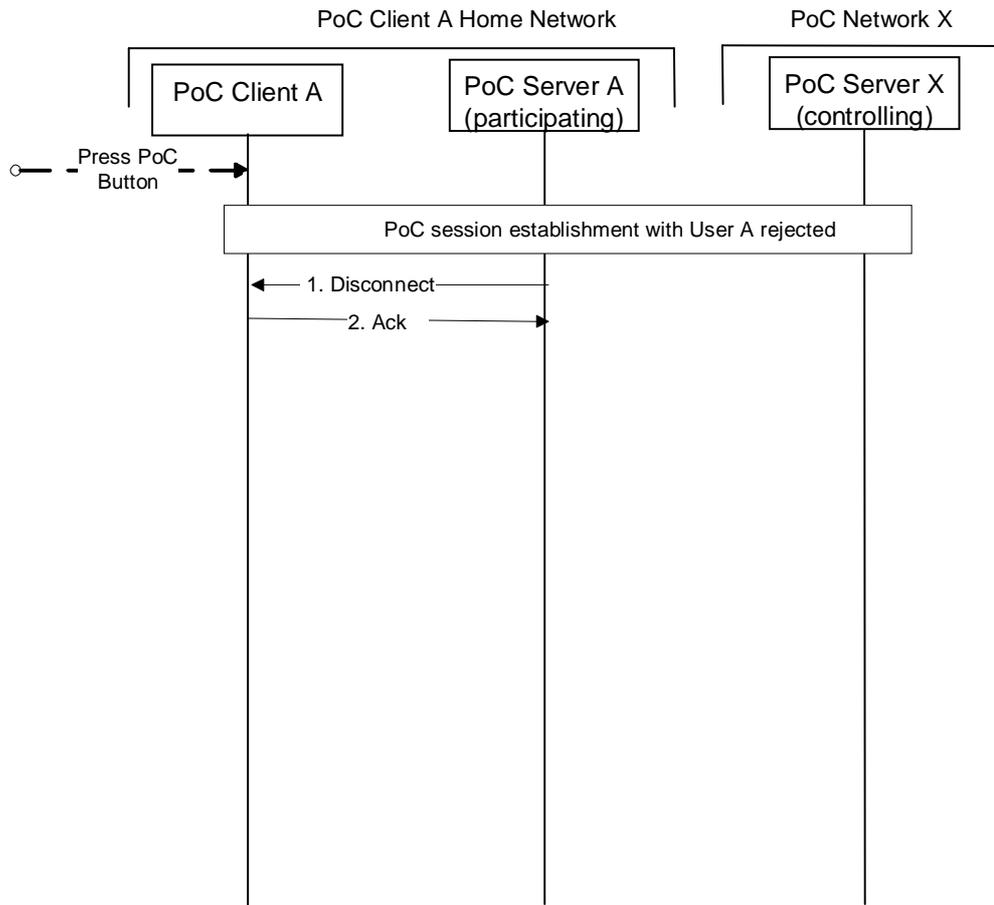


Figure 17: PoC Session establishment is rejected – Pre-established Session case

A PoC User A at a PoC Client A has pressed the PoC button and the PoC Client A has initiated a PoC Session with a PoC Server X (controlling). This creates an implicit TBCP Talk Burst Request message at the PoC Server X (controlling).

The controlling PoC Server has rejected the PoC Session.

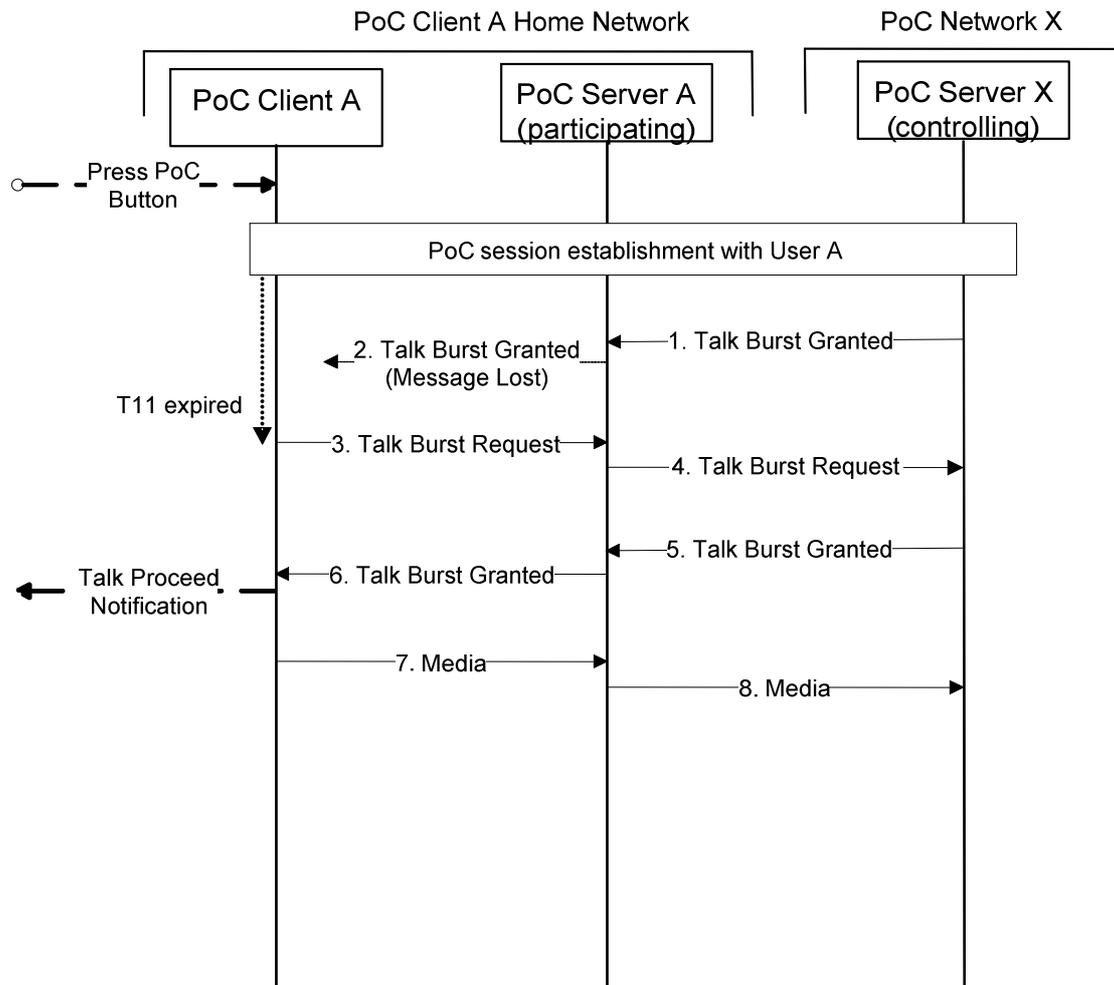
The steps of the flow are as follows:

1. The PoC Server A (participating) receives a failed indication from PoC Server X (controlling) and sends the TBCP Disconnect message to the PoC Client A to indicate the PoC Session establishment is rejected.
2. The PoC Client A sends TBCP Talk Burst Acknowledgment to acknowledge the TBCP Disconnect message.

B.1.2 Talk Burst Granted message from PoC Server performing the Controlling PoC Function is lost

This subclause shows an example of the scenario when the TBCP Talk Burst Granted message, sent from the PoC Server performing the Controlling PoC Function during PoC Session establishment, is lost.

Figure 18 “*TBCP Talk Burst Granted message from PoC Server performing the Controlling PoC Function is lost*” shows the message flow for the scenario.



NOTE: The PoC Session may be an On-demand Session (initiated by a SIP INVITE request) or a PoC Session over a Pre-established Session (initiated by a SIP REFER request). While this scenario shows the TBCP Talk Burst Granted message being sent after the PoC Session is established, it may be transmitted before or during the PoC Session establishment depending on whether the PoC Session establishment is confirmed or unconfirmed.

Figure 18: TBCP Talk Burst Granted message from PoC Server performing the Controlling PoC Function is lost

A PoC User A at a PoC Client A has pressed the PoC button and the PoC Client A has initiated a PoC Session with a PoC Server X (controlling). This creates an implicit TBCP Talk Burst Request message at the PoC Server X (controlling). The PoC Server X (controlling) grants the PoC Client to send one Talk Burst but the PoC Client A does not receive the message.

The PoC Client is supervising the reception of a TBCP message (e.g. the TBCP Talk Burst Granted message) by means of the timer T11 (Talk Burst Request).

A PoC Server A (participating) has inserted itself in the media stream and all TBCP messages and RTP Media packets will go thru the PoC Server A (participating).

