



Technical Report

**Digital cellular telecommunications system (Phase 2+);  
Universal Mobile Telecommunications System (UMTS);  
LTE;  
Feasibility study on combined Circuit Switched (CS)  
calls and IP Multimedia Subsystem (IMS) sessions  
(3GPP TR 22.979 version 11.0.0 Release 11)**



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**Reference**

RTR/TSGS-0122979vb00

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**Keywords**

GSM,LTE,UMTS

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Sous-Préfecture de Grasse (06) N° 7803/88

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## Foreword

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# 1 Scope

This document studies the service requirements associated with a multimedia service combining a CS call with one or more IMS services (or vice versa), while appearing as a single service to both end-users. The feasibility study addresses the high-level requirements and use cases such for combinational service including charging and user experience.

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# 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.
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[1] 3GPP TS 22.115: "Service aspects; Charging and billing".

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# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

**Combinational Service:** A combinational service is created by adding one or more IP multimedia component(s) to a CS call (or vice versa). The CS and IMS components are established between the same participants.

**Combinational call:** this is the name given to the service in which a circuit switched speech teleservice is enriched by adding an IMS session where both services (session and CS call) are originated in one single UE and are terminated in another single UE.

**Combinational Session:** this is the name given to the service in which an ongoing IMS session between two users is enriched by adding a circuit switched based call. The individual service instances that form the combinational session are originated in a single UE and terminated in another single UE.

**CSICS capable UE:** UE that supports Combinational Service.

## 3.3 Abbreviations

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

CSICS            Circuit Switched IMS Combinational Service

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# 4 Introduction to Combinational Service

- Combinational services are applicable to both UTRAN and GERAN.
- The service shall enable the unidirectional exchange of PS data within the context of an IMS session

- The service shall enable the bi-directional (simultaneous send receive) exchange of PS data within the context of a IMS session.
- The communication between user A and user B and the related charging shall continue even if a component drops

A specific subscription for combinational services is not foreseen as being necessary.

- The preconditions for a combinational service are
  - Users A and B have valid subscriptions for voice calls as well as for accessing the IMS
- The service shall enable the communication:
  - between a user (A) using a UE with CSICS capability and a user (B) using a UE with CSICS capability within the same PLMN and different PLMNs;
  - between users camping on different RATs
- An IMS capable UE that also supports CS service should also be CSICS capable.
- The service has to be available when roaming.
- Interoperability between CSICS capable UE and IMS Core/Application server needs to be guaranteed

According to different UE implementations, it is expected that the following two service modes will exist in regards to IMS registration:

- 1) IMS pre established state: the CSICS capable UE performs the IMS registration at switch on.
- 2) IMS on demand state: the CSICS capable UE performs the IMS registration:
  - to start the communication, or
  - to add a IMS component to an existing CS call.

Interoperability between UEs that implement such different approaches shall be enabled.

It shall be possible to successfully invite a user to join an IMS session whether the invited UE is IMS registered or not. The invited user shall be able to accept/refuse the IMS Registration request.

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## 5 User experience of combinational services

The existing address context is reused when the combined service is established. There is no need for the user to 'redial', which makes the combined service simple to invoke for the user.

When one of the participating users terminates the CS call of a combinational service, the IMS session may continue.

When one of the participating users terminates the IMS component of a combinational service, the CS call may continue.

When the user A sends a multimedia content to a user B, the user B can accept or reject the multimedia content (confirmation from the receiving party is needed) and vice versa.

It shall be possible to initiate a combinational service with a CS call and to add an IMS/PS session later.

It shall be possible to initiate a combinational service with an IMS/PS session and to add a CS call later

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## 6 Service Capability Detection

The Service Capability Detection may indicate to the user that the UEs have interoperable CSICS capability and that the network(s) the users are attached to have the necessary network functionality to carry the combinational service.

- Before or during the combined service establishment between user A and user B the recipient (user B) UE capabilities may need to be checked
- The detection of the capabilities of the recipient terminal shall ensure that information is updated in case of change of terminal
- The (CSICS capable) UEs should have the information, prior to initiating a combinational service, regarding the type of capabilities, e.g. in terms of MMS classes, which are jointly supported by both UEs.
- An operator should have the mechanism to inhibit the capability check, or at least indicate to UE that it should not be performed.

