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Contents

Foreword

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Introduction

Development of the architecture for Voice Call Continuity has identified that supporting domain transfer of active mid-call services by implementing these services in both the CS domain and IMS is not a viable solution in the Release 7 timeframe. Therefore it has been proposed that an architecture is necessary that allows implementation of such services in IMS while also allowing control when the serving access network is in the CS domain. In addition to the VCC scenario, the increased deployment of VoIP capable access technologies will encourage further service development on IMS also increasing the importance of being able to access these services via CS domain access independently of the support of VCC.

1 Scope

This document contains the results of the feasibility study into the architectural requirements and alternatives for the delivery of consistent services to the user mainly via IMS centralized services regardless of the attached access type; e.g. CS domain access or IP-CAN. Considerations include overall requirements, architectural requirements, alternative architectures and evaluation of potential architectural solutions.

The study considers how to access IMS-based multimedia telephony services while still allowing innovative services. It includes investigation into call/session establishment via CS domain access and IP-CAN and for calls/sessions transferred across CS domain access and IP-CAN, including the interactions with domain selection. It provides consideration for the handling of the multiple medias that are enabled by the multimedia telephony communication service. The solution should be applicable for terminals with VCC capabilities and for non-VCC capable terminals. Impact on legacy terminals with the same subscription (e.g. SIM swapping) should be studied.

The second objective of the study is an investigation into the means to support and the need of the evolution of a network towards the IMS centralized services architecture. The assumption for this evolution is that some networks may not immediately migrate all services to the IMS centralized services architecture. In addition, given that some calls may not be rerouted to IMS during the migratory period, the study shall also investigate how to ensure that equivalent services are implemented in IMS and CS.

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 TS 22.101: "Service principles"

[2] 3GPP TS 22.173: "IP Multimedia Core Network Subsystem (IMS) Multimedia Telephony Service and supplementary services"

[3] 3GPP TS 23.206: "Voice Call Continuity between CS and IMS"

[4] 3GPP TS 23.228: "IP Multimedia Subsystem (IMS)"

[5] 3GPP TS 24.173: "IMS Multimedia telephony service and supplementary services"

[6] 3GPP TS 23.229: "Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP)"

[7] 3GPP TS 24.008: "Mobile radio interface Layer 3 specification; Core network protocols"

3 Definitions, symbols and abbreviations

3.1 Definitions

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

Bearer Control Signalling Path: Standard CS signalling path used to control the call established to setup CS voice bearer between the UE and IMS.

CS Access Signalling: Standard CS signalling used between the UE and the CS network.

ICS UE: The ICS UE is a User Equipment that is capable of receiving telephony services and other services offered by IMS while the voice bearer is established via CS. An ICS UE can also be a UE which can access IMS via an IP-CAN that supports the full duplex speech component of the IMS multimedia telephony service, and follows the procedure defined in 3GPP TS 22.101 [1], 22.173 [2], 23.228 [4], 24.229 [6] and 24.173 [5]. An ICS UE is not necessarily capable of VCC.

Editors Note: The definition of the "ICS UE" may require updating to account for non-call related signalling procedures (e.g. changing the call forward number).

Non-ICS UE: The non-ICS UE is a User Equipment that does not contain the new capabilities defined in this document. A non-ICS UE is not necessarily capable of VCC.

RUA Leg: The call leg between the RUA and the remote end. It is formed at the RUA for presentation of the SIP UA behaviour to IMS on behalf of the UE. The TAS, VCC AS and other Application Servers are invoked on the RUA Leg.

Session Control Signalling Path: Signalling path established between the UE and the RUA, either directly or via CS network elements such as the VMSC and the HSS for enablement of IMS control of user sessions at the RUA when using CS voice bearers.

UE Leg: The call leg between the RUA and the UE. It is formed at the RUA by combining of the CS call established between the UE and the RUA to set up the voice bearer, and the ICCC established between the RUA and the UE either directly or via the CAAF.