The steps of the flow are as follows:

1. When the PoC Server X (controlling) receives the PoC Session Initiation from PoC Client A, an implicit Talk Burst request is created at the PoC Server X (controlling). The PoC Server X (controlling) then sends a TBCP Talk Burst Granted message, including information about the stop talking timer, towards the PoC Client A.

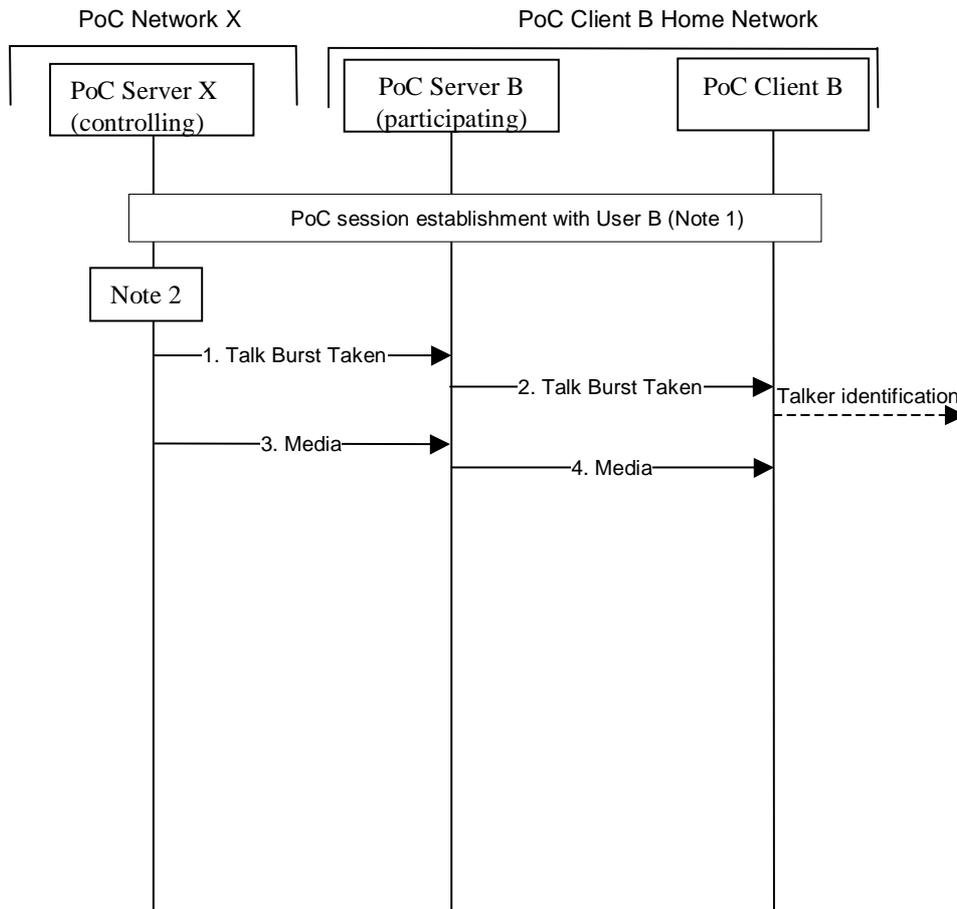
2. The PoC Server A (participating) modifies the IP address and port and tries to send the TBCP Talk Burst Granted message to PoC Client A. During transmission the message gets lost.
3. When the T11 (Talk Burst Request) timer expires in the PoC Client A, it sends a TBCP Talk Burst Request message towards the PoC Server X (controlling).
4. The PoC Server A (participating) modifies the IP address and port and sends the TBCP Talk Burst Request message to the PoC Server X (controlling). When the PoC Server (controlling) receives the TBCP Talk Burst Request message, it sends the same response to the PoC Client A that it had previously sent.
5. When the PoC Server X (controlling) receives the TBCP Talk Burst Request message, it sends the same response to the PoC Client A that it had previously sent in step 1.
6. The PoC Server A (participating) modifies the IP address and port and sends the TBCP Talk Burst Granted message to PoC Client A.
7. When PoC Client A receives the TBCP Talk Burst Granted message, it provides a Talk Burst granted notification, including information about the stop talking timer, to the User A. PoC Client A then begins to send RTP media packets towards the PoC Server X (controlling).
8. PoC Server (participating) A modifies the IP address and port and forwards the RTP media packet to PoC Server X (controlling).

B.1.3 Message flows in the terminating PoC network

B.1.3.1 Inviting a PoC User to a PoC Session using On-demand Session establishment

This subclause shows an example of the scenario when a PoC User is invited to a PoC Session using On-demand Session establishment.

Figure 19 “*Inviting a PoC User to a PoC Session using On-demand Session establishment*” shows the message flow for the scenario.



NOTE 1: While only 1 terminating PoC Client B is shown in the figure, this flow applies to all terminating PoC Clients where On-demand establishment is used for Inviting PoC Users to a PoC Session.

NOTE 2: The TBCP message flows for the Inviting PoC User see Figure 13 “Talk burst request procedure at PoC Session establishment”.

Figure 19: Inviting a PoC User to a PoC Session using On-demand Session establishment

A PoC Session is established with an Invited PoC User B at the PoC Client B and a PoC Server X (controlling). The normal case results in that the Invited PoC Client has no permission to send a Talk Burst.

A PoC Server B (participating) has inserted itself in the media stream and all TBCP messages and RTP Media packets will go thru the PoC Server B (participating).

The steps of the flow are as follows:

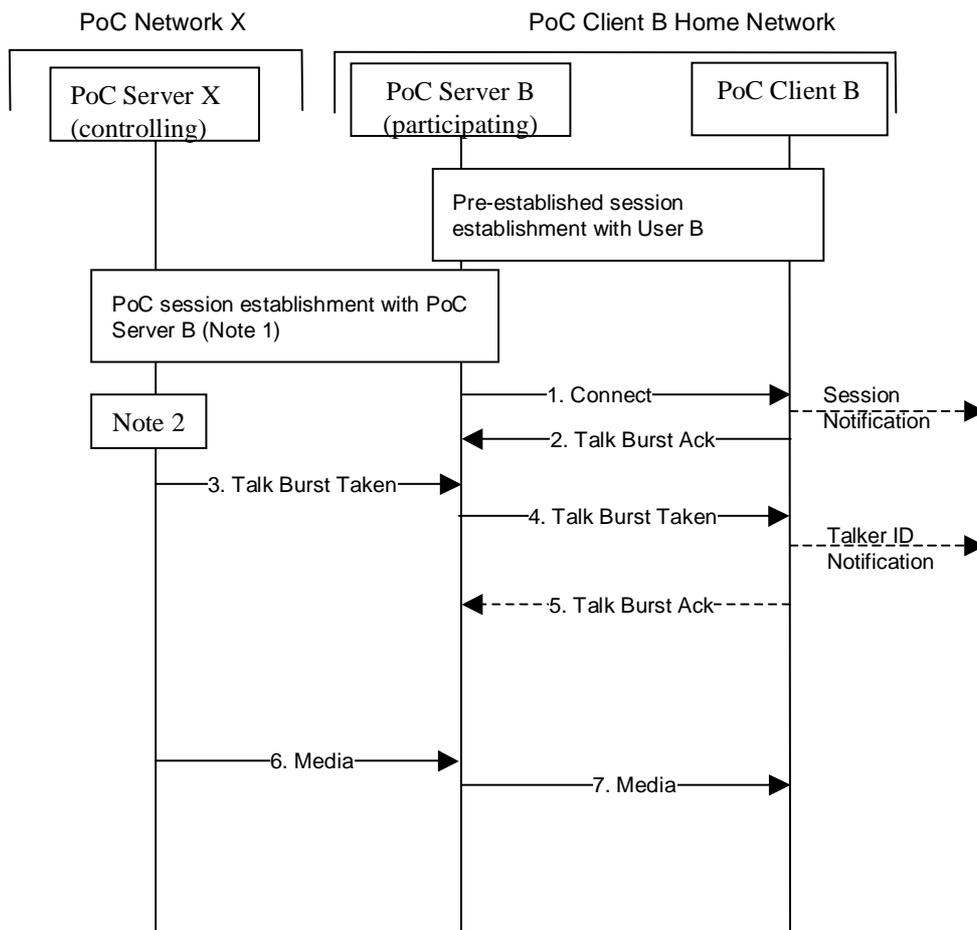
1. A PoC Server X (controlling) sends a TBCP Talk Burst Taken message towards the PoC Client B. The message includes the identity of the PoC User that currently has permission to send a Talk Burst.
2. The PoC Server B (participating) modifies the IP address and port and sends the TBCP Talk Burst Taken message to PoC Client B. The PoC Client B presents the talker identity to PoC User B.
3. The PoC Server X (controlling) begins to transmit RTP Media packets towards the PoC Client B.

