

ETSI TS 122 078 V5.11.0 (2003-09)

Technical Specification

**Digital cellular telecommunications system (Phase 2+);
Universal Mobile Telecommunications System (UMTS);
Customized Applications for Mobile network
Enhanced Logic (CAMEL);
Service description;
Stage 1
(3GPP TS 22.078 version 5.11.0 Release 5)**



Reference

RTS/TSGS-0122078v5b0

Keywords

GSM, UMTS

ETSI

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

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Foreword

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Introduction

Unlike earlier releases of this document, no markers are used to indicate the changes from the previous CAMEL release, namely, CAMEL Phase 3 Release 99.

1 Scope

This standard specifies the stage 1 description for the CAMEL feature (Customised Applications for Mobile network Enhanced Logic) which provides the mechanisms to support services consistently independently of the serving network. The CAMEL features shall facilitate service control of operator specific services external from the serving PLMN. The CAMEL feature is a network feature and not a supplementary service. It is a tool to help the network operator to provide the subscribers with the operator specific services even when roaming outside the HPLMN.

If an IPLMN or VPLMN supports CAMEL Phase 4, then it shall also provide the functionality of all previous CAMEL phases.

Phase 4 network signalling shall support interworking with CAMEL Phases 3 and 2.

The CAMEL feature is applicable

- To mobile originated and mobile terminated call related activities;
- To supplementary service invocations;
- To SMS MO, to GPRS sessions and PDP contexts, to the control of HLR subscriber data, to the control of network signalling load.

The mechanism described addresses especially the need for information exchange among the VPLMN, HPLMN and the CAMEL Service Environment (CSE) for support of such operator specific services. Any user procedures for operator specific services are outside the scope of this standard.

This specification describes the interactions between the functions of the VPLMN, HPLMN, IPLMN and the CSE.

The second phase of CAMEL enhances the capabilities of phase 1 where the following capabilities have been added:

- Additional event detection points;
- Interaction between a user and a service using announcements, voice prompting and information collection via in-band interaction or USSD interaction;
- Control of call duration and transfer of Advice of Charge Information to the mobile station;
- The CSE can be informed about the invocation of the supplementary services ECT, CD and MPTY;
- For easier post-processing, charging information from a serving node can be integrated in normal call records.

The third phase of CAMEL enhances the capabilities of phase 2. The following capabilities are added:

- Support of facilities to avoid overload;
- Capabilities to support Dialed Services;
- Capabilities to handle mobility events, such as (Not-)reachability and roaming;
- Control of GPRS sessions and PDP contexts;
- Control of mobile originating SMS through both circuit switched and packet switched serving network entities.
- Interworking with SoLSA. (Support of Localised Service Area). Support for this interworking is optional.
- The CSE can be informed about the invocation of the supplementary services CCBS.

Detailed information is given in the respective sections.

The fourth phase of CAMEL enhances the capabilities of phase 3. The following capabilities are added:

- CAMEL support for Optimal Routing of circuit-switched mobile-to-mobile calls;
- The capability for the CSE to create additional parties in an existing call;

- The capability for the CSE to create a new call unrelated to any other existing call;
- Capabilities for the enhanced handling of call party connections;
- The capability for the CSE to control sessions in the IP Multimedia Subsystem.

With CAMEL Phase 4, it is possible that only a limited subset of the new functionalities is supported, in addition to the complete support of CAMEL Phase 3.

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 22.093: "Completion of Calls to Busy Subscriber (CCBS); Service description, Stage 1".
- [2] 3GPP TS 22.079: "Support of Optimal Routing (SOR); Service definition (Stage 1)".
- [3] 3GPP TS 22.030: "Man-machine Interface (MMI) of the Mobile Station (MS) (Stage 1)".
- [4] 3GPP TS 22.090: "Stage 1 Decision of Unstructured Supplementary Service Data (USSD)".
- [5] 3GPP TS 22.097: "Multiple Subscriber Profile (MSP); Service definition (Stage 1)".
- [6] 3GPP TS 22.060: "General Packed Radio Service (GPRS); Service definition (Stage 1)".
- [7] 3GPP TS 22.057: "Mobile Environment (MExE); Service definition (Stage 1)".
- [8] 3GPP TS 22.071: "Location Services; Service Definition (Stage 1)".
- [9] 3GPP TS 23.018: "Basic Call Handling; Technical Realization".
- [10] 3GPP TS 22.003: "Circuit teleservices supported by a public land mobile network (PLMN)".
- [11] 3GPP TS 22.228: "Service Requirements for IP multimedia Core Network; (Stage 1)".
- [12] 3GPP TS 23.228: "IP Multimedia (IM) Subsystem - Stage 2".
- [13] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

3 Definitions and abbreviations

Operator Specific Service (OSS): Any non-standardised service offered to a mobile user.

Interrogating PLMN (IPLMN): The PLMN which interrogates the HPLMN for information to handle a mobile terminating call.

CAMEL Service Environment (CSE): A CSE is a logical entity which processes activities related to Operator Specific Services (OSS).

Route select failure: A condition when routing to the called party fails. Route Select Failure can be reported in an existing relationship or a new relationship can be initiated.

Service event: A specific event of a process which may be used as part of an operator specific service.

Initial service event: A service event which triggers the establishment of a relationship between the CSE and the controlled entity.

Subsequent service event: A service event which is reported in the context of an existing relationship between the CSE and the reporting entity.

Service procedure: A part of the CAMEL feature to be used when a specific CAMEL service event is detected.

Network CAMEL Service Information (N-CSI): Identifies services offered by the serving PLMN operator equally for all subscribers.

NOTE: These services may also be provided using a technology other than CAMEL.

CAMEL Subscription Information (CSI): Identifies that CAMEL support is required for the subscriber and the identities of the CSEs to be used for that support. The CSI also contains information related to the OSS of the subscriber, e.g. Service Key.

The OSS may include both services provisioned for individual subscribers and services provisioned equally for all users of a VPLMN.

Location Area Code: Indicates the global identity of that part of the service area of a VLR in which the subscriber is currently located, and in which the subscriber will be paged for mobile terminated traffic

Location Information: The location information shall be an identification of the location of the served subscriber.

The following location information shall be sent to the CSE (if available):

- **Geographical information** indicates the location (latitude and longitude) of the served subscriber. When Cell ID or Location Area Code is known the latitude and longitude may be calculated as the nominal central point of the cell or of the location area; alternative mechanisms for determining latitude and longitude may also be supported. The uncertainty of the indicated location is part of the geographical information.
- **Geodetic Information** provides the same functional capability as geographical information; however it is encoded differently.
- **Cell ID** indicates the global identity of the current or last cell which the subscriber is using or has used if the subscriber is using GERAN. The VPLMN shall update the stored Cell ID at establishment of every radio connection and whenever the subscriber is handed over between cells.
- **Routing Area ID** indicates the global identity of the current or last GPRS routing area which the subscriber is using or has used if the subscriber is using GERAN radio access in a GPRS serving network.
- **Service Area ID** indicates the global identity of the current or last service area which the subscriber is using or has used if the subscriber is using UTRAN radio access. The VPLMN shall update the stored Service Area ID at establishment of every radio connection and whenever the subscriber is handed over between service areas.
- **VLR number** is the number of the serving VLR stored in the HPLMN.
- **Location status** indicates whether or not the location information has been confirmed by radio contact. If the location information has not been confirmed by radio contact, then a time stamp is sent indicating the time elapsed since the last radio contact with the subscriber.
- **Location number** is the number received on the incoming circuit (for an incoming call) or to be sent on the outgoing circuit (for an outgoing call).

Service Key: An identifier of the OSS which shall be transparent to the IPLMN/VPLMN.

Subscriber Status: An indication of the status of a subscriber, determined by the state of the subscriber's MS. The subscriber status depends on the domain for which it is requested:

The **Subscriber Status in the circuit switched domain** can take one of three values:

- **CAMEL-busy:** The MS is engaged in a mobile-originated or mobile-terminated circuit-switched call.
- **Network determined not reachable:** The network can determine from its internal data that the MS is not reachable. This includes detached and purged mobile stations.

- **Assumed idle:** The MS is not CAMEL-busy or network determined not reachable.

The **Subscriber Status in the packet switched domain** can take one of five values:

- **Detached:** The network can determine from its internal data that the MS is not registered to the GPRS data network.
- **CAMEL-attached, MS not reachable for paging:** The MS is registered to the GPRS data network, but there are no PDP contexts active for this MS; the GPRS data network can determine from its internal data that the MS is not reachable for paging.
- **CAMEL-attached, MS may be reachable for paging:** The MS is registered to the GPRS data network, but there are no PDP contexts active for this MS; the GPRS data network has not determined from its internal data that the MS is not reachable for paging.
- **CAMEL-PDP context active, MS not reachable for paging:** The MS is registered to the GPRS data network, and there is at least one PDP context active for this MS; the GPRS data network can determine from its internal data that the MS is not reachable for paging. The status includes the information for each active PDP context, as specified in 3GPP TS 23.060 [13].
- **CAMEL-PDP context active, MS may be reachable for paging:** The MS is registered to the GPRS data network, and there is at least one PDP context active for this MS; the GPRS data network has not determined from its internal data that the MS is not reachable for paging. The status includes the information for each active PDP context, as specified in 3GPP TS 23.060 [13].

GPRS session: The period during which the GPRS subscriber is registered to the GPRS data network. A GPRS session starts when the GPRS subscriber attaches to the GPRS data network. It ends when the GPRS subscriber detaches from the GPRS data network.

PDP Context: A transaction for the exchange of data between an MS and a peer entity, which is addressed by the Access Point Name. A PDP context starts when the request from a GPRS subscriber successfully establishes the PDP context and ends when the subscriber deactivates the PDP context.

PDP: Packet Data Protocol (as defined in TS 22.060 [6])

Carrier Identification Code: Identifies uniquely the Carrier (NAEA).

Carrier Selection Information: An indication of whether the subscriber selected a carrier, or the carrier is predefined for the subscriber (NAEA).

Originating Line Identification: Identifies uniquely the subscriber to be charged for the usage of the carrier (NAEA).

Charge Number: Identifies uniquely the organisation to be charged for the usage of the carrier (NAEA).

North American Equal Access (NAEA): A service used in the North American region whereby a subscriber may select the carrier to be used for long distance calls.

Subscribed Dialed Services: Identifies a set of at most ten service numbers. The served subscriber can originate calls by entering a service number for the destination. This is in addition to the possibility to route calls by entering the destination number. Each service number is defined at the HPLMN operator's discretion. The set of service numbers forms part of the subscriber's profile, whether she is registered in the HPLMN or another PLMN.

Call Party Handling (CPH): A method of manipulating call legs which includes creating new parties in a call, placing individual call parties on hold, reconnecting them to the group of call parties and disconnecting individual call parties.

CPH Configuration: One or more groups of call legs that share a common dialogue to the CSE.

Call Leg: The connection joining the call party to the CPH configuration.

Call Party: A party (e.g. served subscriber, called party, PSTN subscriber etc.) in the CPH configuration.

IP multimedia session (IPMM session): See [11] for definition.

IM CN subsystem (IP Multimedia Core Network subsystem): See [11] for definition.

IM application level registration: See [12] for definition.

4 Description

The CAMEL network feature enables the use of Operator Specific Services (OSS) by a subscriber even when roaming outside the HPLMN.

4.1 Provision of CAMEL

CAMEL subscribers have one or more CAMEL Subscription Information (CSI) elements. CAMEL Subscription Information is provided by the HPLMN operator by administrative means.