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:

CAAF	CS Access Adaptation Function
ICCC	IMS CS Control Channel
ICS	IMS Centralized Services
ICCP	IMS CS Control Protocol
ICCF	IMS CS Control Function
L-CAAF	Local CS Access Adaptation Function
L-CAAF-n	Local CS Access Adaptation Function-network equivalent
RUA	Remote User Agent
R-CAAF	Remote CS Access Adaptation Function
VCC	Voice Call Continuity

4 Overall Requirements

5 Architectural Requirements and Considerations

5.1 Basic Assumptions

5.2 Architectural Requirements

5.2.1 Service consistency

The following requirements are defined to ensure service consistency:

- It shall be possible to provide the services offered by the Telephony Application Server to the users who are accessing the network via the CS domain or via an IP-CAN.support MMTel full duplex speech service set as defined in 22.173 [2] & 24.173 [5].
  - Current definition of the MMTel multimedia telephony service definitions offered by the TAS as defined in 22.173 [2] and 24.173 [5] shall not be changed due to the centralization of services in IMS.
  - Home IMS network services shall be provided when using CS access for speech media transport in home and roaming networks; however a reduced service offering may be provided subject to the constraints of the access network.
  - Home IMS network services shall not be impacted by the solution for Centralized IMS Service Control when using an IP-CAN for speech media transport in home and roaming networks.
  - The solution shall support call independent IMS supplementary services management
  - Solution needs to work also over international transit networks.

Editors Note 1: The capabilities of the international transit networks need to be identified.

- It shall be possible to support Emergency Call and Priority Services (ETS) for IMS Centralized Services users.

Editor's Note 2: Other services beside the one defined in TS 22.173 [2] is FFS.

5.2.2 Core network requirements

5.2.2.1 IMS Core Network

- Impacts on IMS entities should be minimized.

5.2.2.2 CS Core Network

- Impacts on CS network elements should be minimized.

5.3 UE requirements

5.3.1 Support of Pre-Rel-08 non ICS Enhanced UEs

- Pre-release 8 UEs (without IMS Centralized Services enhancements) should be supported. When services are provided by the IMS, a reduced supplementary service set may be allowed.

Editor's Note: Impact of SIM swapping needs to be studied.

5.4 Service continuity requirements

- The IMS Centralized Services solution is required to enable subscribers to have consistent service behaviour upon Domain Transfers between access networks, subject to the constraints of the device and access network.

Editor's Note: multimedia and non-voice services require further consideration for seamless transparency.

5.4.1 Priority Service (ETS)

- The IMS centralized services solution needs to support Domain Transfers of Priority Service.

Editor's Note: It is for further study whether Priority Service can be provided from IMS domain when using CS access.

5.4.2 Supplementary services

- The IMS centralized services solution needs to provide subscribers with a consistent supplementary service behaviour upon Domain Transfers (e.g. Call Forwarding, Communication Waiting, Call Hold, etc.).

5.5 Session Scenarios

5.5.1 Session Scenarios PS networks that support the full duplex speech component of the IMS multimedia telephony service

The solution shall support standard IMS session scenarios according to procedures specified in 22.101 [1], 22.173 [2], 23.228 [4], 24.229 [6] and 24.173 [5] when using PS networks that support the full duplex speech component of the IMS multimedia telephony service.

5.5.2 Session Scenarios for use of CS network to access IMS services

5.5.2.1 Session scenarios for an ICS UE

The solution shall support the following IMS session scenarios according to procedures specified in 22.101 [1], 22.173 [2], 23.228 [4], 24.229 [6] and 24.173 [5] when ICS UE accesses IMS services:

- Basic voice service origination and terminating sessions.
- Voice origination and termination service sessions with Line ID services (e.g. OIP, OIR, TIP, TIR) controlled in IMS.
- Voice origination and termination service sessions with Communication Barring services controlled in IMS.
- Voice termination service sessions with Communication Diversion services controlled in IMS.
- Voice origination and termination service sessions with mid-call services (e.g. Hold/Resume, Conferencing, CW, ECT) controlled in IMS.

The solution shall provide also generic capabilities to enable introduction of new bi-directional speech related IMS services via CS bearer without further standardisation.

5.5.2.2 Additional Session Scenarios for ICS UE capable of VCC

In addition to session scenarios specified in the respective clause for ICS UEs, the solution shall support the following VCC session scenarios according to network procedures specified in 23.206 [3] when a ICS UE capable of VCC accesses:

- Domain Transfers of basic voice service sessions in both directions (networks that support the full duplex speech component of the IMS multimedia telephony service over IP-CAN and CS).
- Domain Transfers of voice sessions with non mid call services in both directions (networks that support the full duplex speech component of the IMS multimedia telephony service over IP-CAN and CS).
- Domain Transfers of voice sessions with mid call services in both directions (networks that support the full duplex speech component of the IMS multimedia telephony service over IP-CAN and CS).

Domain Transfers of Emergency sessions in both directions using the work being done in TR 23.826 VCC support for Emergency Calls as a basis.