4. The PoC Server A modifies the IP address and port of the RTP Media packet and sends it to the PoC Client B. The PoC Client B plays the media to the PoC User B.

B.1.3.2. Inviting a PoC User to a PoC Session using a Pre-established Session

This subclause shows an example of the scenario when a PoC User is invited to a PoC Session using a Pre-established Session.

Figure 20 “Inviting a PoC User to a PoC Session using a Pre-established Session” shows the message flow for the scenario.



NOTE 1: While only 1 terminating PoC Client B is shown in the figure, this flow applies towards all terminating PoC Clients with a Pre-established Session invited to a PoC Session.

NOTE 2: The TBCP message flow for the Inviting PoC User see Figure 13 “Talk burst request procedure at PoC Session establishment”.

Figure 20: Inviting a PoC User to a PoC Session using a Pre-established Session

A PoC Server B (participating) controls the Pre-established Session and all TBCP messages and RTP Media packets will go thru the PoC Server B (participating).

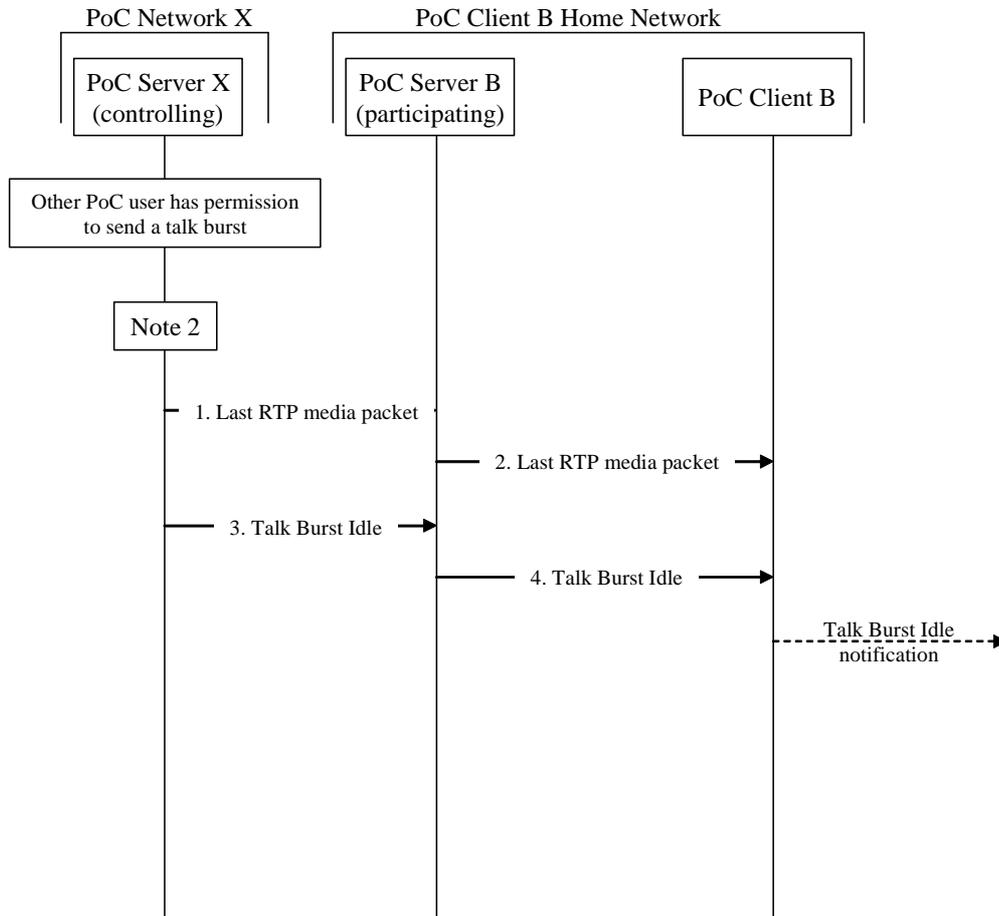
The steps of the flow are as follows:

1. The PoC Server B (participating) sends a TBCP Connect message to PoC Client B triggered by the SIP INVITE. The message includes the identity of the PoC User that initiated the PoC Session. The PoC Server B (participating) adds the identity of the Group. The PoC Client B presents the Group Identity, if exists, to PoC User B.
2. The PoC Client B sends a TBCP Talk Burst Acknowledgement message to PoC Server B (participating) to acknowledge the receipt of the TBCP Connect message.
3. The PoC Server X (controlling) sends a TBCP Talk Burst Taken message to PoC Client B. The TBCP Talk Burst Taken message includes the identity of the PoC User that currently has the permission to send a Talk Burst.
4. The PoC Server B (participating) modifies the IP address and port and sends the TBCP Talk Burst Taken message to PoC Client B.
5. The PoC Client B sends a TBCP Talk Burst Acknowledgement message to Participating PoC Server B to acknowledge the receipt of the TBCP Talk Burst Taken message, if requested.
6. Controlling PoC Server X begins to transmit RTP Media packets to the PoC Client B. While this is shown as beginning after the receipt of the TBCP Talk Burst Acknowledgement message in this flow, the transmission of the RTP Media packets can begin at any time after the TBCP Talk Burst Taken message has been sent.
7. The PoC Server A (participating) modifies the IP address and port of the RTP Media packet and sends it to the PoC Client B.

B.2 Talk Burst idle procedure

This subclause shows the scenario when another PoC Client has completed the sending of a Talk Burst or if another PoC Client was revoked the permission to send a Talk Burst.

Figure 21 “*Talk Burst idle procedure*” shows the message flow for the scenario.



NOTE 1: While only 1 terminating PoC Client B is shown in the figure, this flow applies towards all listening PoC Clients in a PoC Session.

NOTE 2: For the TBCP message flows when the PoC User releases the PoC button, see Figure 23 “TBCP Talk Burst Release procedure”, Figure 25 “Talk Burst Revoke procedure in PoC Server performing the Controlling PoC Function” and Figure 26 “Talk Burst release procedure”.

Figure 21: Talk Burst idle procedure

The PoC Server X (controlling) has received a TBCP Talk Burst Release message from the PoC Client that has been given permission to send a Talk Burst.

A PoC Server B (participating) has inserted itself in the media stream and all TBCP messages and RTP Media packet will go thru the PoC Server B (participating).

The steps of the flow are as follows:

1. The last RTP Media packet is sent from PoC Server X (controlling) towards all the PoC Clients in the PoC Session, including the PoC Client B.
2. The PoC Server B (participating) modifies the IP address and port of the last RTP packet and sends the packet to the PoC Client B.