The following CSIs may be administered per subscriber:

- D-CSI** *Dialled Services CAMEL Subscription Information (D-CSI)* is transferred to the VPLMN (at location update), IPLMN (for an incoming call in GMSC) or the IM CN subsystem. D-CSI contains trigger information which is required to invoke a CAMEL service logic for subscribers dialled services. See section 5.3.2 and section A.2.2 for the usage of D-CSI.
- GPRS-CSI** *GPRS CAMEL Subscription Information (GPRS-CSI)* is transferred to the VPLMN. GPRS-CSI contains trigger information which is required to invoke a CAMEL Service Logic for GPRS Sessions and PDP Contexts.
See section 10 for the usage of GPRS-CSI.
- M-CSI** *Mobility Management CAMEL Subscription Information (M-CSI)* is transferred to the VPLMN. M-CSI is used to notify the CSE about Mobility Management events for the CS subscriber.
See section 12.1 for the usage of M-CSI.
- MG-CSI** *Mobility Management for GPRS CAMEL Subscription Information (MG-CSI)* is transferred to the VPLMN. MG-CSI is used to notify the CSE about Mobility Management events for the GPRS subscriber.
See section 12.1 for the usage of MG-CSI.
- MO-SMS-CSI** *Originating Short Message Service CAMEL Subscription Information (MO-SMS-CSI)* is transferred to the VPLMN. MO-SMS-CSI contains trigger information that is required to invoke a CAMEL Service Logic for Mobile Originating Short Message submissions.
See section 9 for the usage of MO-SMS-CSI.
- MT-SMS-CSI** *Terminating Short Message Service CAMEL Subscription Information (MT-SMS-CSI)* is transferred to the VPLMN. MT-SMS-CSI contains trigger information that is required to invoke a CAMEL Service Logic for Mobile Terminating Short Message delivery.
See section 9 for the usage of MT-SMS-CSI.
- O-CSI** *Originating CAMEL Subscription Information (O-CSI)* is transferred to the VPLMN (at location update), to the IPLMN (for an incoming call in the GMSC) and to the IM CN subsystem. O-CSI contains trigger information that is required to invoke a CAMEL Service Logic for Mobile Originating calls (in the VMSC) and Mobile Forwarding calls (in the VMSC and the GMSC).
See sections 5 and A for the usage of O-CSI.
- SS-CSI** *Supplementary Service Invocation Notification CAMEL Subscription Information (SS-CSI)* is transferred to the VPLMN. SS-CSI is used to notify the CSE about the invocation of certain Supplementary Services.
See section 12.3 for the usage of SS-CSI.
- T-CSI** *Terminating CAMEL Subscription Information (T-CSI)* is transferred to the IPLMN for an incoming call in the GMSC. T-CSI contains trigger information which is required to invoke a CAMEL Service Logic for Mobile Terminating calls in the GMSC.
See section 6 for the usage of T-CSI.
- TIF-CSI** *Translation information Flag CAMEL Subscription Information (TIF-CSI)* is transferred to the VPLMN. TIF-CSI is used in the HLR for registering short Forwarded-to-Numbers (FTNs). When TIF-CSI is present, the subscriber is allowed to register short FTNs.
When the subscriber invokes Call Deflection, TIF-CSI in the VPLMN allows the subscriber to deflect

to short Deflected-to-Numbers.
See section 18.3 for the usage of TIF-CSI.

- U-CSI** *USSD CAMEL Subscription Information (U-CSI)* is held in the HLR; it is not sent to any other node. U-CSI contains trigger information which is used to invoke a USSD application in the CSE for the served subscriber.
See section 14.3 for the usage of U-CSI.
- UG-CSI** *USSD General CAMEL Subscription Information (UG-CSI)* is held in the HLR; it is not sent to any other node. UG-CSI contains trigger information which is used to invoke a USSD application in the CSE for all subscribers.
See section 14.3 for the usage of UG-CSI.
- VT-CSI** *VMSC Terminating CAMEL Subscription Information (VT-CSI)* is transferred to the VPLMN at location update and to the IM CN subsystem. VT-CSI contains trigger information which is required to invoke a CAMEL Service Logic for Mobile Terminating calls in the VMSC.
See sections 6 and A for the usage of VT-CSI.

Refer to 3GPP TS 23.078 for detailed descriptions of the various types of CAMEL Subscription Information.

The CSI may include the Default Call Handling, Default GPRS Handling or Default SMS Handling.

The Default Call Handling indicates whether the call shall be released or continued if the contact with the CSE is not confirmed or is interrupted.

The Default GPRS Handling indicates whether the GPRS Session or PDP Context shall be released or continued, if the contact with the CSE is not confirmed or is interrupted.

The Default SMS Handling indicates whether the SMS submission or delivery shall be terminated or continued, if the contact with the CSE is not confirmed or is interrupted.

Network -based services may be provided by the serving PLMN operator. The provisioning mechanism is out of the scope of this specification.

4.2 General Procedures

Each process is made up of a series of telecommunication events, some of which are service events. At a service event, the IPLMN or VPLMN may:

- Suspend the handling of the telecommunication service and make contact with a CSE to ask for instructions, or
- Send a notification to the CSE and continue the handling of the telecommunication service, or
- Continue the handling of the telecommunication service without sending a notification to the CSE.

When a service event is reported to the CSE, the IPLMN or VPLMN shall send to the CSE the information listed in this specification. All information sent to the CSE relates to the served CAMEL subscriber unless otherwise stated. The initial service events, which can initiate contact with the CSE, are defined in the CAMEL Subscription Information. The CSE identity which corresponds to each initial service event is also defined in the CAMEL Subscription Information.

The serving network shall accept the instruction from the CSE and continue call processing with the received information.

The CAMEL feature is applicable in a PLMN when the CAMEL subscription information is handled properly and when the communication to the CSE is compliant with the CAMEL protocol [8].

The CAMEL network capabilities are used at a PLMN when the CAMEL feature is applicable and:

- The CSI is received from the HPLMN; or
- The CSE requests congestion control in the VPLMN or IPLMN.

In addition dialled network-based services may be applicable in a PLMN if so administered.

The CSE shall be capable of responding to the CAMEL request with instructions on how to resume the suspended process. In the case of subscriber-based services the CSE shall be able to instruct the IPLMN or VPLMN to:

- Activate subsequent service events to be reported to the CSE. These events shall remain active only for the lifetime of the telecommunication service;
- Alter information relating to the suspended process;
- Alter information relating to the parties involved in the process;
- Indicate which of the possible parts of the process should occur next (e.g. terminate the call);
- Perform charging activities;
- Order in-band user interaction.

If a control relationship exists between the CSE and the IPLMN/VPLMN of the served subscriber, then at any time during the call the CSE can instruct the IPLMN/VPLMN of the served subscriber to perform one or more of the following Call Party Handling operations:

- Create additional parties in the call (additional parties shall be created in a held state);
- Release an individual call party ;
- Release all parties in the call.

If a control relationship exists between the CSE and the IPLMN/VPLMN of the served subscriber, then at any time during the alerting and active phases of a call leg, the CSE can instruct the IPLMN/VPLMN of the served subscriber to perform the following Call Party Handling operation:

- Connect an individual call party to the group of call parties, within the same call (the call party shall be in a held state immediately before this operation).

If a control relationship exists between the CSE and the IPLMN/VPLMN of the served subscriber, then at any time during the active phase of a call leg, the CSE can instruct the IPLMN/VPLMN of the served subscriber to perform the following Call Party Handling operation:

- Place an individual call party on hold (the call party shall not be in a held state immediately before this operation).

NOTE: Call Party Handling operations are not applicable to a call leg or group of legs which are involved in user interaction (Play Announcement or Prompt and Collect User Information)

It shall be possible for the CSE to initiate a new call to the HPLMN/VPLMN of a subscriber at any time.

For subscribed dialled services it shall be possible for the CSE to instruct the serving PLMN to perform either or both of the following actions:

- Perform charging activities;
- Order in-band user interaction.

After the CSE has issued either or both of the preceding instructions, it shall issue exactly one of the following instructions to the serving PLMN:

- Continue the processing of the call, or
- Continue the processing of the call with modified information, or
- Connect the calling party to a specified called party, or
- Release the call.

After one of the above instructions, the relation between the serving network and the CSE shall be released. Any other behaviour may cause misoperation of CAMEL based services.

Serving network-based service numbers may be treated after the behaviour described above. These services are outside the scope of the CAMEL specification.

Serving network based service numbers may be provided at the discretion of the network operator but these are outside the scope of this specification.

CAMEL features shall form an integral part of the following processes:

- Mobile Originated call (MO call);
- Mobile Terminated call (MT call) in GMSC;
- Mobile Terminated call (MT call) in VMSC;
- Mobile Forwarded call (MF call) - early call forwarding; early forwarded calls are treated as MO calls;
- Mobile Forwarded call (MF call) - late call forwarding; late forwarded calls are treated as MO calls;
- Mobile Originated IP Multimedia Session in Serving CSCF;
- Mobile Terminated IP Multimedia Session in Serving CSCF;
- Supplementary service invocation;
- USSD user interaction. The service codes for CAMEL services can be allocated per subscriber or globally for all subscribers of the HPLMN;
- Mobile Originated Short Message (MO SM) service; via both the MSC and the SGSN;
- Mobile Terminating Short Message (MT SM) service; via both the MSC and the SGSN;
- General Packet Radio Service (GPRS);
- Mobility Management events;
- Interrogation and control of Subscription Data.

The CSE shall be able to interrogate the HPLMN for information about the location and status of a particular subscriber at any time.

4.3 Applicability of CAMEL Procedures

CAMEL procedures are applicable to all circuit switched Basic Services without distinction (except Emergency calls).

CAMEL procedures are applicable to GPRS sessions and PDP contexts.

CAMEL procedures are applicable to the Mobile Originating/ Terminating Short Message Service through both circuit switched and packet switched serving network entities.

CAMEL procedures are applicable to IP multimedia sessions (except Emergency Calls) to support legacy services.

CAMEL shall support IPMM sessions which are based on the same charging paradigms as CS/PS calls. This applies most probably to VoIP and Video over IP. New charging paradigms - and this includes especially the flexible content-based charging - are to be supported by the new charging functions defined for the IM domain.

CAMEL procedures are applicable to IP multimedia sessions addressed by either E.164 numbers or SIP URLs.

5 Procedures for Mobile Originated Calls and Forwarded Calls

NOTE: Other information elements not listed in the following subclauses may be necessary to meet some Stage 1 service requirements. Refer to the Stage 2 specification TS 23.078 for complete information element lists.

5.1 Initial service events

It shall be possible to specify which of the following initial service events shall initiate contact with the CSE:

- Collection of dialled digits;
- Analysis of dialled digits;
- Detection of unsuccessful call establishment.
Unsuccessful call establishment may be caused by:
 - Route select failure.

The definition of which of the above initial service events shall initiate contact with the CSE is part of the subscriber's CAMEL subscription information. Analysis of dialled digits can open a new dialogue regardless of whether a relationship exists. Upon detection of unsuccessful call establishment no new relationship is opened if there is already a dialogue open due to the same CSI.

5.2 Criteria for contact with the CSE

It shall be possible for the HPLMN to specify criteria which must be satisfied before the CSE is contacted.

The following criteria may be defined:

5.2.1 CSI criteria applicable at call setup

5.2.1.1 CSI criteria applicable at call setup when dialled digits have been collected

CSI criteria may be defined for a subscriber for the case where collection of dialled digits has been performed.

- Criteria on the dialled number; these consist of:
 - The contents of the dialled number (a list of up to 10 dialled number strings may be defined in the criteria. Each dialled number string may be of any type of number (TON) format supported by the access protocol).
 - The length of the dialled number (a list of up to three lengths may be defined.).
- The criteria on the dialled number may be collectively defined to be either "enabling" triggering criteria or "inhibiting" triggering criteria (see below). The HPLMN may also choose not to define any criteria on the dialled number.
- A criterion on the basic service: this consists of a list of up to 5 basic service codes for individual basic services or basic service groups. The HPLMN may also choose not to define any criterion on the basic service.
- A criterion on the type of call: this consists of defining whether the call must be a forwarded call.

A call is treated as forwarded in this respect when either a forwarding supplementary service applies or when the call is forwarded as a result of a terminating CAMEL based service. The HPLMN may also choose not to define any criterion on the type of call.

If the criteria on the dialled number are "enabling", then the dialled number criteria are satisfied if:

- The dialled number matches a dialled number string defined in the criteria; or
- The length of the dialled number matches a dialled number length defined in the criteria.

If the criteria on the dialled number are "inhibiting", then the dialled number criteria are satisfied if:

- The dialled number does not match any of the dialled number strings defined in the criteria; and
- The length of the dialled number is not the same as any dialled number length defined in the criteria.

In these tests the dialled number matches one of the dialled number strings if:

- The two numbers are of the same Type Of Number (TON); and

- The dialled number is at least as long as the dialled number string in the criteria; and
- All the digits in the dialled number string in the criteria match the leading digits of the dialled number.

