Presentation of Specification to TSG or WG

Presentation to:	**TSG SA Meeting #24**
Document for presentation:	**TR 23.979, 3GPP enablers for OMA PoC Services**
Version	**1.0.0**
Presented for:	**Information**

Abstract of document:

TR 23.979 studies the architectural requirements in order to enable services like PoC over 3GPP systems. The report looks into aspects of using 3GPP PS domain and radio access technologies (GERAN, UTRAN) for bearer services and IMS for reachability and connectivity for applications like PoC.

TSG SA WG2 would like to present TR 23.979 to SA for information

Changes since last presentation to SA

None

Outstanding Issues:

Progress the work based on evaluation of stable requirement and architectural documents from OMA.

Contentious Issues:

None identified.

3GPP TR 23.979 V1.0.0 (2004-06)

Technical Report

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Contents

Foreword

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

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

Version x.y.z

where:

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

Introduction

Advanced interactive conferencing applications like Push to talk over Cellular (PoC) service enablers are being developed in OMA. It is expected that some enhancements of the 3GPP specifications will be needed in order to use IMS & its capabilities as a base for the PoC services.

1 Scope

The present document studies the architectural requirements in order to enable services like PoC over 3GPP systems. The report looks into aspects of using 3GPP PS domain and radio access technologies (GERAN, UTRAN) for bearer services and IMS for reachability and connectivity for applications like PoC.

2 References

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

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

[1] 3GPP TR 41.001: "GSM Release specifications".

[2] 3GPP TS 21.905: "Vocabulary for 3GPP Specifications".

[3] 3GPP TS 23.002: "Network architecture".

[4] 3GPP TS 23.228: "IP Multimedia (IM) Subsystem - Stage 2.

[5] 3GPP TS 23.141 "Presence Service; Stage 2"

[6] OMA PoC Specification, AD.

Editor's Note: This reference needs to be detailed, once an official reference is available.

[7] OMA PoC Specification, RD.

Editor's Note: This reference needs to be detailed, once an official reference is available.

[8] 3GPP TS 24.229: "IP Multimedia Call Control Protocol based on Session Initiation Protocol (SIP) and Session Description Protocol; Stage 3"

[9]. 3GPP TS 23.207: "End-to-end Quality of Service (QoS) concept and architecture"

[10] 3GPP TS 23.107: "Quality of Service (QoS) concept and architecture"

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TS 21.905 [2] and the following apply.

PoC session: This is an established connection between PoC users where the users can communicate using voice one at a time.

Right to Speak: In the PoC session establishment, the originating subscriber receives within a pre-determined time, an indication before he can speak, this is known as "Right to Speak (RtS)".

3.2 Symbols

For the purposes of the present document, the following symbols apply:

<symbol> <Explanation>

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

CSCF	Call Session Control Function
GLMS	Group and List Management Server
PoC	Push to talk over Cellular
I-CSCF	Interrogating-CSCF
IMS	IP Multimedia Subsystem
IP	Internet Protocol
P-CSCF	Proxy-CSCF
S-CSCF	Serving-CSCF
SBLP	Service Based Local Policy
UE	User Equipment

4 Architectural Requirements

4.1 General Requirements

The 3GPP system shall provide the capabilities to support the PoC service architecture as specified in OMA.

It is assumed that the PoC architecture makes use of the following IMS capabilities in the 3GPP system, which are described in TS 23.228 [4] and TS 23.141 [5]:

- Registration;
- IMS routing capabilities, including discovery and address resolution;
- IMS security including authentication and authorization;
- IMS charging;
- SIP compression;
- IMS group management;
- Public service identities;
- Presence Service.

Commonality and differences with IMS conferencing require further study.

4.2 PoC specific requirements relevant to 3GPP

In order for 3GPP system to support services like PoC, certain PoC requirements will require additional analysis within 3GPP in order to determine that all necessary architectural support is in place via capabilities provided by the GERAN/UTRAN, GPRS and IMS.