5.5.2.3 Session Scenarios for non-ICS UEs

5.5.2.3.1 When using CS networks upgraded with ICS capability

The solution shall support the following IMS session scenarios according to procedures specified in 22.101 [1], 22.173 [2], 23.228 [4], 24.229 [6] and 24.173 [5] when non-ICS UE accesses IMS services via GSM/UMTS CS network which has been upgraded with ICS capability:

- Basic voice service origination and terminating sessions.
- Voice origination and termination service sessions with Line ID services (e.g. OIP, OIR, TIP, TIR) controlled in IMS.
- Voice origination and termination service sessions with Communication Barring services controlled in IMS.
- Voice termination service sessions with Communication Diversion services controlled in IMS.

Voice origination and termination service sessions with mid-call services (Hold/Resume, Conferencing, CW, ECT) controlled in IMS.

5.5.2.3.2 When using CS networks not upgraded with ICS capability

The solution shall support the following IMS session scenarios according to procedures specified in 22.101 [1], 22.173 [2], 23.228 [4],, 24.229 [6] and 24.173 [5] when non-ICS UE accesses IMS services via GSM/UMTS CS network which has not been upgraded with ICS capability:

- Basic voice service origination and terminating sessions.
- Voice origination and termination service sessions with Communication Barring services controlled in IMS.
- Voice termination service sessions with Communication Diversion services controlled in IMS.

Support of the following session scenarios may not be possible when non-ICS UE accesses IMS services via GSM/UMTS CS network not upgraded with ICS capability; these session scenarios may be supported with control of respective Supplementary Services in CS domain if necessary.

- Voice origination and termination service sessions with Line ID services (OIP, OIR, TIP, TIR) controlled in IMS.

Voice origination and termination service sessions with mid-call services (Hold/Resume, Conferencing, CW, ECT) controlled in IMS.

5.5.2.3.3 Additional Session Scenarios for non-ICS UE capable of VCC

In addition to session scenarios specified in the respective clause for non-ICS UE, the solution shall support the following VCC session scenarios according to procedures specified in 23.206 [3] when a non-ICS UE capable of VCC accesses IMS services via GSM/UMTS CS network:

- Domain Transfers of basic voice service sessions in both directions.
- Domain Transfers of voice sessions with non mid call services in both directions.

6 Architecture Alternatives

Editor's Note: This section will describe and evaluate detailed reference architectures, including network elements, interfaces and reference points, suitable to provide Centralized IMS Services

6.1 Alternative 1

6.1.1 Introduction

In this architecture alternative a fundamental part of the architecture is the concept of the IMS CS Control Channel (ICCC). This is a logical call control signalling channel, established between the UE and an IMS network element for establishment and/or service control of IMS sessions using CS voice bearers as described below.

6.1.1.1 IMS CS Control Channel (ICCC)

The IMS CS Control Channel (ICCC) is a logical signalling channel used to transport control signalling between the ICS UE and the IMS when accessing IMS services via the CS domain. ICCC is used when needed, e.g. for IMS registration, on session establishment and/or service control of IMS sessions using CS voice bearers. The ICCC can in principle be established over the CS domain network or over the PS domain.

- When established over the CS domain the transport mechanism used is USSD. When established over the PS domain the transport mechanism used is a PS bearer.

The USSD transport mechanism does not offer as much bandwidth as the PS bearer so when using the USSD transport mechanism the limited bandwidth has to be taken into account and a suitable IMS CS Control Protocol (ICCP) is required. The ICCP may be implemented as a functional or stimulus protocol as driven by the architectural requirements. Details of ICCP implementation are for further study.

When using PS transport, IMS SIP signalling is carried over the ICCC.

Editor's Note 1: Procedures for use of ICCC for IMS registration when using CS access, and session establishment and/or service control of IMS sessions established using CS voice bearers are FFS.

Editor's Note 2: ICCC only applies to MMTEL services. Potential use of ICCC for non-MMTEL services is FFS.

Editor's Note 3: Use of ICCC with USSD transport for call Independent operations such as user configuration of supplementary service data is FFS.

6.1.2 ICS Reference Architecture

6.1.2.1 Reference architecture diagram

The figure below provides a Reference Architecture for IMS voice sessions established by an ICS UE using CS voice bearers and for voice sessions transferred between CS and PS access.