If no criterion on the dialled number is specified, then the dialled number criteria are satisfied.

The criterion on the basic service is satisfied if the basic service used for the call corresponds to any basic service code or basic service group defined in the criterion or if no basic service criterion is specified.

The criterion on the type of call is satisfied if the type of the call is the same as the type defined in the criterion or if no call type criterion is specified.

The criteria on the call setup event procedure are satisfied if:

- The criteria on the dialled number are satisfied; and
- The criterion on the basic service is satisfied; and
- The criterion on the type of call is satisfied.

5.2.1.2 CSI criterion applicable at call setup for subscribed dialled services

A CSI criterion on the contents of the called number shall be defined for subscribed dialled services. A list of up to 10 called number strings may be defined in the criterion. Each entry in the called number list has associated with it a CSE identity and a service key which defines the service to be triggered if the criterion is satisfied.

If any other CAMEL dialogue has changed the called number, then the modified called number shall be used for the conditional triggering check.

The called number criterion is satisfied if the called number matches a called number string defined in the criterion.

In this test the called number matches one of the called number strings if:

- The two numbers are of the same Type Of Number (TON); and
- The called number is at least as long as the called number string in the criteria; and
- All the digits in the called number string in the criteria match the leading digits of the called number.

5.2.1.3 CSI criterion applicable on detection of unsuccessful call establishment

A criterion on the release cause may be defined. This consists of a list of up to 5 cause values. The criterion on the release cause is satisfied if the received call release cause corresponds to any cause value defined in the list or if no criterion is defined.

5.3 Call set-up request procedure

5.3.1 Procedure when dialled digits have been collected

The purpose of this procedure is to detect a call set-up request at the point where digits have been collected but not analysed, and to allow the CSE to modify the handling of the call set-up request.

If (according to the CSI):

- The subscriber is provisioned with a CAMEL based originating service; and
- The call set-up request occurs; and
- The criteria are satisfied.

Then the VPLMN/IPLMN shall suspend call processing, make contact with the CSE and await further instructions.

- When the VPLMN/IPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below.

- Perform charging activities;
- Activate subsequent control service events for the call. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:
 - Called party alert;
 - Called party connection;
 - Call disconnection;
 - Calling party abandon;
 - Unsuccessful call establishment. In the case of no answer the CSE may provide a no answer timer;
 - Mid call event (DTMF). The CSE shall specify the digit string(s) for which the instruction is valid;
 - Change of Position event.
 - The party in the call for which the event shall be detected and reported (calling or called party);
 - The type of monitoring (control or notification).
- Order in-band user interaction;

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Bar the call (i.e. release the call prior to connection);
- Continue the call processing;
- Continue the call processing with modified information;
- Continue the handling of the calling party without routeing the call to the destination.

5.3.2 Procedure for subscribed dialled services

The purpose of this procedure is to detect a call set-up request at the point where the called party number has been compared with the dialled services information, and allow the CSE to modify the handling of the call set-up request. Triggering of this procedure shall happen immediately after the procedure when dialled digits have been collected.

5.3.2.1 Initiation of contact with the CSE

If (according to the CSI):

- The subscriber is provisioned with a CAMEL based originating service; and
- The call set-up request occurs; and
- The criteria are satisfied.

Then the VPLMN/IPLMN shall suspend call processing, make contact with the CSE and await further instructions.

Contact with the CSE shall (if necessary) be made in this manner before network dialled services are invoked.

5.3.2.2 Further processing of the call

When the VPLMN/IPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN/IPLMN to act as described below:

- Perform charging activities The CSE is only allowed to send e-values (refer to sect. 15.1, 'CSE controlled e-values') and include free format data in Call Data Records (refer to sect. 15.2, 'Inclusion in charging records of information received from the CSE');
- Order in-band user interaction. (Interaction with the service triggered from previous triggering may be needed to avoid duplicated guidance etc.).

Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Allow the call processing to continue unchanged;
- Allow the call processing with modified information;
- Release the call.

5.4 Calling party abandon

The purpose of this procedure is to manage an outgoing call set-up at the time it is terminated by the calling party before the call is established.

If the CSE has activated this subsequent service event for this call in notify mode and the calling party abandon event occurs, then the VPLMN/IPLMN shall:

- Notify the CSE and continue.

The following information shall be provided to the CSE:

- Event met;
- Type of monitoring;

If the CSE has activated this subsequent service event for this call in request mode and the calling party abandon event occurs, then the VPLMN/IPLMN shall suspend call processing, make contact with the CSE and await further instructions.

When the VPLMN/IPLMN has made contact with the CSE in request mode, the CSE shall be able to instruct the VPLMN to act as described below.

- Perform charging activities.

There shall be no restriction regarding the number of times the above instruction can be repeated. Once the CSE has concluded issuing the above instruction, it shall issue the following instruction:

- Continue the call processing.

5.5 Unsuccessful call establishment

The purpose of this procedure is to manage an outgoing call set-up at the time when the call establishment is unsuccessful.

If no control relationship for the given call exists and

- The unsuccessful call establishment procedure is defined as an initial service event (according to the CSI); and
- The call attempt is unsuccessful; and
- The triggering criteria are satisfied.

Then the VPLMN/IPLMN shall suspend call processing, make contact with the CSE and await further instructions.

If a relationship for the given call already exists and the CSE has activated this subsequent service event for this call and the unsuccessful call establishment event occurs, then the VPLMN/IPLMN shall:

- Suspend call processing, notify the CSE and await further instructions, or
- Notify the CSE and continue call processing.

In both cases above the following information shall be provided to the CSE:

- Event met;
- Type of monitoring;
- Cause for unsuccessful call establishment:
 - Not reachable;
 - Busy;
 - No answer;
 - Route select failure.

If the unsuccessful call procedure is armed as an initial service event, then a new relationship is opened only if triggering criteria are fulfilled and no relationship already exists for the same CSI.

When the VPLMN/IPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN/IPLMN to act as described below:

- Perform charging activities;
- Activate subsequent control service events for the call. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:
 - Called party alert;
 - Called party connection;
 - Call disconnection;
 - Calling party abandon;
 - Unsuccessful call establishment. In the case of no answer the CSE may provide a no answer timer;
 - Mid call event (DTMF). The CSE shall specify the digit string(s) for which the instruction is valid. The detection of the mid call event shall be limited to the VPLMN.
 - Change of Position event.
 - The party in the call for which the event shall be detected and reported (calling or called party);
 - The type of monitoring (control or notification).
- Order in-band user interaction;

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Release the call;
- Continue the call processing;
- Continue the call processing with modified information.

5.6 Called party connection procedure

The purpose of this procedure is to manage an outgoing call set-up at the time when the called party answers and the call is successfully established.

If the CSE has activated this subsequent service event for this call and the called party connection event occurs, then the VPLMN/IPLMN shall:

- Suspend call processing, notify the CSE and await further instructions, or
- Notify the CSE and continue call processing.

The following information shall be provided to the CSE:

- Event met;
- The party in the call for which the event is reported (only called party applicable);
- The charge indicator which will be used in the Call Data Record if available;
- Type of monitoring.

When the VPLMN/IPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below.

- Perform charging activities;
- Activate subsequent control service events for the call. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:
 - Call disconnection;
 - Mid call event (DTMF). The detection of the mid call event shall be limited to VPLMN.
 - Change of Position event.
 - The party in the call for which the event shall be detected and reported (calling or called party);
 - The type of monitoring (control or notification).
- Order in-band user interaction.

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Release the call;
- Continue the call processing.

5.7 Mid call procedure

When the CSE instructs the VPLMN to arm the mid-call event it shall specify a criterion against which digits entered by the originating subscriber using the DTMF procedure shall be matched. It shall be possible for the CSE to instruct the VPLMN to re-arm the mid-call event when it is encountered.

In the following, each digit shall be taken from the set (0 - 9, *, #).

The criterion consists of a list defining:

- The minimum number of digits to be collected, and
- The maximum number of digits to be collected, and
- The maximum delay between successive digits, and optionally
- The digit(s) used to indicate the start of the input, and optionally
- The digit(s) used to indicate the end of the input, and optionally
- The digit(s) used to indicate that the input shall be cancelled.

The minimum and maximum number of digits to be collected includes the digit(s) used to indicate the start and end of the input.

A digit string has been cancelled if:

- The CSE has specified digit(s) used to indicate that the input shall be cancelled, and
- The specified digit(s) has/have been received from the user.

If the CSE has specified digit(s) used to indicate the start of the input, then the input has started if:

- The specified digit(s) has/have been received from the user, and
- The digit string has not been cancelled.

If the CSE has not specified digit(s) used to indicate the start of the input, then the input has started if:

- At least one digit has been received from the user, and
- The digit string has not been cancelled.

If the CSE has specified digit(s) used to indicate the end of the input, then the input has ended if:

- The specified digit(s) has/have been received from the user, or
- The maximum number of digits has been received, or
- The maximum delay between successive digits has been exceeded.

If the CSE has not specified digit(s) used to indicate the end of the input, then the input has ended if:

- The maximum number of digits has been received, or
- The maximum delay between successive digits has been exceeded.

A digit string satisfies the criterion for the Mid call detection point if:

- The input has started, and
- The digit string contains at least the minimum number of digits, and
- The input has ended.

Triggering of the mid-call event shall occur immediately after the criterion has been satisfied. Once the triggering occurs the VPLMN shall disarm the mid-call event.

Digits collected from the subscriber shall be relayed as DTMF towards the destination subscriber independent of any CAMEL processing.

If the CSE has activated this service event for the served subscriber and a mid-call event (as determined by the criterion for the mid-call procedure being satisfied) occurs, then the VPLMN shall:

- Suspend call processing, notify the CSE and await further instructions, or
- Notify the CSE and continue call processing.

The following information shall be provided to the CSE:

- Event met;
- Type of monitoring;
- Event specific data:
 - Received DTMF digits.

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below:

- Perform charging activities;
- Activate other control service events for the call. The CSE shall have the possibility to send the following information:
 - The service event which shall be detected and reported:
 - Call disconnection;
 - Mid call event (DTMF);
 - Change of Position event.
 - The party in the call for which the event shall be detected and reported (calling or a called party);
 - The type of monitoring (control or notification).
- Order in-band user interaction.

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Release the call;
- Continue the call processing.

5.8 Call disconnection procedure

The purpose of this procedure is to manage the actions on disconnection of an established call. This procedure is applicable to any party in the call.

If the CSE has activated this subsequent service event for this call and the call disconnection event occurs, then the VPLMN/IPLMN shall:

- Suspend call processing, notify the CSE and await further instructions, or
- Notify the CSE and continue call processing.

The following information shall be provided to the CSE:

- Event met;
- The party in the call for which the event is reported;
- Type of monitoring;
- Disconnection reason.

When the VPLMN/IPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN/IPLMN to act as described below:

- Perform charging activities
- Activate subsequent control service events for the call. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:
 - Called party alert;
 - Called party connection;
 - Call disconnection;
 - Calling party abandon;

- Unsuccessful call establishment. In the case of no answer the CSE may provide a no answer timer;
- Mid call event (DTMF). The CSE shall specify the digit string(s) for which the instruction is valid;
- Change of Position event.
- The party in the call for which the event shall be detected and reported (calling or called party);
- The type of monitoring (control or notification).
- Order in-band user interaction;

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Continue the call processing, i.e. release the call;
- Continue the call processing with modified information.

5.9 CSE initiated call release procedure

Following the CAMEL processing of the Call set-up request procedure it shall be possible for the CSE to initiate a call release at any moment of the call.

To use this procedure:

- The originating VPLMN shall have reported an initial service event to the CSE and be waiting for instructions from the CSE, or
- The CSE shall be waiting for the report of any subsequent service event (with "Type of monitoring" set to control).

5.10 Void

5.11 Called party alert reporting procedure

The purpose of this procedure is to manage an outgoing call set-up at the time when the called party is alerted.

If the CSE has activated this service event for this call and the called party alert event occurs, then the IPLMN/VPLMN shall:

- Suspend call processing, notify the CSE and await further instructions, or
- Notify the CSE and continue call processing.

The following information shall be provided to the CSE:

- Event met;
- The party in the call for which the event is reported (only called party applicable);
- Type of monitoring.