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## 7 Impacts on IP Multimedia and Supplementary Services

### 7.1 Supplementary services during a combinational call

The following supplementary services should be provided. The expected behaviour of the IMS session forming the combinational call is also described:

- Call hold: when the user decides to place the circuit switched call on hold, the user should be able to decide whether the IMS session of the combinational service should be suspended. If the IMS session has been suspended it may be resumed once the circuit switched call is resumed.
- Call waiting: the user should be able to receive an indication and provided with the option to switch between one call and the new incoming call. The IMS session should continue during the alerting of the subscriber and the user may decide to put the IMS session on hold when switching to the new CS.
- Call forwarding unconditional, on subscriber busy, on no reply, on not reachable: it should be possible to add IMS components to a CS call that has been forwarded, subject to the capability of such recipient.
- BAIC, BOIC, BAOC, BOIC-exHC, BIC-Roam: All the barring supplementary services should remain applicable.
- Calling line identity presentation: Existing rules apply to both CS and IMS components independently.
- Calling line identity restriction: Existing rules apply to both CS and IMS session independently, even if this results in the called party being unable to establish a combinational service.
- Connected line identity presentation: Existing rules apply to both CS and IMS components independently.
- Connected line identity restriction: Existing rules apply to both CS and IMS session independently, even if this results in the called party being unable to establish a combinational service.

### 7.2 Service behaviour during a Combinational Session

There is no standardised supplementary service defined for IMS session, however mechanisms exist (service capabilities) to emulate the behaviour of some of the most common supplementary services that exist in the circuit switched domain. The intention in this section is NOT to define "supplementary services" for IMS, just to explain the service behaviour during a combinational session for some specific cases as indicated below:

- IMS session hold: the user may decide to place the IMS session on hold, e.g. due to the wish of using the data capabilities of the UE for other purposes, or to initiate a different service. When this service is invoked the user should be able to decide whether the CS call of the combinational service should also be put on hold.
- IMS session waiting: The user should be able to receive an alert of an incoming IMS session (not part of the active combinational service) towards his UE. Subject to the capability of the UE, the user should be provided with the option to switch between the ongoing session and the new incoming one, or accept the new one in parallel with the existing one. The CS call of the combinational service should continue during the alerting of the subscriber and the user may decide to put the CS call on hold when switching to the new IMS session.



- IMS session redirect: It should be possible to add CS call to a redirected IMS session, subject to the capability of the recipient.
- Identity presentation: Existing rules apply to both CS and IMS components independently.
- Identity restriction: Existing rules apply to both CS and IMS components independently, even if this results in the called party being unable to establish a combinational session.

## 7.3 Support of teleservices during a combinational call

It should be possible to receive an SMS while engaged in a combinational call.

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# 8 Charging aspects for Combinational Service

For combinational services, it must be possible to charge as follows:

- Each media component is a chargeable event on its own also when roaming, which can e.g. be charged to the party originating the media. The principles of such charging are outlined in TS 22.115 [1] section 4.3.1., except for the charging option 'charge for individual components of sessions even if there is no identifiable service'.
- Correlation between the charged media components and CS call should be possible to perform by the home operator in order to introduce dedicated charging schemes, e.g. discounts. This applies to on-line charging as well as off-line charging.
- To continue producing charging information for any remaining multimedia components or the CS call, when a multimedia component or the CS call drops during the communication between the two parties.

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# 9 Suggested high-level Requirements

It shall be possible to add an IMS session to a CS speech call, thereby creating a combinational call.

It shall be possible to add a CS speech call to an IMS session, thereby creating a combinational session.

An IMS capable UE that also supports CS service should also be CSICS capable.

IMS shall interoperate with CSICS capable UE.

It shall be possible for the (CSICS capable) UEs to have the information, prior to initiating a combinational service, regarding the type of capabilities, which are jointly supported by both UEs, without user intervention.

The detection of the capabilities of the recipient terminal shall ensure that information is updated in case of change of terminal.

An operator should have the mechanism to inhibit the capability check, or at least indicate to UE that it should not be performed. During a CS call it shall be possible to request establishment of the IMS session whether the invited UE is IMS registered or not. The invited user shall be able to accept or reject the IMS registration request.

When the user A sends a multimedia content to a user B, the user B can accept or reject the multimedia content (confirmation from the receiving party is needed) and vice versa.

A combinational service shall enable both unidirectional and bi-directional exchange of PS data within the context of the IMS session.