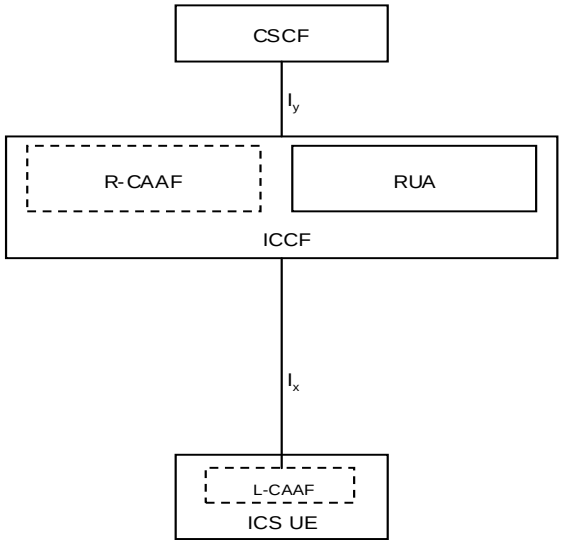

Figure 6.x.x.x -1: ICS – Reference Architecture

NOTE: Only relevant functions are shown.

The architecture introduces two new logical functions, the IMS CS Control Function (ICCF) and the ICS UE, as described below.

6.1.2.2 IMS CS Control Function (ICCF)

The IMS CS Control Function (ICCF) provides functions necessary for provision of IMS services for calls originated or terminated over CS access networks and for calls transferred between CS and PS access networks. The ICCF belongs to the IMS home network and is comprised of two functions: the CS Access Adaptation Function (CAAF) and the Remote User Agent (RUA).

6.1.2.2.1 Remote User Agent (RUA)

The Remote User Agent (RUA) performs SIP User Agent functions on behalf of the ICS UE for IMS voice sessions established using CS voice bearers.

The RUA combines the CS call established between the UE and the RUA to set up a voice bearer, and the ICCC established between the RUA and the UE either directly or via the CAAF. It enables the completion of the call leg towards the UE, referred to hereafter as the "UE Leg"; and presents the session through the S-CSCF toward the other party, on a call leg referred to hereafter as the "RUA Leg". The UE Leg and the RUA Leg form a B2BUA at the RUA. The TAS and other Application Servers are executed on the RUA Leg as part of standard service execution logic at the S-CSCF. The session processing complies with the current IMS procedures (e.g. MMTel as in TS 24.173 [5] for standardized supplementary services). In other words TAS and other IMS Application Servers do not see a difference regarding the current IMS/MMtel procedures, whether it serves a UE roaming in CS or in IP-CAN. This does not exclude access specific information passing via SIP and its use when necessary by the services.

The RUA may be realized as an IMS Application with an ISC interface to S-CSCF. In this mode, it is invoked as the very first SIP AS in the originating call and the last one in terminating calls i.e. closest to the access. It needs to be ensured that the VCC Application Server is either second for originating calls or second last for terminating calls. This approach for physical realization of RUA is referred to hereafter as the Application Server approach.

Another implementation of the RUA may be with a Gm interface to the P-CSCF. In this mode, it acts as an IMS UE remotely controlled from the ICS UE, i.e. an ICS user connected via CS access and RUA is perceived from IMS point of view as an IMS user with capability bi-directional speech only. This approach for physical realization of RUA is referred to hereafter as the IMS Adaptor approach.

Editor's Note 1: A decision would be required for selection of one physical implementation of RUA.

Editor's Note 2: Call independent aspects such as user configuration of supplementary services are FFS.

Editor's Note 3: The interaction between VCC and ICS is for further study

6.1.2.2.2 CS Access Adaptation Function (CAAF)

The CS Access Adaptation Function (CAAF) is an adaptation function for the service control signalling between CS domain and IMS. The CAAF conveys the service control signalling information received from the ICS UE over CS access signalling to the RUA and vice versa. The RUA uses the information received from the CAAF for initiation and control of SIP sessions.

The Remote CS Access Adaptation Function (R-CAAF) resides in the ICCF with a Local CS Access Adaptation Function (L-CAAF) provided in the ICS UE.

The CAAF is not employed in the ICCF and the UE when using SIP over PS bearers for the ICCC.

6.1.2.3 ICS UE

The ICS UE is a UE capable of ICS. An ICS UE communicates via ICS-1 with the ICCF.

The UE contains the L-CAAF for enablement of ICCC with CS Access Signalling.

6.1.3 Architecture for ICS support without terminal impact

6.1.3.1 Reference architecture

The following ICS Ref Architecture may be used to provide ICS support. When considering deploying this option the limitations of the legacy UEs need to be taken into consideration.