When the IPLMN/VPLMN has made contact with the CSE, the CSE shall be able to instruct the IPLMN/VPLMN to act as described below:

- Perform charging activities;
- Activate subsequent control service events for the call. The CSE shall have the possibility to send the following information:
 - The service event which shall be detected and reported:

- Calling party abandon;
- Unsuccessful call establishment. In the case of no answer the CSE may provide a no answer timer;
- Call disconnection;
- Mid call event (DTMF);
- Called party connection;
- Change of Position event.
- The party in the call for which the event shall be detected and reported;
- The type of monitoring (control or notification).
- Order in-band user interaction.

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue the following instruction:

- Continue the call processing.

5.12 Change of position procedure

When the CSE instructs the VPLMN to arm the change of position event, the VPLMN shall report the event when the subscriber's location information changed. It shall be possible for the CSE to instruct the VPLMN to re-arm the change of position event when it is encountered.

If the CSE has activated this service event for the served subscriber and a change of position event occurs, then the VPLMN shall:

- Notify the CSE and continue call processing.

The following information shall be provided to the CSE:

- Event met;
- Type of monitoring;
- Event specific data;
- Location information;
- Charge result if charging supervision is provided;

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below:

- Perform charging activities;
- Activate other control service events for the call. The CSE shall have the possibility to send the following information:
 - The service event which shall be detected and reported:
 - Change of position event.
 - The party in the call for which the event shall be detected and reported;
 - The type of monitoring (notification).

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated.

6 Procedures for Mobile Terminated Calls

NOTE: Other information elements not listed in the following subclauses may be necessary to meet some Stage 1 service requirements. Refer to the Stage 2 specification TS 23.078 for complete information element lists.

In the following subclauses VPLMN applies to CAMEL3 and later only.

6.1 Initial service events

It shall be possible to specify which of the following initial service events shall initiate contact with the CSE:

- Terminating Attempt Authorised;
- Detection of unsuccessful call establishment.

Unsuccessful call establishment may be caused by:

- Called subscriber busy;
- Called subscriber not reachable;
- No answer from called subscriber.

Upon detection of unsuccessful call establishment no new relationship is opened if there is already a dialogue opened due to same CSI.

6.2 Criteria for contact with the CSE

6.2.1 CSI criteria applicable on terminating attempt authorisation

It shall be possible for the HPLMN to specify a criterion which must be satisfied before the CSE is contacted.

The following criterion may be defined:

- A criterion on the basic service; this consists of a list of up to 5 basic service codes for individual basic services or basic service groups. The HPLMN may also choose not to define any criterion on the basic service.

The criterion on the basic service is satisfied if the basic service used for the call corresponds to any basic service code defined in the criterion or if no basic service criterion is specified.

On the incoming call request event procedure the CSE shall be contacted if the criterion on the basic service is satisfied.

6.2.2 CSI criterion applicable on detection of unsuccessful call establishment

A criterion on the failure reason may be defined. This consists of a list of up to 5 failure reasons. A failure reason can denote a release cause value or can denote that the HPLMN determined that the called subscriber was not reachable.

The criterion on the failure reason is satisfied if the reason for failure of the call corresponds to any failure reason defined in the list or if no criterion is defined.

6.3 Incoming call request procedure

The purpose of this procedure is to detect an incoming call request and allow the CSE to modify the handling of the incoming call.

If (according to the CSI):

- The subscriber is provisioned with a CAMEL based terminating service; and
- The incoming call request event occurs

Then the IPLMN/VPLMN shall suspend call processing, make contact with the CSE and await further instructions.

When the IPLMN/VPLMN has made contact with the CSE, the CSE shall be able to instruct the IPLMN to act as described below:

- Perform charging activities;
- Activate subsequent control service events for the call. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:
 - Called party alert;
 - Called party connection;
 - Call disconnection;
 - Calling party abandon;
 - Unsuccessful call establishment. In the case of no answer the CSE may provide a no answer timer.
 - Mid call event (DTMF). The CSE shall specify the digit string(s) for which the instruction is valid;
 - Change of Position event.
 - The party in the call for which the event shall be detected and reported (calling or called party);
 - The type of monitoring (control or notification).
- Suppress tones and announcements which may be played to the calling party, if an unsuccessful call establishment occurs.
- Order in-band user interaction.

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Bar the call (i.e. release the call before connection);
- Continue the call processing;
- Continue the call processing with modified information;
- Continue the handling of the calling party without routeing the call to the destination.

If the CSE instructs the IPLMN/VPLMN to continue the call processing with a changed called party number, then the CSE shall indicate whether the IPLMN/VPLMN may invoke a CAMEL Service for the resulting call. A forwarded call resulting from a CSE Call Forwarding service may cause an invocation of a mobile originated CAMEL based service in the IPLMN/VPLMN.

If the CSE instructs the IPLMN/VPLMN to allow the call processing with modified information, then the CSE may send to the IPLMN/VPLMN an alerting pattern in order to alert the called subscriber in a specific manner. When the alerting pattern is sent to the IPLMN, it shall be transferred to the VPLMN.

6.4 Calling party abandon

The purpose of this subsequent procedure is to manage an incoming call set-up at the time it is terminated by the calling party before the call is established.

If the CSE has activated this service event for this call in notify mode and the calling party abandon event occurs, then the IPLMN/VPLMN shall:

- Notify the CSE and continue.

The following information shall be provided to the CSE:

- Event met;
- Type of monitoring.

If the CSE has activated this subsequent service event for the call in request mode and the calling party abandon event occurs, then the IPLMN/VPLMN shall suspend call processing, make contact with the CSE and await further instructions.

When the IPLMN/VPLMN has made contact with the CSE in request mode, the CSE shall be able to instruct the IPLMN/VPLMN to act as described below:

- Perform charging activities;

There shall be no restriction regarding the number of times the above instruction can be repeated. Once the CSE has concluded issuing the above instruction, it shall issue the following instruction:

- Continue the call processing.

6.5 Unsuccessful call establishment

The purpose of this procedure is to manage an incoming call set-up at the time when the call establishment is unsuccessful.

If no relationship for the given call exists and

- The unsuccessful call establishment procedure is defined as an initial service event (according to the CSI); and
- The call attempt is unsuccessful; and
- The triggering criteria are satisfied

Then the VPLMN/IPLMN shall suspend call processing, make contact with the CSE and await further instructions.

If a relationship for the given call already exists and the CSE has activated this subsequent service event for this call and the unsuccessful call establishment event occurs, then the VPLMN/IPLMN shall:

- Suspend call processing, notify the CSE and await further instructions, or
- Notify the CSE and continue call processing.

In both cases above the following information shall be provided to the CSE:

- Event met;
- Type of monitoring;
- Cause for unsuccessful call establishment:
 - Not reachable;
 - Busy;
 - No answer;
 - Forwarding notification.

If the unsuccessful call establishment procedure is armed as an initial service event and the IPLMN/VPLMN has made contact with the CSE, then the CSE shall be able to instruct the IPLMN to act as described below:

- Perform charging activities;
- Activate subsequent control service events for the call. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:
 - Called party alert;

- Called party connection;
- Call disconnection;
- Calling party abandon;
- Unsuccessful call establishment. In the case of no answer the CSE may provide a no answer timer;
- Mid call event (DTMF). The CSE shall specify the digit string(s) for which the instruction is valid;
- Change of Position event.
- The party in the call for which the event shall be detected and reported (calling or called party);
- The type of monitoring (control or notification).
- Order in-band user interaction.

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Release the call;
- Continue the call processing;
- Continue the call processing with modified information.

6.6 Called party connection procedure

The purpose of this procedure is to manage an incoming call set-up at the time when the called party answers and the call is successfully established.

If the CSE has activated this subsequent service event for this call and the called party connection event occurs, then the IPLMN/VPLMN shall:

- Suspend call processing, notify the CSE and await further instructions, or
- Notify the CSE and continue call processing.

The following information shall be provided to the CSE:

- Event met;
- The party in the call for which the event is reported (only called party applicable);
- The destination address for the call;
- The charge indicator which will be used in the Call Data Record if available;
- Type of monitoring.

When the IPLMN/VPLMN has made contact with the CSE, the CSE shall be able to instruct the IPLMN/VPLMN to act as described below.

- Perform charging activities;
- Activate subsequent control service events for the call. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:
 - Call disconnection;
 - Mid call event (DTMF). Detection of the mid call event shall be limited to the VPLMN;

- Change of Position event.
- The party in the call for which the event shall be detected and reported (calling or called party);
- The type of monitoring (control or notification).
- Order in-band user interaction.

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Release the call;
- Continue the call processing;

6.7 Mid Call procedure

When the CSE instructs the VPLMN to arm the mid-call event it shall specify a criterion against which digits entered by the terminating subscriber using the DTMF procedure shall be matched. It shall be possible for the CSE to instruct the VPLMN to re-arm the mid-call event when it is encountered.

In the following each digit shall be taken from the set (0 - 9, *, #).

The criterion consists of a list defining:

- The minimum number of digits to be collected, and
- The maximum number of digits to be collected, and
- The maximum delay between successive digits, and optionally
- The digit(s) used to indicate the start of the input, and optionally
- The digit(s) used to indicate the end of the input, and optionally
- The digit(s) used to indicate that the input shall be cancelled.

The minimum and maximum number of digits to be collected includes the digit(s) used to indicate the start and end of the input.

A digit string has been cancelled if:

- The CSE has specified digit(s) used to indicate that the input shall be cancelled, and
- The specified digit(s) has/have been received from the user.

If the CSE has specified digit(s) used to indicate the start of the input, then the input has started if:

- The specified digit(s) has/have been received from the user, and
- The digit string has not been cancelled.

If the CSE has not specified digit(s) used to indicate the start of the input, then the input has started if:

- At least one digit has been received from the user, and
- The digit string has not been cancelled.

If the CSE has specified digit(s) used to indicate the end of the input, then the input has ended if:

- The specified digit(s) has/have been received from the user, or
- The maximum number of digits has been received, or
- The maximum delay between successive digits has been exceeded.

If the CSE has not specified digit(s) used to indicate the end of the input, then the input has ended if:

- The maximum number of digits has been received, or
- The maximum delay between successive digits has been exceeded.

A digit string satisfies the criterion for the Mid call detection point if:

- The input has started, and
- The digit string contains at least the minimum number of digits, and
- The input has ended.

Triggering of the mid-call event shall occur immediately after the criterion has been satisfied. Once the triggering occurs the VPLMN shall disarm the mid-call event.

Digits collected from the subscriber shall be relayed as DTMF towards the destination subscriber independent of any CAMEL processing.

If the CSE has activated this service event for this call and a mid call event (as determined by the criterion for the mid-call procedure being satisfied) occurs, then the VPLMN shall:

- Suspend call processing, notify the CSE and await further instructions, or
- Notify the CSE and continue call processing.

The following information shall be provided to the CSE:

- Event met;
- The party in the call for which the event is reported;
- Type of monitoring;
- Event specific data:
 - Received DTMF digits.

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below:

- Perform charging activities
- Activate other control service events for the call. The CSE shall have the possibility to send the following information:
 - The service event which shall be detected and reported:
 - Call disconnection;
 - Mid call event (DTMF);
 - Change of Position event.
 - The party in the call for which the event shall be detected and reported (calling or a called party);
 - The type of monitoring (control or notification).
- Order in-band user interaction.

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Release the call;
- Continue the call processing.

6.8 Call disconnection procedure

The purpose of this procedure is to manage the actions on disconnection of an established call.

If the CSE has activated this subsequent service event for the call and the call disconnection event occurs, then the IPLMN/VPLMN shall:

- Suspend call processing, notify the CSE and await further instructions, or
- Notify the CSE and continue call processing.

The following information shall be provided to the CSE:

- Event met;
- The party in the call for which the event is reported;
- Type of monitoring;
- Disconnection reason.

When the IPLMN/VPLMN has made contact with the CSE, the CSE shall be able to instruct the IPLMN/VPLMN to act as described below.