This section captures the possible relevant requirements for the purposes of additional evaluation to ensure proper support is in place within 3GPP infrastructure:

- The PoC service entity may provide the originating user with an early indication to start to speak even before invited users accept the call.
- If the above condition is applied then the initiating PoC subscriber shall receive an indication if no participants receive the talk burst.
- The originating subscriber receives 'right-to-speak' (RtS) indication after certain time depending on the answer mode setting of the target PoC subscriber.
- Depending on the setting by the PoC subscriber, the right-to-speak indication can be given to the originating PoC subscriber before the target PoC subscriber is reached or at least one of the target PoC subscribers has to accept the PoC session before the 'right-to-speak' indication is given to the originating PoC subscriber.
- During the PoC session, the PoC service entity provides 'right-to-speak' indication to a PoC subscriber requesting to speak.
- In case of a chat group session, the communication between chat group participants shall be possible at the time the PoC chat group session is established, that is at least one participant has joined the chat session.
- The timing requirements for capabilities such as RtS shall be taken into account within 3GPP as specified in OMA RD [6].
- Charging architecture requirements shall be taken into account as specified in OMA PoC AD.
- The user equipment, depending on its capabilities, shall support notification of incoming CS call during an ongoing PoC session as well as a notification of an incoming PoC session set up during an ongoing CS call.

Editor's note: Further requirements are expected to be included to the list above as work progresses.

5 Architectural Concept

5.1 General overview

Editor's Note: The purpose of this sub-clause is to describe the general overview of the PoC service architecture principles based on IMS and functions supported by PoC services. Where necessary, a mapping from OMA terminology and reference points to 3GPP terminology and reference points will be given.

PoC service is introduced as an application within the frame of the IP Multimedia Subsystem (IMS). Figure 5.1 below illustrates how the PoC service elements fit into the IMS architecture.

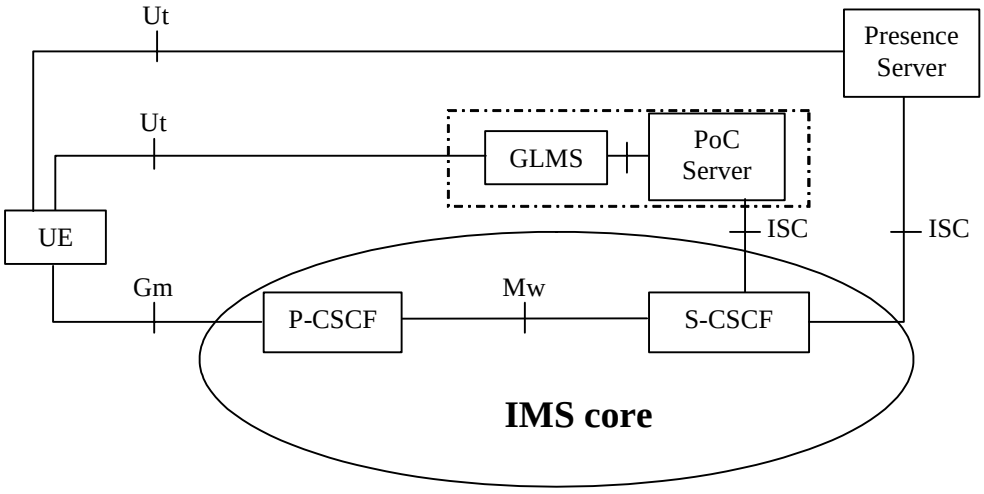

Figure 5-1. PoC service elements in the IMS architecture

Note: The I-CSCF is not shown in Figure 5-1 for the sake of simplicity.

The OMA PoC architecture specification [6] leverages IMS as the underlying SIP-based IP-core network. To understand the details of how IMS capabilities relate to the overall PoC architecture, there is a need to map the reference points defined in the OMA PoC specification [6], and the reference points defined in 3GPP TS 23.002 [3] and 3GPP TS 23.228 [4].

The PoC server implementing the application level network functionality for the PoC service is essentially seen as an Application Server from the IMS perspective. Consequently, communications between the IMS core and the PoC server utilize the ISC interface defined in 3GPP TS 23.228 [4].

As defined by [6], the Group and List Management Server (GLMS) is used by the PoC users to manage groups and lists (e.g. contact and access lists) that are needed for the PoC service. In the IMS architecture, the Ut interface provides these functions, hence communications between the GLMS and the UE utilize the Ut interface.