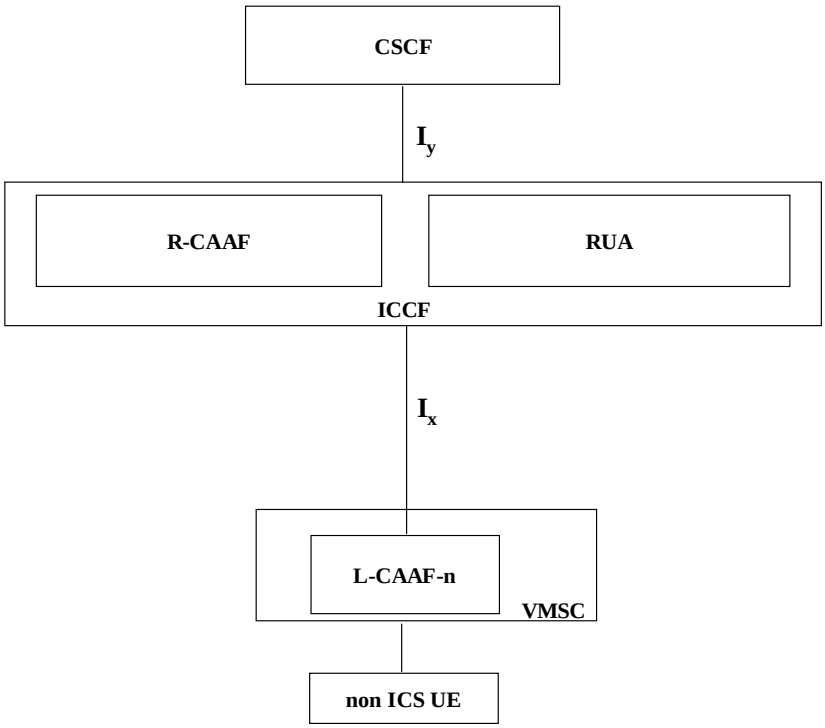

Figure 6.1.3.1-1: Architecture for ICS support without terminal impact

NOTE: Only relevant functions are shown.

6.1.3.2 Extensions to CAAF for support of non ICS UEs

CAAF provides necessary adaptation needed for enablement of the RUA.

CAAF is exclusively provided as a network function; i.e. for non ICS UEs, the L-CAAF logic which is otherwise associated with ICS UEs is provided by a CS Core Network function, Local CS Access Adaptation Function-network equivalent (L-CAAF-n) on behalf of the UE. The L-CAAF-n also provides interworking with 24.008 [7] as necessary. As shown in the above figure, there is a CAAF component on the ICCF referred to as Remote CS Access Adaptation Function (R-CAAF), and a CAAF component on the VMSC referred to as Local CS Access Adaptation Function (L-CAAF-n); these two CAAF components use the service control signalling to communicate over ICCC in a manner similar to the ICS UE and the ICCF.

The CAAF may be exclusively provided in association with the VMSC in which case the R-CAAF component in the ICCF is not required.

NOTE: L-CAAF-n resides at the access edge of the VMSC.

Editor's Note: Call independent aspects such as user configuration of supplementary services are FFS.

6.1.4 ICS Reference Points

6.1.4.1 Ix Reference Point

For ICS UEs, the Ix reference point is used between the ICS UE and the ICCF. The Ix reference point implements the ICCC. The ICCC may be established through the CS domain network using CS Access Signalling or through PS domain using PS transport.

For non ICS UEs, the Ix reference point is used between the L-CAAF associated with the VMSC and the R-CAAF in the ICCF for establishment and control of ICCC.

6.1.4.2 Iy Reference Point

Iy reference point is used between the ICCF and the CSCF for presentation of the SIP UA behaviour toward IMS for control of user sessions.

6.1.5 Signalling and bearer achitecture for full duplex speech over CS access

6.1.5.1 Introduction

Different models for the signalling/bearer architecture for full-duplex speech service with IMS centralized services over CS access are discussed in the following.

6.1.5.2 Calls established using CS bearers with use of PS transport for ICCC

When in CS coverage with simultaneous PS access available, e.g. UTRAN, the ICS UE may use IMS SIP signalling over PS bearers for enablement of ICCC when support of the full duplex speech component of the IMS multimedia telephony service is not available over PS bearer.