CS call hold: In an ongoing combinational service, when the user decides to place the circuit switched call on hold, the user should be able to decide whether the IMS session of the combinational service should be suspended. If the IMS session is suspended it may be resumed once the circuit switched call is resumed

IMS session hold: In an ongoing combinational service, the user may decide to suspend the IMS session. When this service is invoked the user should be able to decide whether the CS call of the combinational service should also be put on hold.

CS call waiting: In an ongoing combinational service, the user should be able to receive an indication and provided with the option to switch between one call and the new incoming call. The IMS session should continue during the alerting of the subscriber and the user may decide to put the IMS session on hold when switching to the new CS.

IMS session waiting: In an ongoing combinational service, the user should be able to receive an alert of an incoming IMS session towards his UE. Subject to the capability of the UE, the user should be provided with the option to switch between the ongoing session and the new incoming one, or accept the new one in parallel with the existing one. The CS call of the combinational service should continue during the alerting of the subscriber and the user may decide to put the CS call on hold when switching to the new IMS session.

Calling line identity restriction: Existing CLIR rules apply , even if this results in the called party being unable to establish a combinational call.

Identity restriction: Existing Session Originator Identity Presentation Suppression rules apply to IMS components, even if this results in the called party being unable to establish a combinational session.

Connected line identity restriction: Existing COLR rules apply , even if this results in the called party being unable to establish a combinationalcall.

Identity presentation: Existing Session Originator Identity Presentation rules apply to IMS components.

Call forwarding unconditional, subscriber busy, no reply, not reachable: It should be possible to add IMS components to a CS call that has been forwarded, subject to the capability of recipient UE.

IMS session redirect: It should be possible to add CS call to a redirected IMS session, subject to the capability of the recipient UE.

It shall be possible to receive an SMS while engaged in a combinational service.

It shall be possible to provide charging information on the CS call and IMS session for correlation purposes in order to allow off-line charging.

The charging information shall continue to be produced for any remaining multimedia components or the CS call when a multimedia component or the CS call drops during the communication between the two parties.

It shall be possible to establish a combinational call between two users within the same PLMN or within different PLMNs.

It shall be possible to establish a combinational call between two users camped on identical or different RATs.

It shall be possible to establish a combinational call when roaming, assuming the visited operator supports GPRS roaming.

The home operator should be able to correlate charged media components and CS call in order to introduce dedicated charging schemes, e.g. discounts. This applies to on-line charging as well as off-line charging.

The user (A or B party) shall only need to know one address in order to establish the combinational service.

The combinational service should not place additional provisioning requirement on the operator.

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## 10 Conclusions and recommendations

The requirements captured in section 9 need to be reflected in 3GPP stage 1 specifications. It is recommended that this is achieved via developing a new technical specification for combinational services, which can then be referenced via the existing appropriate specifications.

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# Annex A: Use cases

## A.1 Enriching Communications

This category captures those combinational services where an ongoing communication is enriched.

### A.1.1 Enriched call session with multimedia

#### Description:

The 'enriched call session with multimedia' service enables a user participating in a mobile-to-mobile Circuit Switched (CS) conversation with another user to take a picture/video with the inbuilt camera in the mobile and transmit the picture to the other party during this conversation. Either party in the conversation may initiate a picture/video transmission to the other party.

#### Procedures:

- **Discover service authorization**  
At power on the UE performs a discovery of the service capability. The purpose of the discovery is for the UE to verify that the user is authorized by the IMS system to use this service.
- **Discover Service capability**  
This may be initiated from a UE that is involved in a CS call that has reached an active state. The purpose of this step is to allow a UE to discover the capabilities of the remote terminal.
- **Establish message session**  
A message session has to be established before an image transfer can take place. The UE that has taken the picture initiates setting up the message session.
- **Transfer message**  
This is performed when one of the users involved in a CS call, initiates the sending of multimedia content (e.g. image, clips or video) to the other user, using the message session established prior to the image transfer.
- **Release message session**  
This is to allow the release of a message session.

#### User Scenario:

Alice registers her SIP contact to the IMS system and indicates her subscription to the 'enriched call session with multimedia' service. Right after her registration the UE will send a request to the network to authorize the service. The IMS system validates the service subscription and sends a response to the UE.