As defined by [6], a Presence Server may provide availability information about PoC users to other PoC users. The3GPP Presence architecture and the Presence Server are defined in TS 23.141 [5].

5.2 Architecture assumptions

Editor's note: The purpose of this sub-clause is to describe the assumptions that can be made from the architecture and 3GPP IMS (e.g. use of concepts for Presence, ISC, security, charging etc.).

5.2.1 Charging architecture aspects

3GPP TS 32.240 specifies the overall charging architecture for the 3GPP system, including the IMS charging architecture. 3GPP TS 32.260 and 3GPP TS 32.299 specify the IMS charging details, including the S-CSCF's interfaces towards the charging nodes used for session charging.

Based on the IMS charging architecture described in these TSs, and the mapping of IMS and OMA PoC architectures described in Section 5.1, the architecture described in Figure 5-2 below shows the charging interfaces around the PoC server:

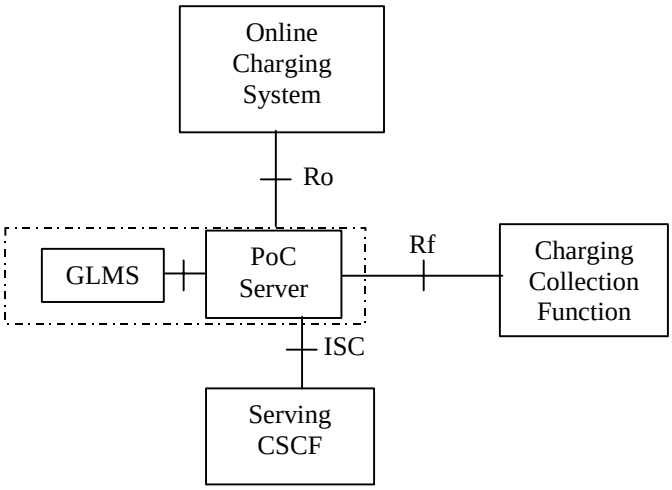

Figure 5-2 - Architecture for PoC charging

The Charging Collection Function (CCF) is used for offline charging. It shall be possible for the PoC server to send offline accounting information about PoC-service events to the CCF using the mechanisms described for the Rf interface described in 3GPP TS 32.260. Possible additional accounting information to cover PoC charging requirements shall be fulfilled by extending the Rf interface, if needed.

The address of the CCF to be used by the PoC server for the PoC session is distributed to the PoC server in SIP signaling, as described in 3GPP TS 24.229 [8].

The Online Charging System is used for online charging PoC service-related events. It shall be possible for the PoC server to perform credit control interactions as per the mechanisms defined for the Ro interface. The address of the OCS (same as the address of the ECF) to be used by the PoC server for the PoC session is distributed to the PoC server in SIP signaling.

5.3 Signalling plane impacts

5.3.1 General aspects for PoC signalling

As described in OMA-AD_PoC [6] architecture document, there are two mechanisms for session establishment signalling supported. In both scenarios, the session is first established between the PoC user (originating or terminating) and the PoC server serving the user and then the other party is invited to the session. User preferences on how the handled PoC sessions may require special user level interactions are described in the OMA_RD PoC [7] and OMA_AD_PoC [6], but the general principle of the session flows is not affected by such interactions.

The mechanisms for session set-up as defined by OMA are described in the following sub-clauses in more detail, i.e. those would require changes if changes are performed in the OMA specifications. These procedures have the following functional description of behaviour:

1. On-Demand Session:

   The On Demand session provides a mechanism to negotiate media parameters such as IP address, ports and codecs, which are used for sending the media and floor control packets between the PoC Client and the home PoC Server when the user wants to actually establish a PoC session. This mechanism allows the PoC Client to invite, via PoC server(s), other PoC clients or receive PoC sessions by using the full session establishment procedure each time the user wants to establish/receive/join a PoC session. Media parameters may be negotiated again in this mechanism.

2. Pre-established Session:

   The pre-established session provides a mechanism to negotiate media parameters such as IP address, ports and codecs, which are used for sending the media and floor control packets between the PoC Client and the home PoC Server before establishing the PoC session. This mechanism allows the PoC Client to invite other PoC clients or receive PoC sessions without negotiating again the media parameters. After the pre-established session has been set up (once the PoC user has registered), the PoC Client is able to activate media bearer whenever needed:

   - immediately after the general PoC session pre-establishment procedure or;
   - when the actual SIP signalling for the PoC media session establishment is initiated.