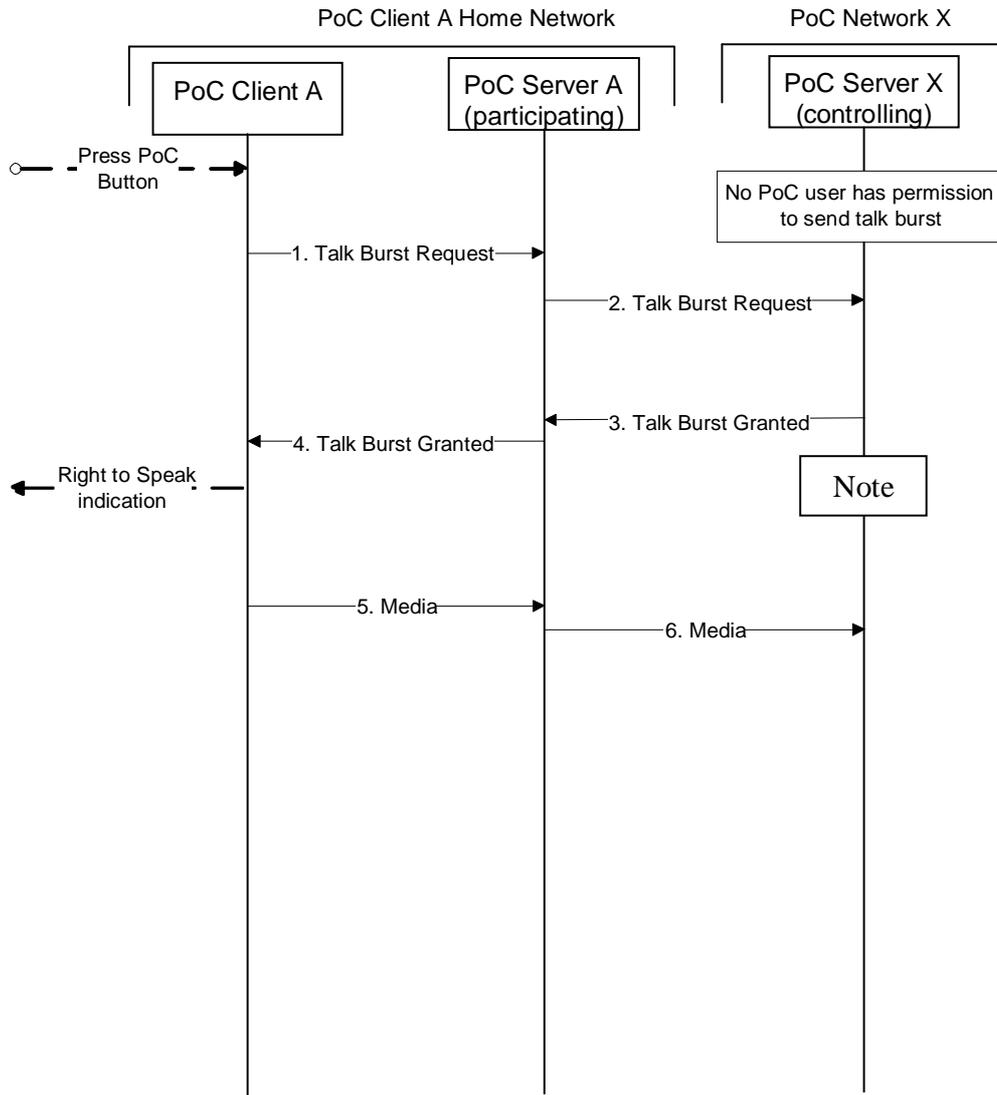
3. The PoC Server X (controlling) sends a TBCP Talk Burst Idle message to all PoC Clients in the PoC Session, including the PoC Client B.
4. The PoC Server B (participating) modifies the IP address and port and sends the message to PoC Client B. PoC Client B sends a Talk Burstidle notification to PoC User B.

B.3 Talk Burst request during a PoC Session

B.3.1 Sending a Talk Burst request

This subclause shows the normal case when the PoC Client has received a TBCP Talk Burst Idle message from the PoC Server performing the Controlling PoC Function and the PoC User at the PoC Client presses the PoC button in order to request permission to send a Talk Burst.

Figure 22 “*Another PoC User request the permission to send a Talk Burst*” shows the message flow for the scenario.



NOTE: For the TBCP message flows for PoC Users without permission to talk see Figure 24 “Another PoC User request the permission to send a Talk Burst”.

Figure 22: Sending a Talk Burst request

A PoC User A at the PoC Client A presses the PoC button.

A PoC Server A (participating) has inserted itself in the media stream and all TBCP messages and RTP Media packet will go thru the PoC Server A (participating).

The steps of the flow are as follows:

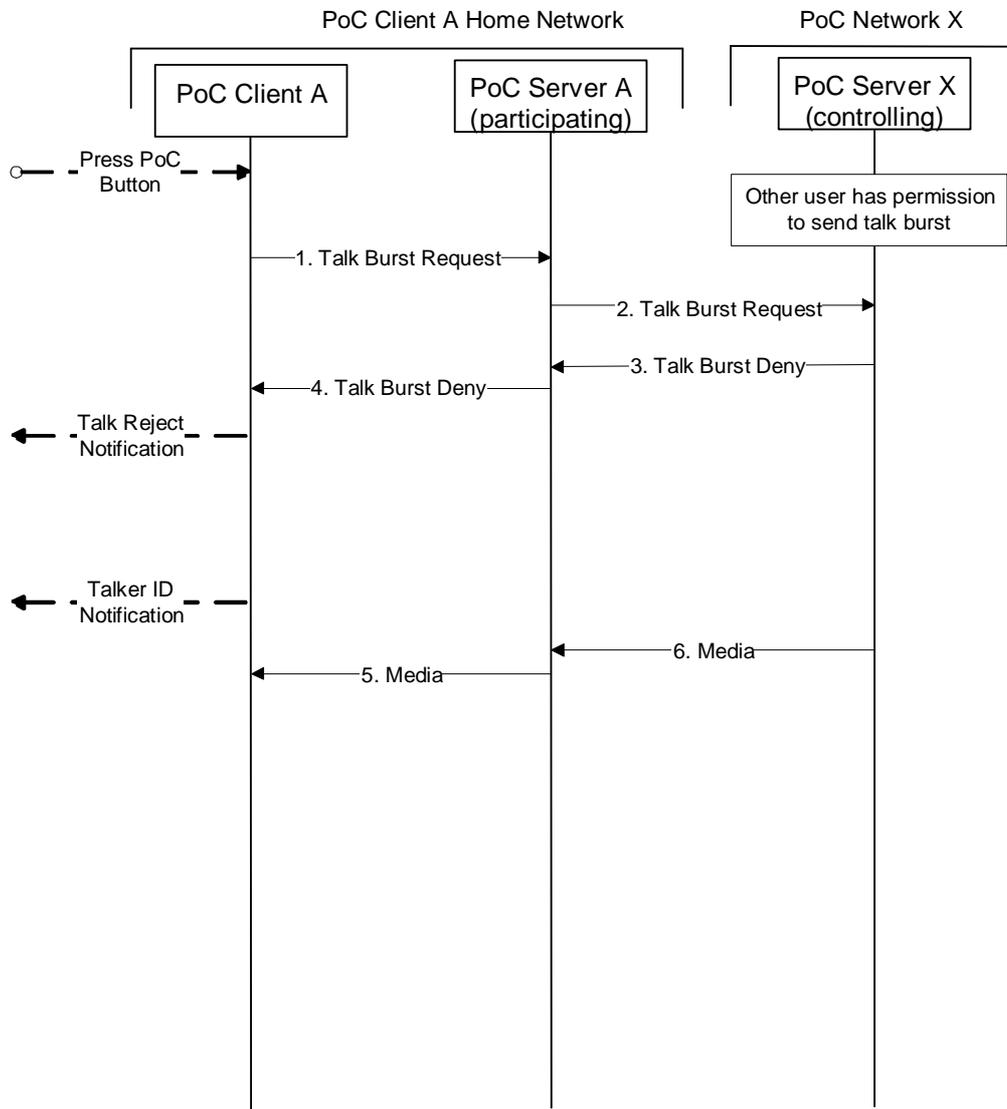
1. The PoC Client A sends a TBCP Talk Burst Request message towards the PoC Server X (controlling).
2. The PoC Server A (participating) modifies the IP address and port and sends the TBCP Talk Burst Request message to PoC Server X (controlling).

3. The PoC Server X (controlling) determines that the PoC Client A can be given permission to send a Talk Burst and sends a TBCP Talk Burst Granted message, including information about the stop talking timer, towards the PoC Client A.
4. The PoC Server A (participating) modifies the IP address and port and sends the TBCP Talk Burst Request message to the PoC Client A.
5. When the PoC Client A receives the TBCP Talk Burst Granted message, it provides a Talk Burst granted notification, including information about the stop talking timer, to the PoC User A. The PoC Client A then begins to send RTP Media packets towards the PoC Server X (controlling).
6. The PoC Server A (participating) modifies the IP address and port and forwards the RTP Media packets to the PoC Server X (controlling).

B.3.2 Talk Burst request when other PoC User has the permission to send a Talk Burst and queuing is not supported

This subclause describes the case when a PoC User request for permission to send a Talk Burst when another PoC User already has the permission and queuing is not supported.

Figure 23 "*TBCP Talk Burst Request message when other PoC User has the permission to send a Talk Burst*" shows the message flow for the scenario.



NOTE: The TBCP Talk Burst Deny message and the TBCP Talk Burst Taken message can be sent in the same IP packet.

Figure 23: TBCP Talk Burst Request message when other PoC User has the permission to send a Talk Burst

A PoC User A at a PoC Client A presses the PoC button.

A PoC Server A (participating) has inserted itself in the media stream and all TBCP messages and RTP Media packets will go thru the PoC Server A (participating).