Alice establishes a call with Bob and starts talking with Bob. While the conversation is established, Alice's UEs will attempt to discover the Service capabilities of Bob's UE in the background of the ongoing call. Alice's UE will contact an ENUM server that translate Bob's E.164 number into Bob's SIP address. Alice's UE will send discover Service capability request to Bob's UE. Bob's UE responds to this message indicating that it is also subscribed to the 'enriched call session with multimedia' service. The 'discover Service capability' function will also be initiated from Bob's UE.

After the discovery of the Service capability the UEs are ready to share any multimedia content with the other UEs. This will be displayed to the users via the UE display.

#### Scenario A (session initiated by Alice):

While discussing with Bob, Alice notes a beautiful sports car on the road that is Bob's favorite. She takes a picture of the car and sends it to Bob. Alice's UE will send a message to Bob's UE and request to initiate a 'enriched call session with multimedia' service with Bob. An icon is highlighted on Bob's UE for Bob to accept or reject the invitation to the service. Once Bob accepts the service request, Bob's UE responds to Alice's UE that the service is accepted by Bob and the message session is established between the UEs.

Alice will be offered a menu on her UE to send the picture of the sport car to Bob (knowing that this will mean that the content will be delivered to Bob's terminal) and initiate the sending of the picture. Alice starts to talk about the sports car with Bob and enjoys a very nice continuation of her conversation with Bob.

After termination of the CS call Alice's UE will immediately release the message session.

Any party may release the message session at any time during the CS call.

Scenario B (session initiated by Bob):

While talking Bob suddenly notices Alice's favorite film star acting within a movie clip on the film festival of Cannes and Bob obtains the trailer of this movie clip to his mobile. During the call, Bob's UE requests an enriched call session with multimedia, Alice accepts the enriched call session request, and an icon on Bob's UE will be highlighted. Bob notes the activation of the 'enrichment' icon and sends the video clip towards the Alice's UE. Bob and Alice starts to talk about this video clip and Alice asks Bob to request the movie stand for more video clips.

After termination of the CS call Bob's UE will immediately release the message session.

Any party may release the message session at any time during the CS call.

## A.1.2 Voice enhanced chatting

### **Description:**

A user is engaged within a multi party chat session and notes that his buddy is entering the chat session as well. To gain a level of privacy on his conversation with his buddy, the user establishes a CS voice session with his buddy. During the CS voice session, both users are still engaged in the chat service exchange messages with the other chat users.

## Annex B: Change history

Change history											
TSG SA#	SA Doc.	SA1 Doc	Spec	CR	Rev	Rel	Cat	Subject/Comment	Old	New	WI
2004-06			22.979					Draft skeleton		0.0.0	CSICS
2004-07			22.979					Output from SA1 #25 Montreal	0.0.0	0.1.0	CSICS
2004-08			22.979					Output from SA1 SWG Vienna (S1-040800)	0.1.0	0.2.0	CSICS
2004-10			22.979					Editorial modifications of Tdoc.800	0.2.0	0.2.1	CSICS
2004-10			22.979					Output from first day's SWG in Sophia Antipolis (SA1#26)	0.2.1	0.3.0	CSICS
2004-10			22.979					Output from second day's SWG SA1#26	0.3.0	0.4.0	CSICS
2004-10			22.979					Revised based on comments received at SA1#26 plenary	0.4.0	0.4.1	CSICS
2004-12			22.979					Version 1.0.0 created for presentation to SA #26	0.4.1	1.0.0	CSICS
2005-01			22.979					Version 1.1.0 created at SA1 #27	1.0.0	1.1.0	CSICS
2005-01	SP-050070	S1-050212	22.979					Raised to version 2.0.0 for approval at SA #27	1.1.0	2.0.0	CSICS
SP-27	SP-050070	S1-050212	22.979					Approved at SA #27	2.0.0	7.0.0	CSICS
SP-42	-	-					Rel-8	Updated from Rel-7 to Rel-8	7.0.0	8.0.0	
SP-46	-	-	-	-	-	-	-	Updated to Rel-9 by MCC	8.0.0	9.0.0	
2011-03	-	-	-	-	-	-	-	Update to Rel-10 version (MCC)	9.0.0	10.0.0	
2012-09	-	-	-	-	-	-	-	Updated to Rel-11 by MCC	10.0.0	11.0.0	

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## History

<b>Document history</b>		
V11.0.0	October 2012	Publication