5.3.2 On-demand Session

A simplified high-level PoC session flow is shown below when using GPRS bearer. The flow shows a general case and relation of PDP context with PoC/IMS session and does not show any special order or requirement of whether separate PDP context is required for the media or not.

Editor's Note: The figure below will need to be updated to capture interconnecting PoC Application Servers.

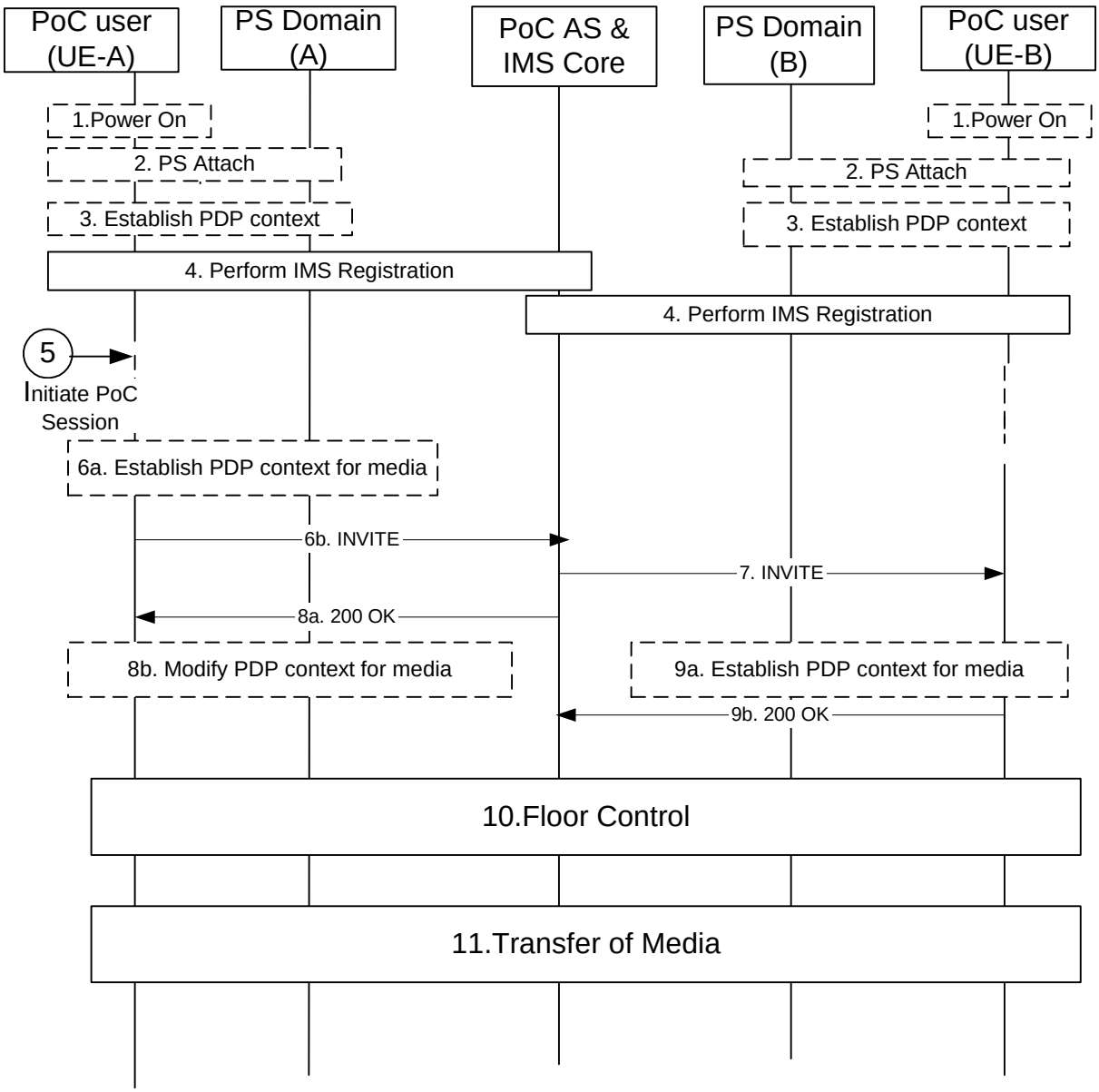

Figure 5.3.1 Simplified PoC communication based on '*on demand*' signalling

The simplified steps for establishing PoC communication based upon on demand signalling are:

1. Each terminal is powered on.
   Note: This may occur at different times for each terminal.

2. Each terminal performs PS attach in order to authenticate to the PS domain.
   Note: This may occur at different times for each terminal

3. Each terminal establishes the PDP context to establish any kind of communication.
   Note: This may occur at different times for each terminal. The use of this PDP context bearer can be realised in different ways depending on how the terminal, network and overall system is configured to operate. Detailed implications of such scenarios will be further analysed in subsection 5.4 and section 6.

4. Each terminal performs the IMS registration
   Note: This may occur at different times for each terminal.

5. User A presses the push-to-talk indication/button on the terminal A to indicate that he wishes to communicate to the user at terminal B.

Note that step 5 can occur anytime after step 4 has been performed, there is no timing correlation between these steps once steps 1-4 has been performed.

6. In case Terminal A does not have a PDP Context active for the media or floor control exchange, it establishes a PDP Context (6a), and creates a SIP session for the PoC communication by sending the SIP INVITE into the IMS (6b). The INVITE request contains the PoC service indication; the S-CSCF identifies that this service indication matches ISC filtering information and routes the session establishment request to the PoC AS.

   It is FFS whether the QoS of the pre-established PDP context is allowed to have a higher QoS than best effort.

In case Service Based Local Policy is applied in Terminal A's network, PDF(A) generates an authorization token for the session, and P-CSCF(A) inserts and delivers it to the terminal in the first available reliable SIP response (in this case the 200OK). In this case, the terminal inserts the authorization token in a PDP Context modification for the media depicted in step 8b. Note that the establishment of PDP context for media is optional, depending on the configuration of the IM/PoC application. Details of the analysis will be described in subsection 5.4 and section 6.

7. As this is an "early media flow", the PoC AS (after determining that the PoC communication should be completed), together with the IMS, forwards the invite to the terminating terminal for the PoC communication.

   In case Service Based Local Policy is applied in Terminal B's network, PDF (B) generates an authorization token for the session, and P-CSCF(B) inserts and delivers it to the terminal in the INVITE request.

   The PoC AS, together with the IMS, complete the originating session by returning the 200 OK to terminal A.

8-9. After receiving the INVITE (7), terminal B accepts the session by returning 200 OK and establishes the PDP context for the media. Depending on the terminal setting (automatic answer mode or manual answer mode, the PDP context may be established in different order).

   In case Service Based Local Policy is applied in Terminal B's network, the terminal inserts the authorization token received in the INVITE request into the PDP Context activation request.

10. The PoC AS performs the floor control, informing terminal A that he has the floor, and informing terminal B of whom has the floor.

11. The media is transferred from Terminal A to Terminal B.

5.3.3 Pre-established Session

A simplified high-level PoC session flow is shown below when using GPRS bearer. The flow shows a general case and relation of PDP context with IMS session and does not show any special order or requirement of whether separate PDP context is required for the media or not. This flow assumes (though it is not required for both sides to use the same mechanism) that both originating and terminating PoC user uses the Pre-established session mechanism.

Editor's Note: The figure below will need to be updated to capture interconnecting PoC Application Servers.