The steps of the flow are as follows:

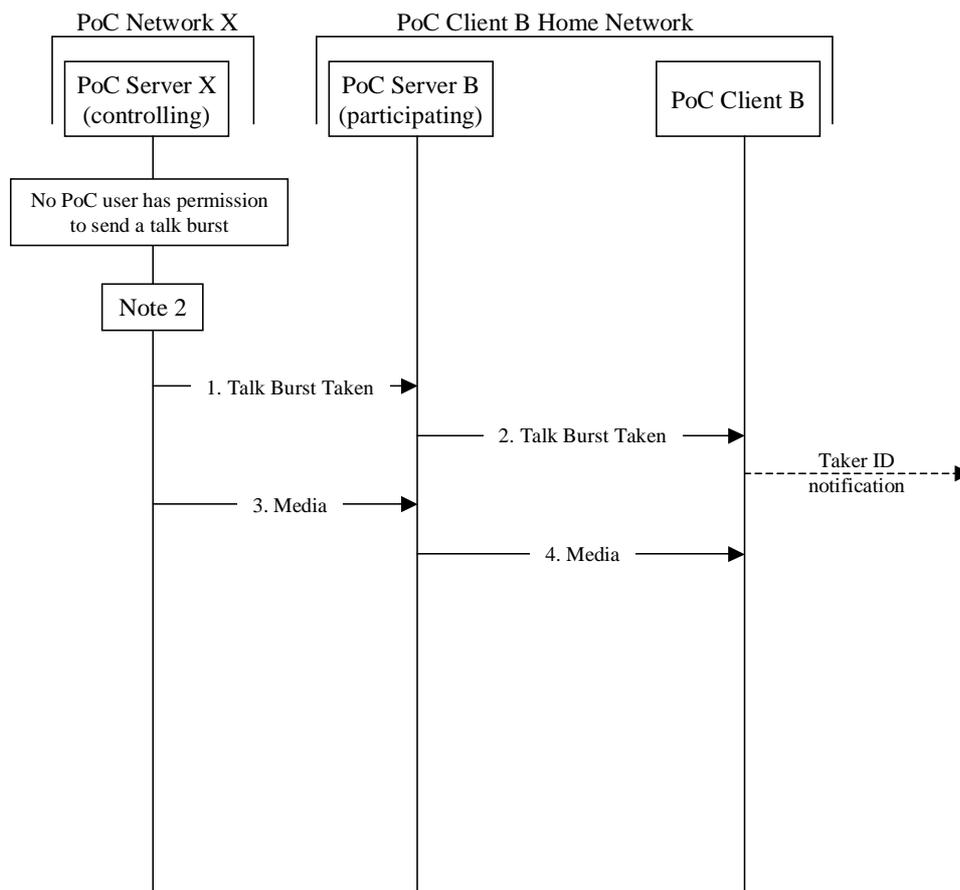
1. The PoC Client A sends a TBCP Talk Burst Request message towards a PoC Server X (controlling).

2. The PoC Server A (participating) modifies the IP address and port and sends the TBCP Talk Burst Request message to the PoC Server X (controlling).
3. The PoC Server X (controlling) determines that the PoC Client A cannot be given permission to send a Talk Burst, because another PoC Client currently has permission and sends a TBCP Talk Burst Deny message towards the PoC Client A. The message includes:
 - a. A Reason code (Another PoC User has permission) for the rejection.
4. The PoC Server A (participating) modifies the IP address and port and sends the TBCP Talk Burst Deny message to PoC Client A.
5. The PoC Server X (controlling) begins to transmit RTP Media packets towards PoC Client A.
6. The PoC Server A (participating) modifies the IP address and port and sends the RTP Media packets to PoC Client A. The PoC Client A plays the media to PoC User A.

B.3.3 Another PoC User request the permission to send a Talk Burst

This subclause shows an example of the case when another PoC Client is granted permission to send a Talk Burst.

Figure 24 “Another PoC User request the permission to send a Talk Burst” shows the message flow for the scenario.



NOTE 1: The PoC Server X (controlling) executes this procedure for all PoC Clients that will be listening.

NOTE 2: For the TBCP message flows for the granted PoC User see Figure 22 “Sending a Talk Burst request”.

Figure 24: Another PoC User request the permission to send a Talk Burst

This procedure starts when no PoC Client has the permission to send a Talk Burst. Prior to the start of the message flow in another PoC Client has sent a TBCP Talk Burst Request message to the PoC Server X (controlling) and it has granted that PoC Client permission to send a Talk Burst.

A PoC Server B (participating) has inserted itself in the media stream and all TBCP messages and RTP Media packet will go thru the PoC Server B (participating).

The steps of the flow are as follows:

1. The PoC Server X (controlling) sends a TBCP Talk Burst Taken message towards PoC Client B. The message includes:
 - a. The identity of the PoC User that currently has the permission to send the Talk Burst.
2. The PoC Server B (participating) modifies the IP address and port and sends the message to the PoC Client B. The PoC Client B presents the talker identity to the PoC User B.
3. The PoC Server X (controlling) begins to transmit RTP Media packet towards the PoC Client B.
4. The PoC Server B (participating) modifies the IP address and port of the RTP Media packet and sends it to PoC Client B. The PoC Client B plays media to the PoC User B.

B.4 Talk Burst revoke procedure

The T2 (Stop Talking) in the PoC Server performing the Controlling PoC Function is used to limit the time that a PoC Client is permitted to send a Talk Burst.

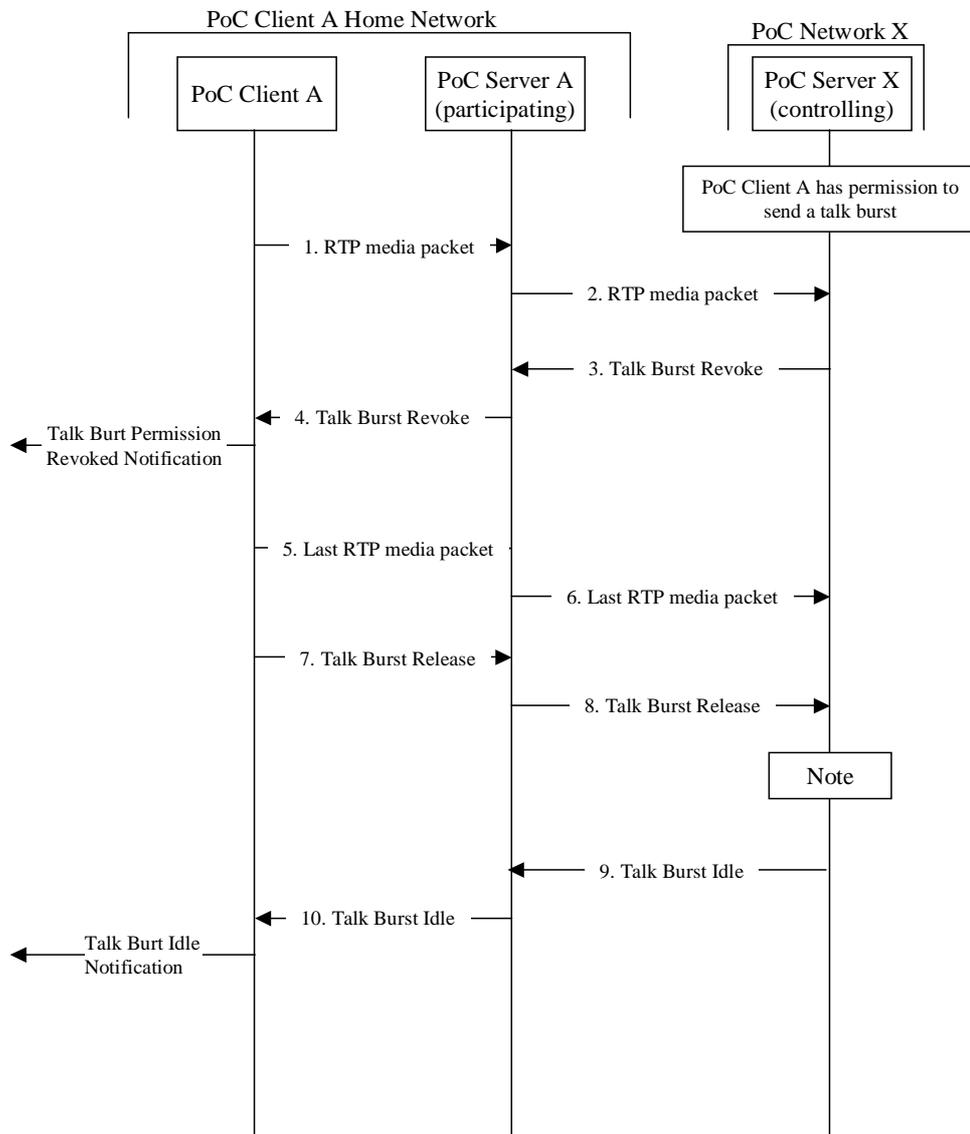
When T2 (Stop Talking) expires, the PoC Server performing the Controlling PoC Function sends a TBCP Talk Burst Revoke message to the PoC Client that is sending the Talk Burst and then starts the T3 (Stop Talking Grace) timer. This will allow the PoC Client time to gracefully complete the Talk Burst before the PoC Server performing the Controlling PoC Function stops forwarding the RTP Media packets and sends out a TBCP Talk Burst Idle message.