- Perform charging activities;
- Activate subsequent control service events for the call. The CSE shall have the possibility to send the following information:
 - The service subsequent event which shall be detected and reported:
 - Called party alert;
 - Called party connection;
 - Call disconnection;
 - Calling party abandon;
 - Unsuccessful call establishment. In the case of no answer the CSE may provide a no answer timer;
 - Mid call event (DTMF). The CSE shall specify the digit string(s) for which the instruction is valid;
 - Change of Position event.
 - The party in the call for which the event shall be detected and reported (calling or called party);
 - The type of monitoring (control or notification).
- Order in-band user interaction.

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instruction:

- Continue the call processing, i.e. release the call;
- Continue the call processing with modified information.

6.9 CSE initiated call release procedure

Following the CAMEL processing of the incoming call request procedure it shall be possible for the CSE to initiate a call release at any moment of the call.

To use this procedure:

- The originating VPLMN shall have reported an initial service event to the CSE and be waiting for instructions from the CSE, or
- The CSE shall be waiting for the report of a subsequent service event (with "Type of monitoring" set to control).

6.10 Called party alert reporting procedure

The purpose of this procedure is to manage an outgoing call set-up at the time when the called party is alerted.

If the CSE has activated this service event for this call and the called party alert event occurs, then the IPLMN/VPLMN shall:

- Suspend call processing, notify the CSE and await further instructions, or
- Notify the CSE and continue call processing.

The following information shall be provided to the CSE:

- Event met;
- The party in the call for which the event is reported (only called party applicable);
- Type of monitoring.

If the VPLMN reports the alerting event to the CSE, then the location information of the MS shall be provided to the CSE.

When the IPLMN/VPLMN has made contact with the CSE, the CSE shall be able to instruct the IPLMN/VPLMN to act as described below:

- Perform charging activities;
- Activate subsequent control service events for the call. The CSE shall have the possibility to send the following information:
 - The service event which shall be detected and reported:
 - Calling party abandon;
 - Unsuccessful call establishment. In the case of no answer the CSE may provide a no answer timer;
 - Call disconnection;
 - Mid call event (DTMF);
 - Change of Position event;
 - Called party connection.
 - The party in the call for which the event shall be detected and reported;
 - The type of monitoring (control or notification).
- Order in-band user interaction.

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue the following instruction:

- Continue the call processing.

6.11 Void

6.12 Change of position procedure

When the CSE instructs the VPLMN to arm the change of position event, the VPLMN shall report the event when the subscriber's location information changed. It shall be possible for the CSE to instruct the VPLMN to re-arm the change of position event when it is encountered.

If the CSE has activated this service event for the served subscriber and a change of position event occurs, then the VPLMN shall:

- Notify the CSE and continue call processing.

The following information shall be provided to the CSE:

- Event met;
- Type of monitoring;
- Event specific data;
- Location information;
- Charge result if charging supervision is provided:

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below:

- Perform charging activities;
- Activate other control service events for the call. The CSE shall have the possibility to send the following information:
 - The service event which shall be detected and reported:
 - Change of position event.
 - The party in the call for which the event shall be detected and reported;
 - The type of monitoring (notification).

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated.

7 Procedures for serving network dialled services

The purpose of this procedure is to detect a match between the called party number and a stored network service number at the call set-up request. It is to allow the CSE to modify the handling of the call set-up request. If this procedure is triggered, it shall happen after processing of Subscribed Dialled Services triggered via the CSI. If any other CAMEL dialogue has changed the called party number then the modified called party number is used for conditional triggering check.

7.1 Initiation of contact with the CSE

If:

- The call set up request occurs, and
- The call set up request procedure is passed, and
- The PLMN is provisioned with network based service information

Then the PLMN shall suspend call processing, make contact with the CSE and await further instructions.

7.2 Further processing of the call

When the serving network has made contact with the CSE, the CSE shall be able to instruct the serving network to act as described below:

- Release the call;
- Continue the call processing;
- Continue the call processing with modified information;
- Perform charging activities (the CSE is only allowed to include charging data in the Call Data Record or to provide Advice of Charge information);
- Order in-band user interaction. (Interaction with the service triggered from previous triggering may be needed to avoid duplicated guidance etc.).

Further processing of the call continues as detailed in Section 5.3, and the CSE contact initiated at this procedure is terminated.

8 Procedures for Call Party Handling

Call Party Handling (CPH) procedures only apply to speech telephony (TS11) as defined in TS 22.003 [10].

CPH procedures apply to MO, MF, MT, VT and CSE initiated calls. If the served subscriber is involved in a CPH configuration controlled by her CSE, then any further MO or MT call setup request involving the served subscriber shall be handled by a separate relationship with the served subscriber's CSE. This new relationship may lead to the creation of a further CPH configuration for the served subscriber. The service logic for one CSE relationship is not necessarily aware of what is happening in another CSE relationship involving the same served subscriber.

It is not required to transfer a leg or a group of legs between separate CPH configurations.

Where service logic involves Call Party Handling procedures, the Service Interaction Indicators Two parameter should be used to manage interactions with Supplementary Services (CF, CD and MPTY for each call leg and ECT and HOLD for the served subscriber).

The CSE shall be able to add parties to, or remove parties from, the group. Each party in this group can communicate with all other parties in the group. The IPLMN/VPLMN shall support at least 6 parties (of which one may be a Specialised Resource Function) in a group.

If a control relationship exists, the CSE may order in-band user interaction with any held call party at any point during the active phase of the call leg.

Charging activities shall be possible during a CPH configuration as indicated in clause 15.

8.1 CPH procedures for an existing call

8.1.1 Creating additional parties in the call

The purpose of this procedure is to allow the CSE to create additional parties in a call at any point during that call. The CSE initiated call leg shall be created in the held state in the IPLMN/VPLMN of the served subscriber.

If a control relationship exists, it shall be possible for the CSE to instruct the IPLMN/VPLMN of the served subscriber to initiate a new call leg to an additional party. The new call leg shall form part of the existing CPH configuration.

If a CSE initiated new call leg is created within a CAMEL relationship for a mobile originated call (MO case) or for a mobile terminating call in the VPLMN (VT case), then the CSE initiated new leg in the VPLMN shall be subject to the Outgoing Call Barring Supplementary Services and the Outgoing Operator Determined Barring categories. However the CSE shall be able to instruct the VPLMN to suppress the invocation for the new leg of conditional barring of outgoing calls by the call barring supplementary service and operator determined barring as indicated in subclause 18.8.

If the CSE sends a request to initiate a new call leg, then the events relating to unsuccessful call establishment and answer shall be armed by the CSE to maintain a control relationship.

8.1.2 Placing an individual call party on hold

The purpose of this procedure is to allow the CSE to instruct the IPLMN/VPLMN to place an individual call party on hold.

The CSE may instruct the IPLMN/VPLMN to put a call party on hold at any point during the active phase of the call leg if a control relationship exists.

The CSE shall be able to instruct the IPLMN/VPLMN to send a notification towards the held party indicating that she has been placed on hold. The notification shall be a tone or an announcement.

NOTE: This procedure does not use the HOLD supplementary service, however the notification message sent to the MS may be the same as for the HOLD supplementary service. The CSE may use other procedures instead of, or as well as, instructing the IPLMN/VPLMN to send a tone or announcement to notify the held party that she has been placed on hold.

8.1.3 Releasing call parties

The purpose of this procedure is to allow the CSE to instruct the IPLMN/VPLMN to release an individual call party or all the call parties in a CPH configuration.

The CSE may instruct the IPLMN/VPLMN to release all the call parties in a CPH configuration at any point in a call if a control relationship exists.

The CSE may instruct the IPLMN/VPLMN to release an individual CSE initiated call party at any point in a call if a control relationship exists.

If, at the initial service event, the CSE instructed the IPLMN/VPLMN not to route the call directly to the destination, then the CSE may instruct the IPLMN/VPLMN to release the calling party at any point in a call if a control relationship exists.

If, at the initial service event, the CSE instructed the IPLMN/VPLMN to proceed with the call as normal then the CSE may instruct the IPLMN/VPLMN to release the calling party or the called party during the active phase of the call only.

The release of the served subscriber shall not necessarily lead to the disconnection of the other parties in the CPH configuration.

8.1.4 Connecting an individual call party to the group

The purpose of this procedure is to allow the CSE to instruct the IPLMN/VPLMN to connect an individual call party to the group.

If, at the initial service event, the CSE instructed the IPLMN/VPLMN not to route the call leg directly to the destination, then the CSE may instruct the IPLMN/VPLMN to connect a held call party to the group at any point during the alerting and active phases of the call leg if a control relationship exists.

If, at the initial service event, the CSE instructed the IPLMN/VPLMN to proceed with the call as normal then the CSE may instruct the IPLMN/VPLMN to connect a held call party to the group at any point during the alerting and active phases of the call leg if a control relationship exists and at least one call leg in the group has reached the active phase.

If the CSE has initiated the call, it may instruct the IPLMN/VPLMN to connect another held call party to the group at any point during the alerting and active phases of the call leg.

The CSE shall be able to instruct the IPLMN/VPLMN to send a notification towards the previously held party indicating that she has been connected to the group. The CSE shall be able to instruct the IPLMN/VPLMN to send a notification towards the other party or parties in the group indicating that an additional party has been connected to the group. The notification shall be a tone or an announcement.

NOTE: The CSE may use other procedures instead of, or as well as, instructing the IPLMN/VPLMN to send a tone or announcement to notify the previously held party that she has been connected to the group. The same principle applies to the notification towards the other party or parties in the group.

8.2 Creating a new call

The purpose of this procedure is to allow the CSE to create a new call to the served subscriber.

It shall be possible for the CSE to instruct the IPLMN/VPLMN of the served subscriber to initiate a new call on behalf of the served subscriber. The IPLMN/VPLMN shall have the possibility to reject this request. The CSE shall be able to instruct the HPLMN to suppress the invocation of Incoming call barrings for a CSE initiated call.

The CSE shall be able to instruct the HPLMN to suppress the triggering of terminating CAMEL-based services in the VPLMN for the served subscriber.

The CSE shall be able to instruct the IPLMN to suppress the triggering of terminating CAMEL-based services in the IPLMN for the served subscriber.

If the CSE sends a request to initiate a call, the events relating to unsuccessful call establishment and answer should be armed by the CSE to maintain a control relationship.

9 Procedures for SMS

9.1 Criteria for contact with the CSE

It shall be possible for the HPLMN to specify criteria which must be satisfied before the CSE is contacted.

The following criteria may be defined:

9.1.1 CSI criteria applicable at Short message delivery

9.1.1.1 CSI criteria applicable at SM delivery when MT SM attempt has been received

CSI criteria may be defined for a subscriber for the MT SM delivery.

- Criterion on the status report;

This criterion can indicate:

- The VPLMN shall trigger only in the case of a status report;
- The VPLMN shall not trigger in the case of a status report.

When this criterion is not present this criterion is regarded as satisfied.

9.2 Short message submission request procedure

The purpose of this procedure is to detect an SMS set-up request and to allow the CSE to modify the handling of the SMS set-up request.

The SMS set-up request may be circuit switched based or packet switched based.

If (according to the CSI):

- The subscriber is provisioned with a CAMEL based SMS originating service; and
- The SMS set-up request occurs

Then the VPLMN shall suspend SMS processing, make contact with the CSE and await further instructions.

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below.

- Perform charging activities;
- Activate subsequent control service events for the SM submission. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:
 - Successful SM submission to the SMSC
 - Unsuccessful SM submission to the SMSC;
 - The type of monitoring.

There shall be no restriction regarding the order of the above instructions. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Bar the SM submission;
- Continue the submission;
- Continue the SM submission with modified information. The CSE shall have the possibility to send the following information:
 - Called Party Number;
 - Calling Party Number;
 - SMSC address.

If the SM submission is barred, the served subscriber shall be informed.

9.3 Successful Short Message submission procedure

The purpose of this procedure is to detect the successful submission of a Short Message (SM) to the SMSC and to inform the CSE about it.

If the successful SM submission event occurs, then the VPLMN shall suspend processing, make contact with the CSE and await further instructions or send a notification and continue.

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below:

- Perform charging activities.

Once the CSE has concluded performing charging activities, it shall issue the following instruction:

- Continue the processing.

9.4 Unsuccessful Short Message submission procedure

The purpose of this procedure is to detect the unsuccessful submission of a Short Message (SM) to the SMSC and to inform the CSE about it.