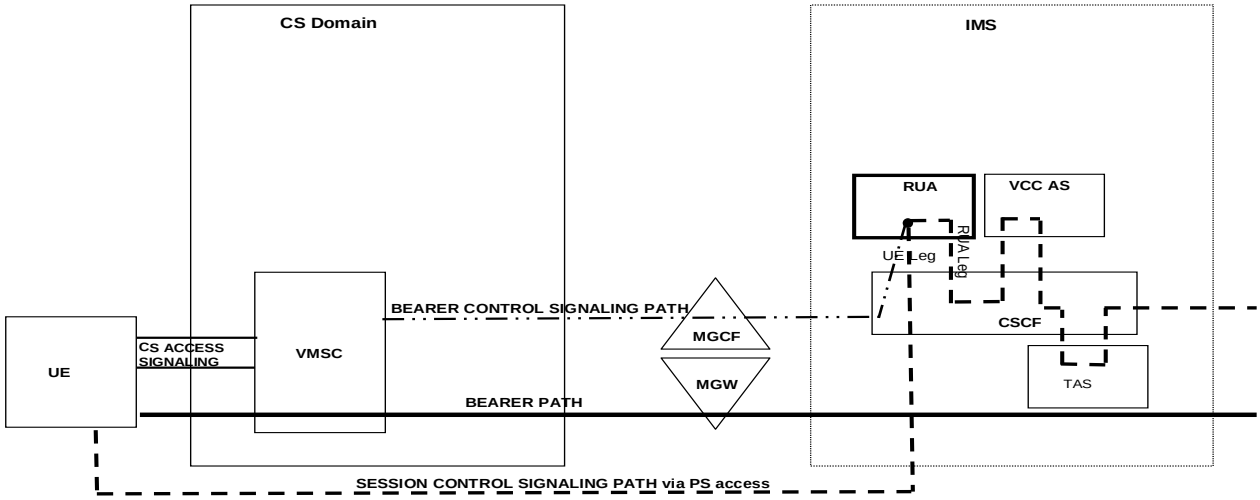

Figure 6.1.5.2-1: Signalling/Bearer Paths for PS transport of ICCC

In this model the ICCC is enabled by using IMS SIP signalling over PS bearers, and is used for session setup when establishing IMS voice sessions using CS voice bearers. IMS SIP signalling is used in the UE for control of all calls with the ICCC established through the Session Control Signalling Path over PS access. Standard IMS call control procedures are used to set up the Session Control Signalling Path between the UE and remote end with the RUA inserted in the session path. No bi-directional speech media is transmitted over the IP-CAN. In parallel, the UE establishes a Bearer Control Signalling path with the RUA by establishing a CS call toward the RUA. The Bearer Control Signalling and Session Control Signalling stimuli are combined at the RUA for presentation of the IMS session toward the CSCF on behalf of the UE.

The UE maintains the SIP/SDP state machine with RUA also maintaining a copy of the state data when present in the session path.

Use of the ICCC for session setup for this model enables the capability to provide all services exclusively by IMS.

The CAAF is not required when using IMS SIP signalling over PS bearers for enablement of the ICCC with RUA providing control of IMS sessions using CS voice bearers.

6.1.5.3 Calls established using CS bearers with USSD transport for ICCC & Application Server approach for RUA

The Signalling/bearer paths for an IMS session established via CS access with USSD transport of the ICCC and Application Server approach for RUA are described in figure below.