The message flow between the PoC Server performing the Controlling PoC Function and the listening PoC Clients is the same for the Talk Burst idle procedure and the Talk Burst revoke procedure.

B.4.1 User A receives notification that the talk burst permission is revoked

This subclause shows the desired scenario for the Talk Burst revoke procedure i.e. a normal Talk Burst release procedure occurs.

Figure 25 “*Talk Burst Revoke procedure in PoC Server performing the Controlling PoC Function*” shows the message flow for the scenario.



NOTE: For the TBCP message flow for PoC Users without permission to speak see Figure 21 “Talk Burst idle procedure”.

Figure 25: Talk Burst revoke procedure in PoC Server performing the Controlling PoC Function

The PoC Client A, with the permission to send a Talk Burst, is sending RTP Media packet when the timer T2 (Stop Talking) expires in the PoC Server (controlling).

A PoC Server A (participating) has inserted itself in the media stream and all TBCP messages and RTP Media packet will go thru the PoC Server A (participating).

The steps of the flow are as follows:

1. RTP Media packets are sent from the PoC Client A towards the PoC Server X (controlling).
2. The PoC Server A (participating) modifies the IP address and port of the RTP Media packets and sends them to the PoC Server X (controlling).
3. When the timer T2 (Stop Talking) expires in PoC Server X (controlling), the PoC Server X (controlling) sends a TBCP Talk Burst Revoke message towards the PoC Client A and starts the T3 (Stop Talking Grace) timer. The message includes:
 - a. A Reason code (Talk burst too long); and,
 - b. The value of the Retry-after timer.
4. The PoC Server A (participating) modifies the IP address and port and sends the TBCP Talk Burst Revoke message to PoC Client A.

The PoC Client A sends a Talk Burst revoke notification to the PoC User A.

The PoC Client starts the timer T12 (Retry After Timer), using the 'Retry-after timer' value contained in the TBCP Talk Burst Revoke message.

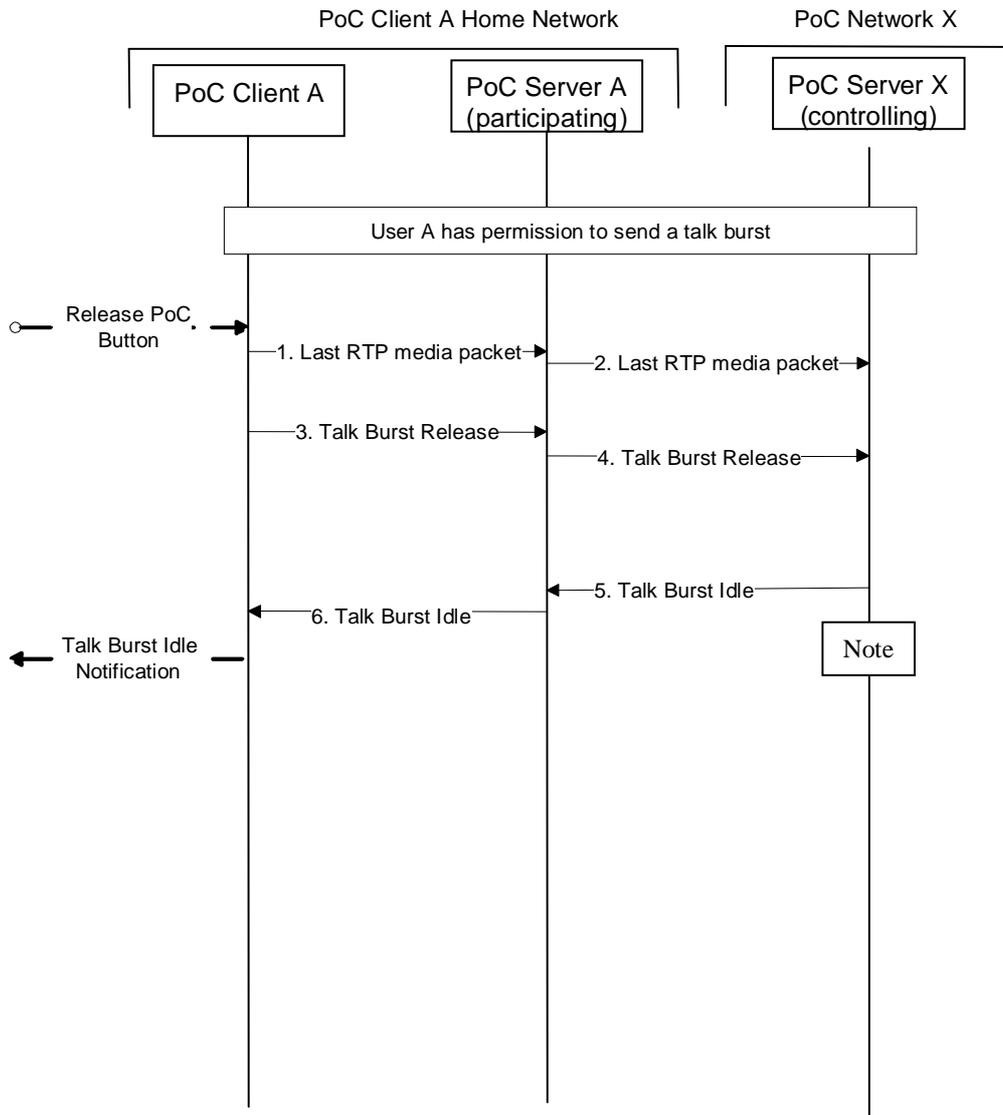
5. The last RTP Media packet is sent from the PoC Client A towards the PoC Server X (controlling).
6. The PoC Server A (participating) modifies the IP address and port of the last RTP Media packet and sends it to the PoC Server X (controlling).
7. The PoC Client A sends a TBCP Talk Burst Release message towards the PoC Server X (controlling) to inform it that the sending of the Talk Burst is completed. The message includes:
 - a. The sequence number of the last RTP packet.
8. The PoC Server A (participating) modifies the IP address and port and sends the TBCP Talk Burst Release message to the PoC Server X (controlling).
9. The PoC Server X (controlling) forwards the last RTP packet to all PoC Clients and sends TBCP Talk Burst Idle message to all PoC Clients in the PoC Session, including the PoC Client A.
10. The PoC Server A modifies the IP address and port and sends the TBCP Talk Burst Idle message to PoC Client A. The PoC Client A sends a Talk Burst idle notification to the PoC User A.

NOTE: Sent RTCP SR/RR packets are described in the subclause B.6 "*Quality feedback flows*".

B.5 Talk Burst release procedure

This subclause describes the normal case when a PoC User at a PoC Client, with the permission to send a Talk Burst, has finished speaking and releases the PoC button.

Figure 26 "*Talk Burst release procedure*" shows the message flow for the scenario.



NOTE: For the TBCP message flow for PoC Users without permission to speak see Figure 21 “TBCP Talk Burst idle procedure”.

Figure 26: Talk Burst release procedure

The PoC User A at the PoC Client A releases the PoC button.

The steps of the flow are as follows:

1. The PoC Client A sends the last RTP Media packet towards the PoC Server X (controlling).
2. The PoC Server A (participating) modifies the IP address and port and sends the last RTP Media packet to the PoC Server X (controlling).
3. After the last RTP packet has been sent, the PoC Client A sends a TBCP Talk Burst Release message towards the PoC Server X (controlling) to inform it that the Talk Burst is complete. The message includes:

- e. The sequence number of the last RTP Media packet.
- 4. The PoC Server A (participating) modifies the IP address and port and sends the TBCP Talk Burst Release message to PoC Server X (controlling).
- 5. After that the PoC Server X (controlling) has forwarded the last RTP Media packet to all PoC Clients, it sends a TBCP Talk Burst Idle message to all PoC Clients in the PoC Session, including the PoC Client A
- 6. The PoC Server A (participating) modifies the IP address and port and sends the TBCP Talk Burst Idle message to the PoC Client A. The PoC Client A sends a Talk Burst idle notification to the PoC User A.