If the unsuccessful SM submission event occurs, then the VPLMN shall suspend processing, make contact with the CSE and await further instructions or send a notification and continue.

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below:

- Perform charging activities.

Once the CSE has concluded performing charging activities, it shall issue the following instruction:

- Continue the processing.

9.5 Short message delivery request procedure

The purpose of this procedure is to detect a SMS set-up request and allow the CSE to modify the handling of the SMS set-up request.

The SMS set-up request may be circuit switched based or packet switched based.

If according to the CSI:

- The subscriber is provisioned with a CAMEL based SMS terminating service, and
- The SMS set-up request occurs

then, when the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below.

- Perform charging activities;
- Activate other control service events for the SM delivery. The CSE shall have the possibility to send the following information:
 - The service event which shall be detected and reported:
 - Successful SM delivery to the MS;
 - Unsuccessful SM delivery to the MS.
 - The type of monitoring (control or notification).

There shall be no restriction regarding the order of the above instructions. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Bar the SM delivery;
- Continue the delivery;
- Continue the SMS delivery with modified information. The CSE shall have the possibility to send the following information:
 - Calling Party Number.

If the SM delivery is barred, the SMSC shall be informed.

9.6 Successful Short Message delivery procedure

The purpose of this procedure is to detect the successful delivery of a Short Message (SM) to the MS and to inform the CSE about it.

If the successful SM delivery event occurs, then the VPLMN shall suspend processing, make contact with the CSE and await further instructions or send a notification and continue.

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below:

- Perform charging activities.

Once the CSE has concluded performing charging activities, it shall issue the following instruction:

- Continue the processing.

9.7 Unsuccessful Short Message delivery procedure

The purpose of this procedure is to detect the unsuccessful delivery of a Short Message (SM) to the MS and to inform the CSE about it.

If the unsuccessful SM delivery event occurs, then the VPLMN shall suspend processing, make contact with the CSE and await further instructions or send a notification and continue.

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below:

- Perform charging activities.

Once the CSE has concluded performing charging activities, it shall issue the following instruction:

- Continue the processing.

9.8 Charging Procedures

9.8.1 Inclusion of Free Format data in CDR

The CSE may send free format data to the VPLMN, for inclusion in a CDR.

When sending the free format data to the VPLMN, the CSE may instruct the VPLMN to

- Overwrite the existing data in the CDR with the newly received free format data, or
- Append the newly received free format data to the existing data in the CDR.

10 Procedures for GPRS Data Transmission

NOTE: Other information elements not listed in the following subclauses may be necessary to meet some Stage 1 service requirements. Refer to the Stage 2 specification TS 23.078 for complete information element lists.

10.1 Initial service events

It shall be possible to specify the following initial service events which shall initiate contact with the CSE:

- Attach procedure: a subscriber requests to register to the GPRS network;
- PDP Context Establishment: a subscriber requests the activation of a Packet Data Protocol Context;
- PDP Context Establishment Acknowledgement: the SGSN has received an acknowledgement from the GGSN for that request.
- Change of Position (Session): a subscriber who has an active GPRS Session changes position to another SGSN;
- Change of Position (PDP Context): a subscriber who has an active PDP Context changes position to another SGSN.

10.2 Void

10.3 Attach procedure

The purpose of this procedure is to detect a request from a GPRS subscriber to attach to the data network and allow the CSE to modify the handling of the attach request.

If (according to the CSI):

- The subscriber is provisioned with a CAMEL based service, relevant for GPRS data transmission; and
- The attach request is set as a trigger detection; and
- The attach request occurs

Then the VPLMN shall suspend attach processing, make contact with the CSE and await further instructions.

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below:

- Activate subsequent control service events for the period being attached to the data network. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:
 - PDP Context Establishment request;
 - PDP Context Establishment Acknowledgement;
 - Change of position (session);
 - Detach;
 - Type of monitoring
 - Perform charging activities (amongst others defining a time threshold). The charging activities shall apply to the GPRS Session.

There shall be no restriction regarding the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Reject the attachment request;
- Continue the processing.

10.4 PDP Context Establishment

The purpose of this procedure is to manage a request from the subscriber to activate a Packet Data Protocol. Multiple contacts to the CSE may be made in parallel due to PDP Context Establishment events being detected whilst a GPRS subscriber is attached to the network. If either (according to the CSI):

- The subscriber is provisioned with a CAMEL based service relevant for GPRS data transmission; and
- The PDP activation request is set as a trigger detection, and
- The PDP Activation request occurs

Or the CSE has activated this service event for the attached subscriber and the PDP activation event occurs, then the VPLMN shall either

- Suspend processing, make contact with the CSE and await further instructions, or
- Send a notification and continue.

When the PDP Context Establishment event occurs, it shall be reported as a Subsequent Service Event, if armed by the CSE. If it is not armed by the CSE, it shall be reported as an Initial Service Event, if statically armed in the subscription information.

10.4.1 PDP Context Establishment reported as Initial Service Event

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below:

- Activate subsequent control service events for the life of the PDP context. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:
 - Change of position (PDP Context);
 - PDP Context Establishment Acknowledgement;
 - PDP deactivation.
 - The type of monitoring.
- Perform Charging Activities (amongst others defining a data or time threshold). The charging activities shall apply to the PDP Context.

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Release the PDP Context;
- Continue the processing;
- Continue the processing with modified information. The CSE shall have the possibility to send the following information:
 - Access Point Name.

10.4.2 PDP Context Establishment reported as Subsequent Service Event

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below:

- Activate subsequent control service events for the life of the PDP context or GPRS Session. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:
 - PDP Context Establishment Acknowledgement;
 - Change of position (PDP Context);
 - PDP deactivation;
 - Change of Position (Session);
 - Detach.
 - The type of monitoring.
- Perform Charging Activities (amongst others defining a data or time threshold).

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Release the PDP Context;
- Release the GPRS Session;
- Continue the processing;
- Continue the processing with modified information. The CSE shall have the possibility to send the following information:
 - Access Point Name.

10.5 PDP Context Establishment Acknowledgement

The purpose of this procedure is to manage a confirmation from the GGSN to activate a Packet Data Protocol. Multiple contacts to the CSE may be made in parallel due to PDP Context Establishment Acknowledgement events being detected whilst a GPRS subscriber is attached to the network.

If either (according to the CSI):

- The subscriber is provisioned with a CAMEL based service relevant for GPRS data transmission, and
- The PDP Context Establishment acknowledgement is set as a trigger detection point, and
- The PDP Context Establishment Acknowledgement request occurs

Or the CSE has activated this service event for the attached and / or active subscriber and the PDP activation acknowledgement event occurs, then the VPLMN shall either

- Suspend processing, make contact with the CSE and await further instructions, or
- Send a notification and continue.

When the PDP Context Establishment Acknowledgement event occurs, it shall be reported as a Subsequent Service Event, if armed by the CSE. If it is not armed by the CSE, it shall be reported as an Initial Service Event, if statically armed in the subscription information.

10.5.1 PDP Context Establishment Acknowledgement reported as an Initial Service Event

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below:

- Activate subsequent control service events for the life of the PDP context. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:
 - Change of position (PDP Context);
 - PDP deactivation;
 - Type of monitoring
- Perform Charging Activities (amongst others defining a data or time threshold). The charging activities shall apply to the PDP Context.

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Release the PDP Context,
- Continue the processing.

10.5.2 PDP Context Establishment Acknowledgement reported as a Subsequent Service Event in PDP Context relationship

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below:

- Activate subsequent control service events for the life of the PDP context. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:

- Change of position (PDP Context);
- PDP deactivation.
- Type of monitoring.
- Perform Charging Activities (amongst others defining a data or time threshold).
The charging activities shall apply to the PDP Context.

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Release the PDP Context;
- Continue the processing.

10.5.3 PDP Context Establishment Acknowledgement reported as a Subsequent Service Event within GPRS Session relationship (I)

This event is reported within a GPRS Session relationship and this is the first event to be reported for this PDP Context. (The PDP Context Establishment event for this PDP Context was not reported.)

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below:

- Activate subsequent control service events for the life of the PDP context or GPRS Session. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:
 - Change of position (PDP Context);
 - PDP deactivation;
 - Change of Position (Session);
 - Detach.
 - Type of monitoring.
- Perform Charging Activities (amongst others defining a data or time threshold).

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Release the PDP Context;
- Release the GPRS Session;
- Continue the processing.

10.5.4 PDP Context Establishment Acknowledgement reported as a Subsequent Service Event within GPRS Session relationship (II)

This event is reported within a GPRS Session relationship and this is not the first event to be reported for this PDP Context. (The PDP Context Establishment event for this PDP Context was already reported.)

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below:

- Activate subsequent control service events for the life of the PDP context or GPRS Session. The CSE shall have the possibility to send the following information:

- The subsequent service event which shall be detected and reported:
 - Change of position (PDP Context);
 - PDP deactivation;
 - Change of Position (Session);
 - Detach.
- Type of monitoring.
- Perform Charging Activities (amongst others defining a data or time threshold).

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Release the PDP Context;
- Release the GPRS Session;
- Continue the processing.

10.6 Change of Position Procedure

The purpose of this procedure is to detect a request from the GPRS subscriber to update the routing area. A change of position can be an intra-SGSN routing area update (update within the same SGSN) or an inter-SGSN routing area update (update from one SGSN to another SGSN). When an intra-SGSN routing area update occurs, then this event shall be reported as a Subsequent Service Event, if it was armed by the CSE.

When an inter-SGSN routing area update occurs, then this event shall be reported as an Initial Service Event, if it was statically armed in the GPRS Subscription data. In this case, the previous relationship shall be terminated.

The change of position event can be armed and reported for a GPRS Session relationship and for a PDP Context relationship.

10.6.1 Intra-SGSN Change of Position

If the CSE has activated this service event and a change of position occurs, the VPLMN shall send a notification and continue.

10.6.2 Inter-SGSN Change of Position

If this event is statically armed and the inter-SGSN change of position event occurs, then the VPLMN shall suspend processing, make contact with the CSE and await further instructions.

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below:

- Activate subsequent control service events for the life of the PDP context or GPRS Session. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:
 - PDP Context Establishment;
 - PDP Context Establishment Acknowledgement;
 - Change of position (PDP Context);
 - PDP deactivation;

- Change of Position (Session):
This subsequent service event may be armed only if the Change of Position Initial Service Event was reported for a GPRS Session;
- Detach:
This subsequent service event may be armed only if the Change of Position Initial Service Event was reported for a GPRS Session.
- Type of monitoring.
- Perform Charging Activities (amongst others defining a data or time threshold).
GPRS Session related charging activities may be instructed only if the Change of Position Initial Service Event was reported for a GPRS Session.

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Release the PDP Context;
- Release the GPRS Session;
The Release GPRS Session instruction may be given only if the Change of Position Initial Service Event was reported for a GPRS Session.
- Continue the processing.

10.7 Data Volume or Time Threshold Procedure

The purpose of this procedure is to control the amount of data transmitted by and transmitted to the served subscriber or the used time per GPRS Session or PDP Context. The threshold is valid either for the GPRS session or for one PDP Context of the subscriber only. If the subscriber controls simultaneous PDP Contexts, thresholds per GPRS session or PDP Context may be defined.

For correct performance, the threshold shall be available for the first time as a response to a GPRS Session establishment (if valid for the GPRS Session) or as a response to a PDP Context Establishment (if valid for the PDP Context). Subsequent thresholds may be received immediately after the expiry of the previous threshold or at change of QoS.

The type of threshold is indicated per GPRS session or PDP Context as:

- A maximum amount of data transmitted by and transmitted to the subscriber;
- A granted time to transmit and receive data.

A threshold is reached within a GPRS session or PDP Context, when:

- The total amount of data transmitted by and transmitted to the subscriber reaches the granted data volume, or
- The allowed time for the GPRS Session or PDP Context has elapsed.

If the CSE has defined a threshold for a GPRS Session or PDP Context and the threshold has been reached, then the VPLMN shall inform the CSE.

The VPLMN shall not suspend the transmission of data packets to and from the GPRS terminal. The VPLMN shall immediately restart counting the amount of data transmitted by and transmitted to the GPRS terminal and restart timing the duration of the GPRS Session or PDP Context.