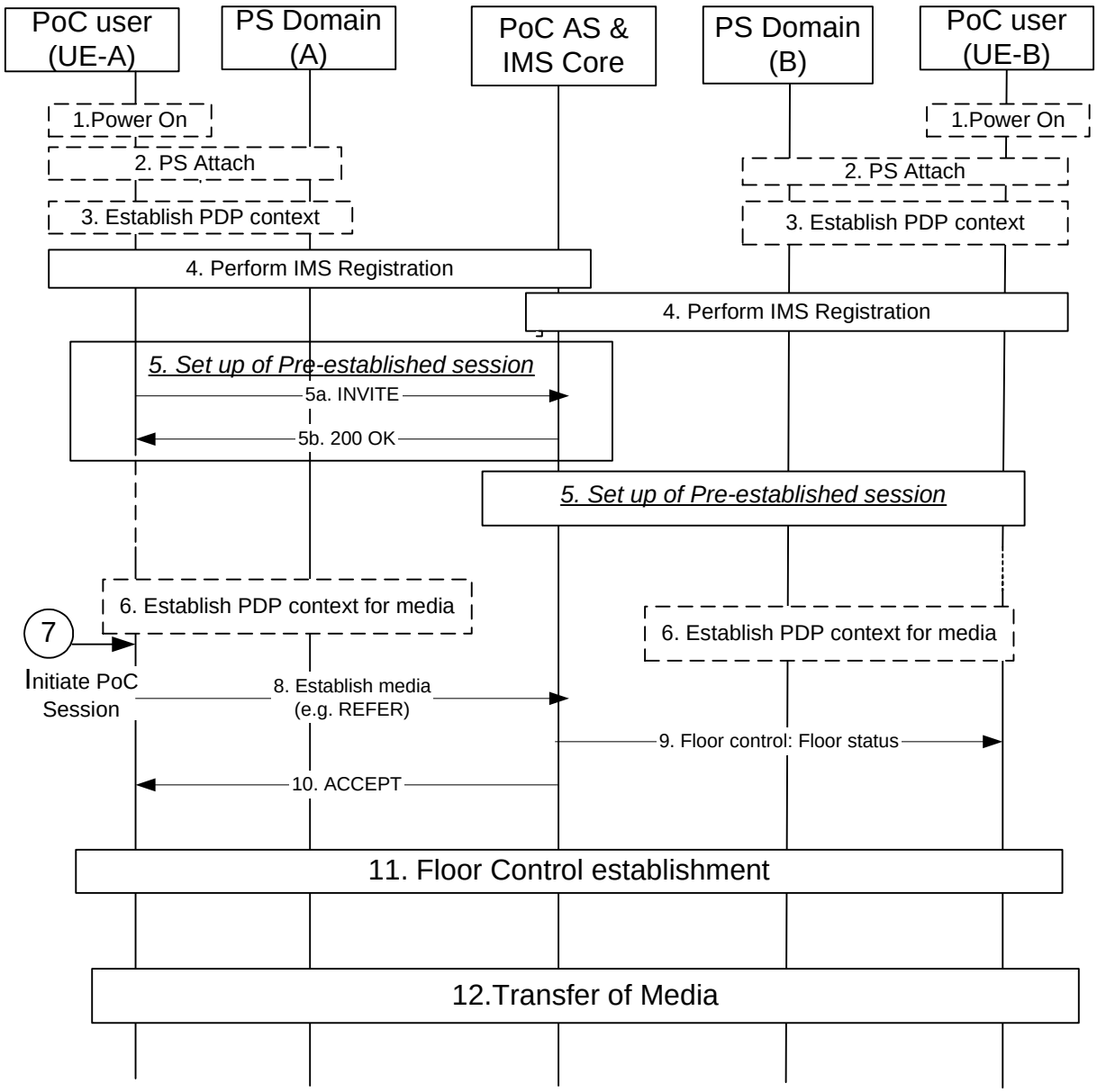

Figure 5.3.2 Simplified PoC communication based on *pre-established session* signalling

The simplified steps for establishing PoC communication based upon on demand signalling are:

1. Each terminal is powered on.
   Note: This may occur at different times for each terminal.

2. Each terminal performs PS attach in order to authenticate to the PS domain.
   Note: This may occur at different times for each terminal.

3. Each terminal establishes a PDP context.
   Note: This may occur at different times for each terminal. The use of this PDP context bearer can be realised in different ways depending on how the terminal, network and overall system is configured to operate. Detailed implications of such scenarios will be further analysed in subsection 5.4 and section 6.

4. Each terminal performs the IMS registration
   Note: This may occur at different times for each terminal.

5. Each terminal establishes the pre-established session for PoC communication towards the PoC AS (e.g. by using a dedicated PSI). The INVITE request contains the PoC service indication; the S-CSCF identifies that this service indication matches ISC filtering information and routes the session establishment request to the PoC AS.