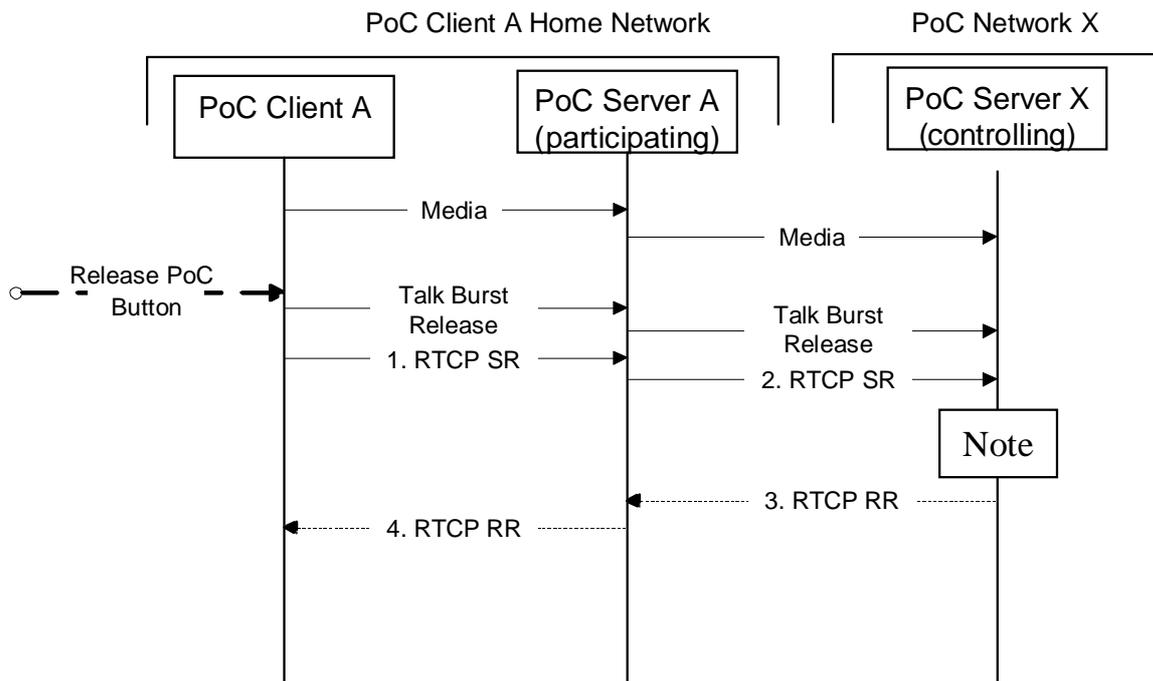
NOTE: Sent RTCP SR/RR packets are described in the subclause B.6 ‘Quality feedback flows’.

B.6 Quality feedback flows

This subclause describes the quality feedback exchange when a PoC User at a PoC Client, with the permission to send a Talk Burst, has finished speaking and releases the PoC button.

Quality feedback is an optional feature, but if it is supported, the PoC Clients and the PoC Servers exchange quality feedback reports.

Figure 27 “RTCP SR compound packet from the PoC Client that transmitted the most recent Talk Burst” and Figure 28 “RTCP RR compound packet from the receiving PoC Client” shows all messages possible for the scenario.



NOTE: For quality feed back message flows for PoC Clients receiving the Talk Burst see Figure 28 “RTCP RR compound packet from the receiving PoC Client”.

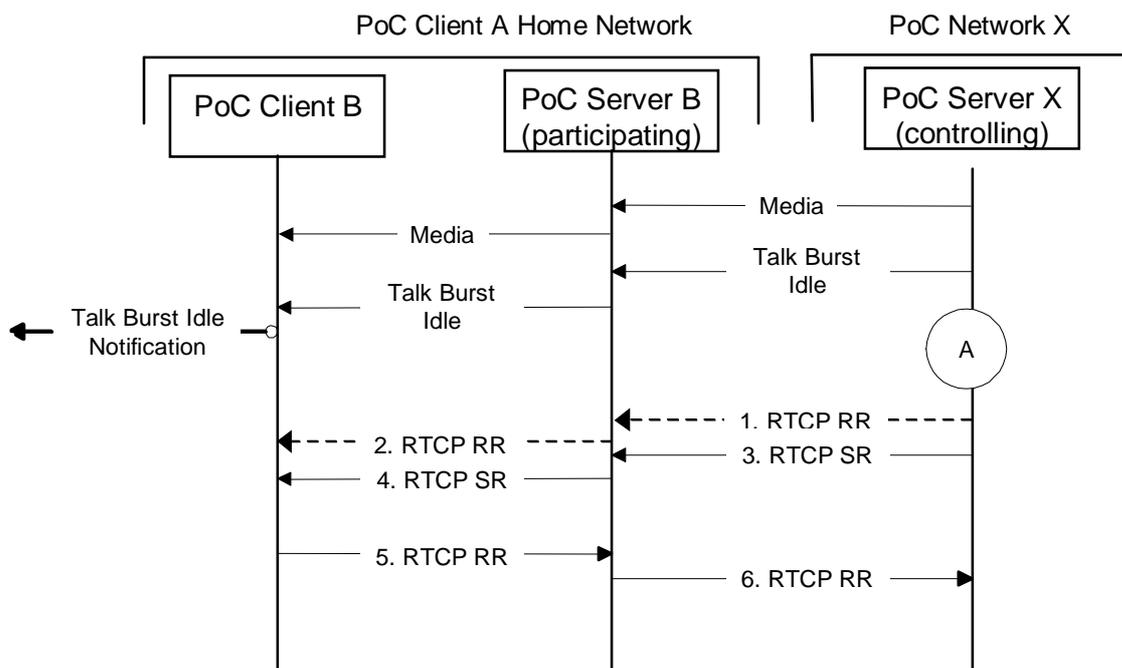
Figure 27: RTCP SR compound packet from the PoC Client that transmitted the most recent Talk Burst

PoC Client A supports quality feedback. The PoC Server X (controlling) support the transmission of RTCP RR compound packets.

PoC Client A sends a TBCP Talk Burst Release message towards the PoC Server X (controlling) to inform it that the Talk Burst is complete.

The steps of the flow are as follows:

1. PoC Client A compiles a sender report packet and sends the RTCP SR compound packet towards the PoC Server X (controlling).
2. PoC Server A (participating) modifies the IP address and port and sends the RTCP SR compound packet to PoC Server X (controlling). The PoC Server X (controlling) may be a monitor and thus uses the information in the sender report to keep statistics, estimate current quality of service for fault diagnosis.
3. The PoC Server X (controlling) may compile a receiver report packet and send the RTCP RR compound packet towards the PoC Client A.
4. If the PoC Server A (participating) receives a RTCP RR message, it modify the IP address and port and sends the RTCP RR compound packet to PoC Client A.



NOTE: For quality feed back message flows for PoC Clients sending the Talk Burst Figure 27 “RTCP SR compound packet from the PoC Client that transmitted the most recent Talk Burst”.

Figure 28: RTCP RR compound packet from the receiving PoC Client

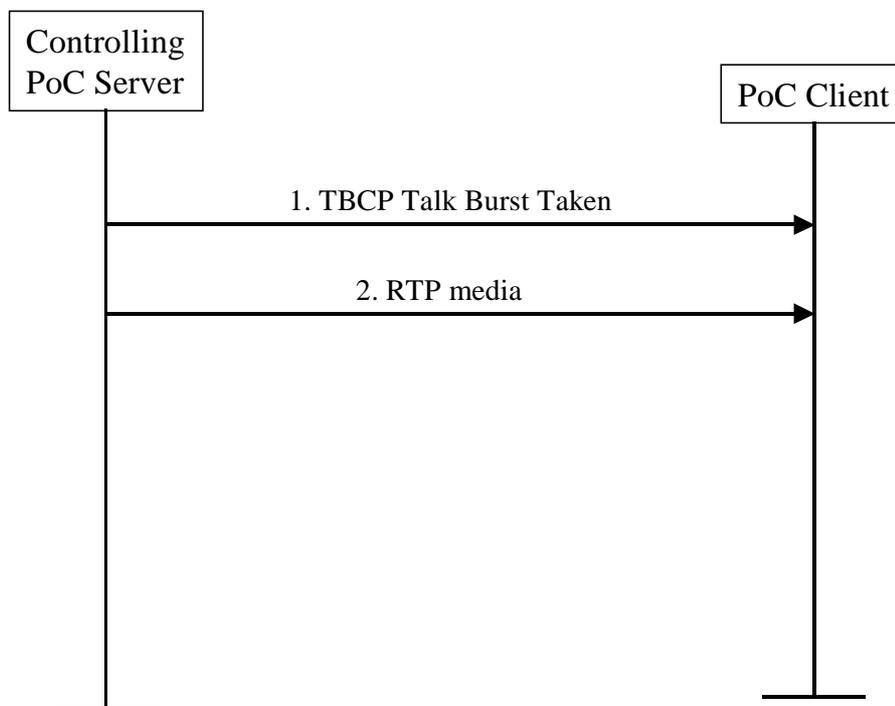
1. The PoC Server X (controlling) may compile a receiver report packet and send the RTCP RR compound packet towards the PoC Client B.
2. PoC Server B (participating) modifies the IP address and port and sends the RTCP RR compound packet to PoC Client B. The PoC Server B (participating) may be a monitor and thus uses the information for charging.