The following information shall be provided to the CSE if available:

- Charge result (elapsed time or total amount of data transmitted);
- The GPRS session or PDP Context for which the event is reported;
- GPRS Session or PDP Context-Active indicator.

When the VPLMN has reported the reaching of the threshold to the CSE, the CSE shall be able to do the following (assuming the continuation of the applicable dialogue):

- Perform charging activities (including the defining of a new threshold or time limit). GPRS Session related charging activities may be sent only if a GPRS Session related charging threshold was reported.
- Activate subsequent control service events for the PDP Context or GPRS Session. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:
 - PDP deactivation;
 - Change of Position (PDP Context);
 - Change of Position (Session): this event may be armed only if the PDP deactivation event is reported within a GPRS Session relationship;
 - Detach; this event may be armed only if the data or time threshold event is reported within a GPRS Session relationship.
 - The GPRS session or PDP Context for which the event shall be monitored and reported;
 - The type of monitoring (only monitor mode is allowed in this case).

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated.

Once the CSE has concluded issuing the above instructions, issue one and only one of the following instructions (provided the GPRS session or PDP context has not been released):

- Release the PDP Context;
- Release the GPRS Session; this instruction may be given only if the data or time threshold event is reported within a GPRS Session relationship;
- Continue the GPRS session or PDP Context.

10.8 PDP deactivation Procedure

The purpose of this procedure is to detect a request from the subscriber to release a Packet Data Protocol.

If the CSE has activated this subsequent service event for the attached subscriber and the PDP deactivation event occurs then the VPLMN shall suspend processing, make contact with the CSE and await further instructions or send a notification and continue.

The following information shall be provided to the CSE:

- Event met;
- The PDP Context for which the event is reported;
- Type of monitoring.

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below.

- Activate subsequent control service events for the GPRS session. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:
 - Detach Procedure: this event may be armed only if the PDP deactivation event is reported within a GPRS Session relationship;

- Change of Position (Session): this event may be armed only if the PDP deactivation event is reported within a GPRS Session relationship.
- The type of monitoring.
- Perform charging activities; GPRS Session related charging instructions may be sent only if the PDP deactivation event is reported within a GPRS Session relationship

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall send one and only one of the following instruction:

- Release the GPRS Session: this instruction may be given only if the PDP deactivation event is reported within a GPRS Session relationship;
- Continue the processing.

10.9 Detach procedure

The purpose of this procedure is to detect a request from a GPRS subscriber to detach from the data network.

If the CSE has activated this subsequent service event for the attached subscriber and the Detach event occurs, then the VPLMN shall suspend processing, make contact with the CSE and await further instructions or send a notification and continue.

The following information shall be provided to the CSE, if available:

- Event met;
- Type of monitoring.

When the VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below.

- Perform charging activities. Only Session related charging instructions may be sent.

There shall be no restriction regarding the number of times the above instruction can be repeated. Once the CSE has concluded issuing the above instruction, it shall send the following instruction:

- Continue the processing.

10.10 CSE Initiated GPRS Detach Procedure

Following the CAMEL processing of the GPRS attach procedure it shall be possible for the CSE to initiate a GPRS detach at any time.

To use this procedure, there shall be a control relationship between the CSE and the GPRS session.

10.11 CSE Initiated PDP Context Deactivation Procedure

Following the CAMEL processing of the PDP Context Establishment procedure or PDP Context Establishment Acknowledgement procedure it shall be possible for the CSE to initiate PDP Context deactivation at any time.

To use this procedure, there shall be a control relationship between the CSE and the PDP Context.

10.12 Change of Quality of Service Procedure

The CSE may request the VPLMN to report a change in the Quality of Service (QoS) for a specific PDP Context.

When a QoS change occurs, then the VPLMN shall send a notification to the CSE and continue.

The following information shall be provided to the CSE:

- Charge result – this may be elapsed time or the total amount of data transmitted by and transmitted to the subscriber
- Quality of Service;
- PDP Context state.

When the CSE receives the notification of change of QoS, it may instruct the VPLMN to act as follows:

- Perform charging activities (including the defining of a new threshold). GPRS Session related charging instructions may be sent only if the change of PDP Context QoS event is reported within a GPRS Session relationship;
- Activate subsequent control service events for the PDP Context or GPRS Session. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported:
 - PDP deactivation;
 - Change of Position (PDP Context);
 - Change of Position (Session): this event may be armed only if the change of PDP Context QoS event is reported within a GPRS Session relationship;
 - Detach Procedure: this event may be armed only if the change of PDP Context QoS event is reported within a GPRS Session relationship.
 - The PDP Context for which the event shall be monitored and reported;
 - The type of monitoring (only monitor mode is allowed in this case).

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated.

Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Release the PDP Context;
- Release the GPRS Session: this instruction may be given only if the change of PDP Context QoS event is reported within a GPRS Session relationship;
- Continue the PDP Context.

10.13 Charging Procedures

The CSE can perform the following charging activities:

10.13.1 Advice of Charge

The CSE may send Charge Advice Information (CAI) elements to the SGSN.

NOTE: Support of Advice of Charge within GPRS is not supported in Release 5 or previous releases. If the CSE sends CAI elements to an SGSN that does not support the Advice of Charge supplementary service, the CAI elements shall be ignored by the SGSN.

10.13.2 Inclusion of Free Format data in CDR

The CSE may send free format data to the SGSN, for inclusion in a CDR. The CSE shall specify the GPRS session or PDP Context for which the free format data is destined.

When sending the free format data to the VPLMN, the CSE may instruct the VPLMN to

- Overwrite the existing free format data for that GPRS session or PDP Context, or

- Append the newly received free format data to the existing free format data.

10.13.3 Specify a threshold for transmitted data or used time

See section 10.7.

10.13.4 Request notification of change in Quality of Service

The CSE may request the VPLMN to notify the CSE when a change in Quality of Service has occurred for a PDP Context.

11 Unused clause

12 Notification of non-traffic events to the CSE

12.1 Mobility management

It shall be possible to mark for a subscriber that a notification shall be sent to the CSE when the VPLMN has completed the processing of any one or more of the following mobility events:

- For a CS subscriber:
 - Location area update of MS to a different VLR service area;
 - Location area update of MS within the same VLR service area;
 - MS-initiated detach (e.g. MS switched off);
 - Network initiated detach (periodic location update of MS failed);
 - Attach of MS (e.g. MS switched on, successful location update after network initiated detach);
- For a GPRS subscriber:
 - Routeing area update of MS to a different SGSN service area;
 - Routeing area update of MS within the same SGSN service area;
 - MS-initiated detach (e.g. MS switched off);
 - Network initiated detach;
 - Network initiated transfer to "MS not reachable for paging" (periodic routeing area update of MS failed);
 - Attach of MS (e.g. MS switched on, successful routeing area update after network initiated detach).

The notification shall contain the following information if available:

- Event met;
- Service Key;
- IMSI;
- Basic MSISDN;
- Location information;
- LSA identity;
- CAMEL phases supported at the VPLMN;

- Offered CAMEL Phase 4 functionalities, if CAMEL Phase 4 is supported in the VPLMN.

12.2 Notification to CSE of change of subscriber data

It shall be possible to mark for a subscriber that a notification shall be sent to the CSE when any of the following subscriber data are changed as a result of a request from any entity except the CSE to which the notification shall be sent:

- CF SS data;
- CB SS data;
- ODB data;
- CAMEL subscription information.

One or more CSEs may be defined to which the notification shall be sent.

12.3 Supplementary service invocation notification to CSE

It shall be possible to mark for a subscriber that a notification shall be sent to the CSE when any of the following supplementary services are invoked:

- ECT;
- CD;
- MPTY;
- CCBS.

13 CSE interrogation and control of subscription data

13.1 Any time interrogation

It shall be possible for the CSE (as part of an OSS, including special handling of mobile terminating calls) to interrogate the HLR for information about a particular subscriber, for which it is entitled to do so (e.g. the subscriber belongs to the same HPLMN as the CSE).

This may be information from the list below:

- Subscriber status;
- Location information (see section 22);
- IMEI (with software version);
- MS class (only in the CS domain);
- GPRS MS class (only in the PS domain);
- Call Forwarding SS data;
- Call Barring SS data;
- Operator Determined Barring data;
- CAMEL Subscription Information;
- CAMEL phases supported at the VPLMN;
- Offered CAMEL4 CSIs In VPLMN.

The CSE shall indicate in the request for subscriber information whether the information is requested from the HPLMN, the VPLMN in the circuit switched domain or the VPLMN in the packet switched domain.

The HPLMN shall have the possibility to reject any interrogation from any CSE.

13.2 Any time modification

It shall be possible for the CSE to modify user data for a particular subscriber, for which it is entitled to do so (e.g. the subscriber belongs to the same HPLMN as the CSE).

This shall be data from the list below:

- Call Forwarding SS data;
- Call Barring SS data;
- Operator Determined Barring data;
- Activation/Deactivation of CAMEL Subscription Information.

The HPLMN shall have the possibility to reject any request for modification from any CSE.

14 Subscriber interactions with the CSE

14.1 Announcement and tones insertion

As a part of the following procedures, it shall be possible for the CSE to order the playing of announcements or tones to the calling subscriber:

- The call set-up request procedure;
- The unsuccessful call establishment procedure;
- The called party connection procedure;
- The call disconnection procedure;
- The incoming call request procedure;
- The called party alert reporting procedure.

In the active phase of the call leg and in the mid-call procedure it shall be possible for the CSE to play tones and/or announcements to any held party or the group as specified in clauses 5, 6 and 8. It shall be possible to play tones efficiently using local tone generators.

The HPLMN operator is responsible for the administration of announcements. If there is an appropriate bilateral agreement the VPLMN operator may also administer announcements.

14.2 Voice prompting and information collection

As a part of the call set-up request procedure, unsuccessful call establishment procedure, call disconnection procedure and incoming call request procedure it shall be possible for the CSE to order voice prompting and information collection to the calling subscriber. It shall not be possible to collect information from the user as part of the originating CAMEL handling for a forwarded call.

In the active phase of the call leg and in the mid-call procedure it shall be possible for the CSE to order voice prompting and information collection towards any held party as specified in clauses 5, 6 and 8.

14.3 Subscriber interaction by using USSD

It shall be possible for the CSE to initiate the sending of a USSD message to the served subscriber at any time. It shall be possible for the CSE to receive a served subscriber initiated USSD message at any time (see TS 22.030 [3] and TS 22.090 [4]).

15 Charging Activities

The following general principles are valid for CAMEL based charging aspects:

- Calls may be divided into call periods for the purpose of controlling the call duration;
- The management and the control of tariff switches is under the responsibility of the HPLMN. There may be a tariff switch for the CSE control of e-values and separate tariff switches for the control of call duration (which apply per call leg). The time at which these tariff switches apply may differ or the CSE control of e-values and for the control of the call duration.;
- The tariff switch time is indicated to the network in the form of a time relative to the reception of the instruction.
- In a CPH configuration, the following procedures shall apply per call party:
 - Inclusion in charging records of information received from the CSE (subclause 15.2);
 - Support of additional charging information to the CSE (subclause 15.3);
 - CSE control of call duration (subclause 15.4).
- The e-values sent by the CSE are reported only to the served subscriber and only if this subscriber is connected to the CPH configuration (subclause 15.1).

15.1 CSE controlled e-values

If the subscriber is provisioned with a CAMEL based service and a contact exists between the VPLMN and the CSE, the CSE shall be able to send e-values for the Advice of Charge supplementary service. Those e-values represent the charge applicable to the CPH configuration.

For the purpose of charge indication on the MS even when one (or more) tariff switch occurs during the call, the CSE may send several sets of e-values to the VPLMN, which will transmit them in sequence to the Mobile Station of the served subscriber.

Before the call is answered, the CSE may send either one set or two sets of e-values:

- If one set is sent, then the set of e-values is applicable from the beginning of the call, that is from the time any call leg is answered;
- If two sets are sent, then:
 - A tariff switch time after which the second set becomes valid must also be sent;
 - If any call leg is answered before the tariff switch time expires, then the first set of e-values is applicable from the beginning of the call and the second set of e-values is stored for future use;
 - If any call leg is answered after the tariff switch time expires, then the first set of e-values is discarded and the second set of e-values is applicable from the beginning of the call.