In case Service Based Local Policy is applied in the terminal's IMS network, the authorization token will be generated by the PDF, inserted and delivered by the P-CSCF to the terminal upon set-up of the pre-established session (in the 200OK response).

Note: This pre-established session set-up may occur at different times for each terminal. Once the session relationship is established, it remains as long as the user wishes to remain connected to the PoC server. Implications of such long established session and its relationship with other IMS functions will require further study.

6. After establishing the pre session for PoC communication, each terminal may establish the PDP context for media depending on the scenario supported where media transfer requires separate PDP context.

   In case Service Based Local Policy is applied, the terminal includes the authorization token it has received at step 5 into the PDP Context activation/modification request.

Editor's Note: The time that Step 6 takes place (immediately after step 5 or after step 7) may need to be determined based on the required QoS Traffic Class and is FFS. The possibility to use an interactive traffic class for the initially established PDP context immediately after step 5 and then modify the PDP context for a higher QoS traffic class after step 7 is FFS.

7. User A presses the push-to-talk indication/button on the terminal A to indicate that he wishes to communicate to the user at terminal B.

8. Terminal A sends, for example, in a SIP REFER message to the PoC AS via the IMS, containing the address of the terminating user.

9. The PoC AS uses the floor control in order to inform the terminating terminal that a terminating PoC communication is incoming.

Editor's note: It is FFS how the floor control request can be transferred to the terminal if the terminating terminal is using pre-established session and does not have a suitable PDP Context active for the flow control request to be transferred.

10. The PoC AS acknowledges the REFER messages.

11. The PoC AS completes the floor control to the originating terminal to inform the terminal that it has the floor.

12. The media is transferred from Terminal A to Terminal B.

5.4 User plane impacts

Editor's Note: The purpose of this sub-clause is to describe the user plane implications of the PoC service architecture principles based on UTRAN/GERAN and PS domain. This section will also include aspects such as PDP context aspects, codec, QoS aspects from RAN etc.

5.4.1 General

The deployment of PoC services over IMS requires some analysis regarding the general IMS as well as the radio, GPRS and terminals. The available QoS and use of specific QoS, codecs etc. may also require analysis or require some guidelines to be provided by 3GPP towards PoC service deployment.

This section provides the background material from which the architecture analysis work can draw the necessary conclusions to be captured in section 6.

Editor's note: The following subsections are work in progress.

5.4.2 GPRS interactions in relation to PoC

5.4.2.1 General

It is assumed that additional PDP contexts (within a single APN) to separate signalling and media traffic within IMS is required only when:

- the QoS need to be different for signalling and media traffic,
- and/or restricted handling of the signalling traffic is required (due to charging (if FBC is not used), policy, policing etc.),
- and/or restricted handling of media traffic is required (due to charging, Service Based Local Policy, policing etc.),
- and/or other GPRS traffic can not use the same PDP context as IMS/PoC.

It is assumed that any of the following are valid GPRS/PDP contexts usage option for any IMS service, i.e. the options also apply for PoC. However, it is not only up to the PoC client to chose any of the options below as the valid options depends on possible restrictions, e.g. whether the GGSN apply restrictions on the PDP context used for IMS signalling as specified in 3GPP TS 23.228[4].

1. A Single PDP context is used for both IMS signalling and media traffic.
2. A separate PDP context for media traffic is required, but IMS signalling may share a general purpose PDP context with other GPRS traffic,
3. A separate PDP context is required for IMS signalling traffic, but the media traffic can share a PDP context with other general purpose PDP Context such as IMS session based messaging as described in 23.228[4],
4. Separate PDP contexts required for IMS signalling, all media share a single PDP context and other GPRS traffic use separate PDP context,
5. Separate PDP contexts required for IMS signalling, all media such as audio, text etc require separate PDP context and other GPRS traffic use separate PDP context,

How such combinations interact with PoC session establishment mechanism need further analysis. Depending on the mechanism used (on-demand and pre-established), whether existing PDP context can be reused or not, how floor control messages should be treated (as user plane traffic or signalling traffic or both) and whether SBLP/Go function is in use or not, the sessions flows may need to be further verified.