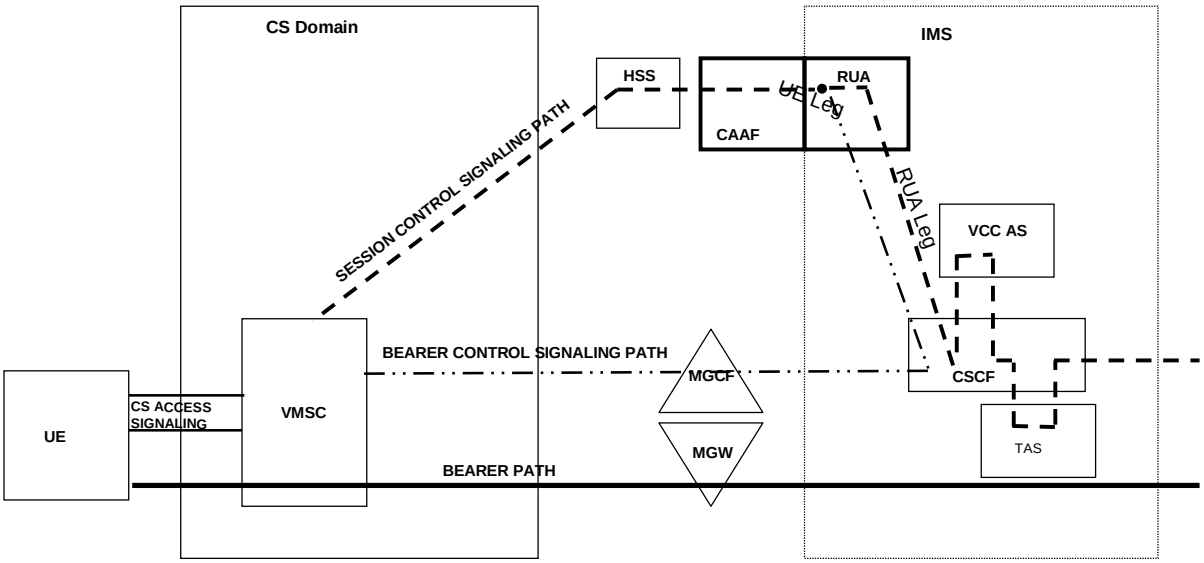

Figure 6.1.5.3-1: Signalling/Bearer Paths-USSD transport with AS approach for RUA

NOTE: gsmSCF used for redirection of CS calls and USSD processing is not shown for brevity

USSD is used for transport of the ICCC communicating the Session Control Signalling via the VMSC to the CAAF. The CAAF performs necessary adaptation when relaying the Session Control Signalling to RUA which presents SIP UA behaviour on behalf of the UE toward IMS.

Two options are possible for establishment of IMS sessions via the CS access using USSD transport of ICCC:

Editor's note: Either one or both of these options are expected to be recommended for standardization as determined at the TR conclusion.

6.1.5.3.1 Use of ICCC for IMS session setup

In this alternative, ICCC is used for session setup when receiving IMS services via CS access. SIP, as generated by the RUA, is used for control of IMS sessions using CS voice bearers. The UE establishes a Bearer Control Signalling path with the RUA by establishing a CS call toward the RUA. In parallel, it establishes the ICCC through the Session Control Signalling Path with the CAAF and RUA using USSD. The Bearer Control Signalling and Session Control Signalling stimuli are combined at the CAAF/RUA for presentation of SIP UA behaviour for establishment of an IMS session.

The UE maintains the key elements of the SIP/SDP state machine and the RUA also maintains a copy of the state data when present in the session path.

Use of the ICCC for session setup for this model enables the capability to provide all services exclusively by IMS.

6.1.5.3.2 Use of CS call control procedures for first session setup, CAMEL used to redirect CS calls to IMS

In this alternative, standard CS call control procedures are used for setup of the first UE session with CAMEL used for redirection of the first user session to IMS. The ICCC is used for subsequent session set up and control of mid call services. SIP is used with the RUA providing SIP UA behaviour on behalf of the UE for control of all user sessions. The Bearer Control Signalling path is established between the UE and the RUA by redirecting the CS call toward the RUA using CS redirection techniques such as the CAMEL origination triggers.
If a supplementary service needs to be invoked for the first user session, the UE uses ICCC to control the service related to the first session. The UE uses the ICCC for establishment and service control of the second user voice session. CS call setup procedures are not used for establishment of subsequent user sessions or invocation of mid-call voice services. The RUA maintains the SIP/SDP state machine. Upon Domain Transfer, the service state is released in the UE. The RUA is therefore inserted in the session path for IMS sessions established for a dual mode UE for synchronization of service data post Domain Transfer to CS when using this model.

Call based (temporary) line identification services shall be provided as assisted by CS domain with this model.

Editor's Note: The need for distributed service configuration for some Supplementary Services e.g. Line ID services with this model is FFS.

6.1.5.4 Calls established using CS bearers with USSD transport for ICCC & IMS Adaptor approach for RUA

This model is centred around the concept of emulating a standard IMS capable UE accessing IMS services via CS access, as an IMS end point, hence CS access specific adaptations are handled in the ICCF. In this approach, the ICCF is not impacted by additional IMS sessions established over IP-CAN in case a suitable IP-CAN is available.

Transparent CS Signalling, using USSD dialogues, is used to communicate needed session control signalling information from the UE using ICCC via the MSC-S / MSC/VLR through the HSS (at initial registration in IMS and when UE is roaming in a visited domain), or directly from the MSC-S / MSC/VLR, when UE is roaming or at home, to the ICCF (serving MSC assumed to have a suitable USSD application for ICS). ICCC is terminated in the CAAF of the ICCF and the CAAF performs necessary adaptation for the ICCC when relaying the Session Control Signalling to/from the RUA which presents SIP UA behaviour on behalf of the UE toward IMS.

Editor's Note 1 : The protocol requirements of the signalling using USSD dialogues are for further study as IMS CS Control Protocol (ICCP).

Editor's Note 2: The IMS registration performed over the RUA leg and the security implications are for further study.