3. The PoC Server X (controlling) receives a RTCP SR compound packet and modifies the IP address and port and sends the RTCP RR compound packet towards PoC Client B.
4. PoC Server B (participating) modifies the IP address and port and sends the RTCP SR compound packet to PoC Client B.
5. PoC Client B compiles a receiver report packet and sends the RTCP RR compound packet towards the PoC Server X (controlling) as soon as PoC Client B gets an indication that the received Talk Burst has ended.
6. PoC Server B (participating) modifies the IP address and port and sends the RTCP RR compound packet to PoC Server X (controlling). The PoC Server X (controlling) may be a monitor and thus uses the information in the receiver report to keep statistics, estimate current quality of service for fault diagnosis or may be used for charging.

B.7 Talker Identification flow

This subclause contains an example flow that describes the Talker Identification procedure.

Figure 29 “Identifying talking Participant in the PoC Client” shows the message flow for the scenario.



NOTE: The signaling flow is repeated for each Participant in the PoC Session.

Figure 29: Identifying talking Participant in the PoC Client

1. The PoC Server sends a TBCP Talk Burst Taken message.

The TBCP Talk Burst Taken message includes:

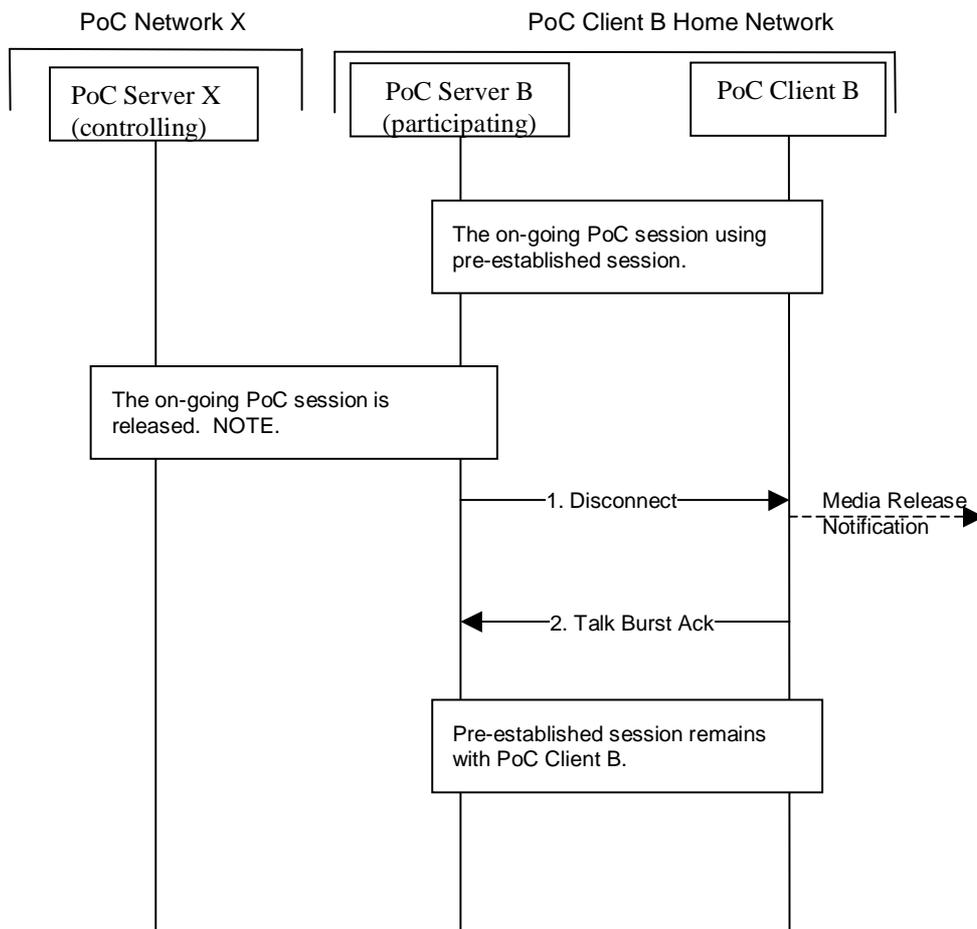
- a. The PoC Address (in the case the sender don't want to be anonymous); and,
- b. The Nick Name of the Participant that has been permitted to send a Talk Burst.

2. If the PoC Client has no mapping between the received PoC Address, the Nick Name and the SSRC identifier of the received RTP Media packet, or the PoC Client discover that the SSRC identifier of the PoC Client that transmits RTP Media packet has changed, the PoC Client can store the mapping between the received PoC Address, Nick Name and the SSRC identifier.

B.8 PoC Session release in the Pre-established Session case

This subclause shows an example of the scenario when a PoC Server releases the PoC media Session, but maintains the Pre-established Session.

Figure 30 “PoC Session release on the Pre-established Session case” shows the message flow for the scenario.



NOTE: While only 1 terminating PoC Client B is shown in the figure, this flow applies towards all terminating PoC Clients with a Pre-established Session invited to a PoC Session.

Figure 30: PoC Session release on the Pre-established Session case

A PoC Server B (participating) controls the Pre-established Session and all TBCP messages and RTP media packets will go thru the PoC Server B (participating).

The steps of the flow are as follows:

1. The PoC Server B (participating) sends a TBCP Disconnect message to PoC Client B triggered by the SIP BYE request (from the PoC Server X). The PoC Client B presents the Media Session release to PoC User B.
2. The PoC Client B sends a TBCP Talk Burst Acknowledgement message to PoC Server B (participating) to acknowledge the receipt of the TBCP Disconnect message.

Appendix C. Change History

(Informative)

C.1 Approved version history

Reference	Date	Description
OMA-TS-PoC-UserPlane-V1_0-20060609-A	09 Jun 2006	Status changed to Approved by TP: OMA-TP-2006-0201R02-ERP_PoCv1_0_for_Final_Approval
OMA-TS-PoC_UserPlane-V1_0_1-20061128-A	28 Nov 2006	Includes agreed CRs: OMA-PoC-POCv1-2006-0115 OMA-PoC-POCv1-2006-0125 OMA-PoC-POCv1-2006-0130R01 OMA-PoC-POCv1-2006-0146 OMA-PoC-POCv1-2006-0150 OMA-PoC-POCv1-2006-0156 OMA-PoC-POCv1-2006-0157
OMA-TS-PoC_UserPlane-V1_0_2-20070905-A	05 Sep 2007	Includes CRs: OMA-POC-POCv1-2006-0179 OMA-POC-POCv1-2007-0007 OMA-POC-POCv1-2007-0012 OMA-POC-POCv1-2007-0013R01 OMA-POC-POCv1-2007-0014 OMA-POC-POCv1-2007-0016 OMA-POC-POCv1-2007-0022 OMA-POC-POCv1-2007-0027 OMA-POC-POCv1-2007-0042 OMA-POC-POCv1-2007-0043 OMA-POC-POCv1-2007-0050 OMA-POC-POCv1-2007-0058R04 OMA-POC-POCv1-2007-0059R02 OMA-POC-POCv1-2007-0070R01 OMA-POC-POCv1-2007-0072R01 OMA-POC-POCv1-2007-0074 Editorial changes to References section. Editorial clean-up of styles and formatting.
OMA-TS-PoC_UserPlane-V1_0_3-20090720-D	20 Jul 2009	Includes agreed CR: OMA-POC-POCv1-2008-0013R02 Editorial clean-up of section 2
OMA-TS-PoC_UserPlane-V1_0_3-20090922-A	22 Sep 2009	Notified to TP: OMA-TP-2009-0396R01-INP_PoCv1_0_3_for_notification

Appendix D. RTP Session description parameters (Informative)

When the PoC Client uses the AMR-NB or AMR-WB RTP payload format, the PoC Client uses either the bandwidth-efficient mode or the octet-aligned mode of the IETF AMR-NB and AMR-WB RTP payload format. For interoperability, the PoC Client should support both octet-aligned mode and bandwidth-efficient mode for single channel as recommended in section 4.5 “*Implementation Considerations*” of [RFC3267].

For OMA PoC Service, the OMA PoC Client that supports 3GPP AMR speech codec, the PoC Client can construct an SDP answer for a payload type in an SDP answer from a payload type in an SDP offer with the following parameters of [RFC3267]. :

- Octet-align=1 or no octet-align parameter;
- Maxptime: 400;
- crc=0 or no crc parameter;
- robust-sorting=0 (or no robust-sorting parameter);
- no interleaving parameter, and
- channels=1 or no channels parameter.