The following subsections describe possible combinations of GPRS and IMS using both mechanisms:

5.4.2.2 QoS traffic class considerations

OMA POC AD [6] recommends that when different PDP contexts are used for IMS signalling and media traffic the OMA PoC Clients should separately utilize the QoS traffic class that is best suitable for signalling (e.g., Interactive traffic class) and the QoS traffic class that is best suitable for the media traffic (e.g. Streaming or Conversational traffic classes).

NOTE: The definitions of the QoS traffic classes used are described in TS 23.107 [10].

According to the OMA POC AD [6], when a single PDP context is used for both IMS Signaling and media traffic the PoC Client should utilize the QoS traffic class that is determined to be the best available considering the overall needs of the PoC Service (e.g., Interactive traffic class).

Editor's Note: Implementation of the usage of certain traffic classes is FFS. It needs to be clarified what OMA means by "the overall needs of the PoC Service" in the paragraph above

5.4.2.3 PDP context and On-demand session mechanism

Editor's note: this subclause will analyze further the interactions between PDP context/GPRS and IMS in case of On-demand session mechanism is in use.

5.4.2.4 PDP context and Pre-established session mechanism

Editor's note: this subclause will analyze further the interactions between PDP context/GPRS and IMS in case of Pre-established session mechanism is in use.

5.4.3 PoC and SBLP/Go functions

Editor's note: The following subclause will provide analysis of various options that need further study and development within 3GPP. The information below is work in progress.

The signaling procedures being studied within OMA for PoC communication are optimized for session establishment time. While it is reasonable to expect that PoC will be deployed in networks where the Go interface & SBLP is employed, it is not reasonable to expect that the end-user's experience, in regard to the PoC communication establishment time, is impacted depending on whether or not the Go interface is utilized.

The procedures for supporting the Go interface in Release 5 require the use of the pre-conditions SIP signaling, which could be considered too heavy for the service scenario where the resources required are already known when the service is invoked.

There are a few options that 3GPP could explore to ensure that end-user experience is not degraded in networks where the Go interface is employed. However, it is still open whether OMA will make use of the SBLP/Go and OMA may avoid the usage of SBLP/Go if it implies that OMA delay requirements will not be met.

3GPP are also studying means to add flexibility to the system regarding the usage of SBLP/Go interface. The main motivation for this flexibility is session based messaging, however, PoC may also benefit from this.

For more information on SBLP/Go functions, see 3GPP TS 23.228 [4] and 3GPP TS 23.207 [9].

6 Impacts on 3GPP System

Editor's Note: The purpose of this sub-clause is to describe the impacts that may be needed on 3GPP system and concepts in order to support features like PoC. Impacts should include the overall system (e.g. RAN, Core PS domain, IMS, UE) and indicate specific work that will be further required within 3GPP in order to support PoC like services.

Annex A:
Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2003-10					First draft version of the TR proposed		0.0.0
2003-11					Changes based on document S2-033751 in SA2#35	0.0.0	0.1.0
2003-12					Changes based on documents S2-034264 (which also the editor agreed to add a box around GLMS & PoC Server in diagram x) & S2-034337	0.1.0	0.2.0
2004-03					Changes based on documents S2-040826, S2-040989 & S2-040990 from SA2#38. Also updated the figure numbers and references in the text in section 5.	0.2.0	0.3.0
2004-05					Changes based on documents S2-041617, S2-041588 rev1, S2-041587 after SA2#39 meeting. Added reference to 23.207 for SBLP/Go and included 24.229 reference in the reference section. Some editorial and format corrections have been made to align with 3GPP rules.	0.3.0	0.4.0
2004-05					Editorial fixes of Flow 5.3.2 (steps inside pre-established session) now shows 5a and 5b and some other format fix.	0.4.0	0.5.0
2004-05					SA2#39 email approved correct document included (S2-041680), SA2#40 approved documents S2-042086, S2-042260, S2-042200, S2-042261 and S2-042254. Some editorial changes of enumerated bullets.	0.5.0	0.6.0
2004-05					Raised to v.1.0.0 for presentation at SA#24 (same content as v.0.6.0)	0.6.0	1.0.0
2004-06	SA#24	SP-040333			Presented for information	1.0.0	1.0.0