For establishment of IMS sessions via CS access, the UE establishes a media control signalling path with the SIP UA (RUA) within the ICCF by establishing a CS call toward the ICCF (the CAAF in the ICCF is bypassed). Different options do exist to route the CS call from the UE to the ICCF. In parallel, it establishes a session control signalling path with USSD Handler in the CAAF within the ICCF using transparent CS Signalling using USSD as described above. The media control Signalling and session control Signalling are combined in the RUA at the ICCF for presentation of SIP UA behaviour for establishment of an IMS session.

The same principle applies for a terminating call to the UE, ie. ICCC is used to carry signalling needed for establishment and/or for any required control of terminating IMS sessions from the ICCF to the UE, and media transport over CS access is either established or an already established one is reused.

The UE uses a session control signalling path via the ICCF to control the service related to the first session (e.g. mid call handling). Subsequent call related input is communicated to the ICCF using the session control signalling path; i.e. CS call setup procedures are not used for establishment of subsequent user sessions or for invocation of mid-call voice services. Upon Domain Transfer from CS to PS, the CS access related service state is released in both the ICCF and the UE.

Use of the ICCC for session setup enables provisioning of MMTel bi-directional speech services to ICS UEs when using CS access with this model.

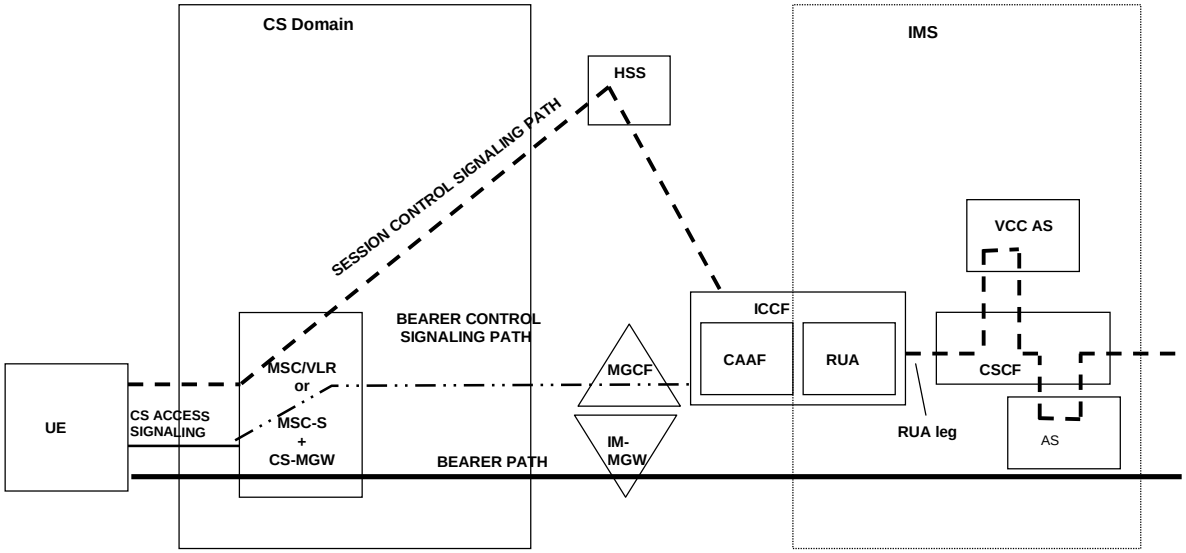

Figure 6.1.5.4-1: uICS-SIP$_{USSD/IA}$: Signalling/Bearer Paths

NOTE 1: Some details omitted for brevity

NOTE 2: In some cases the bearer control signalling path can carry session control signalling for IMS session as well.

6.1.6 Impact on IMS

6.1.7 Impact on CS Core Network

6.1.8 Impact on UE

6.2 Alternative 2

7 Conclusion

Annex x: Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2006-11	*SA2#55*	*S2-063638* *S2-064141*			*Version created based on documents agreed in SA2#55 (Busan)*	*0.0.1*	*0.1.0*
2007-01	*SA2#56*	*S2-070442*			*Version created based on documents agreed in SA2#56 (Florence)*	*0.1.0*	*0.2.0*
2007-02	*SA2#56*	*S2-070678* *S2-070916* *S2-070917* *S2-070982* *S2-070983* *S2-070994* *S2-070995* *S2-070996*			*Version created based on documents agreed in SA2#56b (St Louis)*	*0.2.0*	*0.3.0*
2007-03					*Editorial update due to error implementing S2-070994*	*0.3.0*	*0.3.1*