During the call, the CSE may send a new set of e-values either to be transmitted directly to the mobile station or to be stored until the next tariff switch is reached. The tariff switch time is sent together with the new set of e-values.

When the tariff switch time is reached, the stored set of e-values is sent immediately to the mobile station.

15.2 Inclusion in charging records of information received from the CSE

The CSE shall be able to download free-format charging information to be transparently output to the call record available at the IPLMN/VPLMN depending on the call scenario. The CSE can download free-format charging information for each call leg separately.

15.3 Support of additional charging information to the CSE

It shall be possible for the CSE to request from the VPLMN/IPLMN a call information report to be delivered at the termination of the call leg. The report may contain, amongst others, call duration and release cause. The CSE can request a report for each call leg of the CPH configuration.

15.4 CSE control of call duration

The purpose of this procedure is to allow the CSE to monitor and influence the call duration for each call leg independently of the other call legs in the CPH configuration.

If the subscriber is provisioned with a CAMEL based service and a contact between the IPLMN/VPLMN and the CSE exists, the CSE shall be able to instruct the IPLMN/VPLMN, at the beginning of the call or during the monitoring of the call, to act as described below:

- a) Receive a maximum call period duration from the CSE for a call leg;
- b) Receive a switch time after which the next tariff switch applies for a call leg;
- c) Receive sets of e-values for the served subscriber (for the purpose of AoC controlled by the CSE).

The following combinations of the instructions are allowed:

- (a) or (a and b) or (a and c) or (b and c) or (a and b and c) or (c).

In the above combinations it shall be possible for the CSE to instruct multiple values of (a) and/or (b). In case (a) the CSE shall be able to instruct the IPLMN/VPLMN how to proceed when the maximum call period duration has expired, i.e. release the call leg or allow the call leg to continue. In both cases, a charging report shall be sent to the CSE. The CSE shall also be able to instruct the IPLMN/VPLMN to play a tone before the maximum call period duration is expired.

The CSE shall be able to instruct the IPLMN/VPLMN to begin playing of a tone to the served subscriber before the maximum call period time is expired. The CSE shall be able to instruct the IPLMN/VPLMN when the tone playing shall start.

The tone to be played shall consist of up to three audible bursts. A burst shall consist of a single tone, or a sequence of two tones, or a sequence of three tones. A normal speech path connecting all parties in the call shall be established between bursts. The CSE shall be able to instruct the IPLMN/VPLMN:

- The time before the maximum call period time expires when tone playing shall start;
- The number of bursts to be played;
- The time interval between successive bursts;
- The number of tones in each burst;
- The duration of the tone in a burst;
- The pause between the successive tones in a burst.

When the instruction sent by the CSE is received at the IPLMN/VPLMN as a result of the call set up request procedure before the call is established, the IPLMN/VPLMN shall immediately set the reference point for the next tariff switch, if available.

When a call leg is answered, the IPLMN/VPLMN shall:

- Start the timer for the first call period for that leg;
- Send e-values, if available:
 - If one set of e-values were received from the CSE, then the set of e-values is applicable from the beginning of the call, that is from the time the first call leg is answered;
 - If two sets of e-values were received from the CSE, then:
 - A tariff switch time when the second set becomes valid must be also sent;
 - The first set of e-values is applicable from the beginning of the call (that is from the time the first call leg is answered) except in the case where the tariff switch time occurs before the first call leg is answered, in which case the second set of e-values is applicable at the beginning of the call.

When the reference point for the tariff switch is reached, the stored set of e-values is sent immediately to the mobile station, if available.

When the end of a call period is reached, the IPLMN/VPLMN shall report to the CSE:

- If no tariff switch has occurred since the call leg was answered or since the call was modified by a CPH procedure:
 - Report the elapsed time since the call leg was answered to the CSE;
- If a tariff switch has occurred since the call leg was answered:
 - Report the elapsed time since the last tariff switch has applied;
 - Report the elapsed time from when the call leg was answered or from when the previous tariff switch occurred to the time when the most recent tariff switch occurred.

When the IPLMN/VPLMN has made contact with the CSE, the CSE shall be able to instruct the VPLMN to act as described below:

- Perform charging activities;
- Activate subsequent control service events for the call. The CSE shall have the possibility to send the following information:
 - The subsequent service event which shall be detected and reported (Call disconnection);
 - The party in the call for which the event shall be detected and reported (calling or called party).
 - The type of monitoring (control or notification).

There shall be no restriction regarding the order of the above instructions or the number of times each of the above instructions can be repeated. Once the CSE has concluded issuing the above instructions, it shall issue one and only one of the following instructions:

- Release the call;
- Continue the call processing.

At the end of a call period and after the relevant information is sent to the CSE, the IPLMN/VPLMN may receive instructions applicable to for the next call period for the call leg:

- The timing of the new call period shall start as soon as the previous call period is ended;
- The timing since the call leg was answered or the last tariff switch occurred shall keep on running;
- If the instruction contains an indication for a new tariff switch during the call period, the IPLMN/VPLMN shall set the reference point for the next tariff switch and store the new set of e-values, if available.

When the reference point for the tariff switch is reached, the stored set of e-values (if available) is sent immediately to the mobile station.

When the call leg is released, the IPLMN/VPLMN shall report to the CSE:

- If no tariff switch has occurred since the call leg was answered:
 - The elapsed time since the call leg was answered.
- If a tariff switch has occurred since the call leg was answered:
 - The elapsed time since the last tariff switch occurred,
 - The elapsed time from when the call leg was answered or from when the previous tariff switch occurred to the time when the most recent tariff switch occurred.

In addition, the report to the CSE shall always contain an indication of whether the call leg is active or released.

The following figure explains the division of a call leg into separate call periods and shows which information is sent and when from the IPLMN/VPLMN to the CSE.

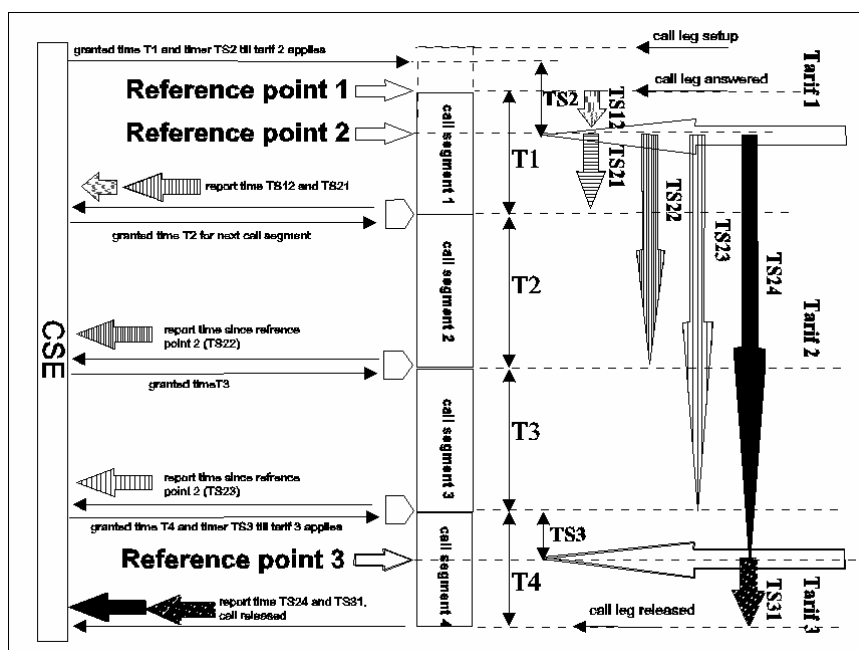


Figure 1: CSE control of call duration

Reference Point 1: when the call leg is answered, tariff 1 applies

Reference Point 2: the point in time when tariff 2 applies

Reference Point 3: the point in time when tariff 3 applies

A call period is a certain time part of an ongoing call. The duration of a call period is limited by the granted time from the CSE.

Timers indicating the maximum duration (or granted time) for the call periods are called T_x (x is the number of the call period).

Timers indicating the duration until the next tariff applies are called TS_x (x is the number of the tariff).

Timers indicating the elapsed time in a certain tariff are called TS_{xy} (x is the number of the tariff and y is the elapsed time since the previous reference point).

When a call period is ended, the elapsed time in each tariff is reported to the CSE.

At the end of the call period any timer indicating the duration until the next tariff switch for this call leg is discarded.

If the report is not confirmed by the CSE within a specified time, the IPLMN/VPLMN shall release all call legs in the group.

The procedure may be repeated sequentially, i.e. when a report is sent to the CSE, the CSE may instruct the IPLMN/VPLMN to monitor the call for a further period.

16 Exceptional procedures or unsuccessful outcome

16.1 Roaming in non-supporting networks

The HPLMN shall control handling of roaming, when a CAMEL subscriber attempts to register in a network not supporting CAMEL, without relying on extra functionality in network entities not supporting CAMEL. The HPLMN can decide for each subscriber whether to allow roaming, or deny individual services (e.g. by applying ODB or denying location up-date).

If the HPLMN allows roaming, the OSSs are not supported for the roaming subscriber.

16.2 Call Set-up from a non-supporting interrogating PLMN

If the CAMEL feature is not supported in the IPLMN, then the following will happen:

- Mobile originating calls:

Not applicable.

- Mobile terminating calls:

Mobile terminating OSSs are not supported in the IPLMN if the HPLMN decides to allow the MT call attempt. The HPLMN may also decide to bar the incoming call attempt, or force the routing interrogation to take place in the HPLMN.

- Mobile forwarded calls:

Mobile forwarding OSSs are not supported in the IPLMN if the HPLMN decides to allow the MT call attempt. The HPLMN may also decide to bar the incoming call attempt, or force the routing interrogation to take place in the HPLMN.

16.3 Roaming in a VPLMN which supports a lower phase of CAMEL

If a CAMEL subscriber attempts to register in a VPLMN which supports CAMEL, the VPLMN shall indicate in the registration request to the HPLMN the phases of CAMEL which the VPLMN supports. If the VPLMN supports only a CAMEL phase which is lower than the one subscribed, then the HPLMN shall take such action (including denying the registration request or transferring to the VPLMN subscription information appropriate to one of the CAMEL phases supported in the VPLMN) as may be decided by the HPLMN operator. If a certain service requires a certain CAMEL phase (e.g. MO SMS requires at least CAMEL phase 3) and the VPLMN does not support that CAMEL phase, the HPLMN may decide to deny roaming or allow roaming without that particular CAMEL OSS.

16.4 Service attempt from a VPLMN which supports a lower phase of CAMEL

If the served subscriber requests a basic service (call, short message, GPRS attach, GPRS PDP context etc.) which requires the VPLMN to contact the CSE, the VPLMN shall indicate to the CSE which phase of CAMEL has been negotiated between the HPLMN and the VPLMN for this service. If the VPLMN supports a CAMEL phase which is lower than the one subscribed and the CSE determines that as a consequence a service which is provisioned for the subscriber will not operate correctly, the CSE shall take such action (including denying the call request or handling the call using only CAMEL capabilities supported in the VPLMN) as may be decided by the CSE operator.

16.5 Call setup from an IPLMN which supports a lower phase of CAMEL

The IPLMN shall indicate to the HPLMN which phases of CAMEL it supports. The HPLMN may decide to bar the incoming call attempt before contacting the CSE, or force the routing interrogation to take place in the HPLMN. When the IPLMN contacts the CSE for instructions to handle an MT call, the IPLMN shall indicate to the CSE the phase of CAMEL which has been negotiated between the HPLMN and the IPLMN for this call. If the IPLMN supports a lower CAMEL phase than the one negotiated between the HPLMN and the IPLMN and the CSE determines that as a consequence a service which is provisioned for the subscriber will not operate correctly, the CSE shall take such action (including denying the call request or handling the call using only CAMEL capabilities negotiated between the HPLMN and the IPLMN) as may be decided by the CSE operator.

16.6 Roaming in a VPLMN with a partial implementation of CAMEL Phase 4

In principle, CAMEL based services require support of subscription information in the VPLMN and support for certain information flows between service logic (at the CSE) and the VPLMN. Subscription information are exchanged when a subscriber attempts to register in a VPLMN. Information flows are started when the VPLMN initiates contact to the CSE. Those procedures are de-coupled and happen at different points in time. If both procedures are supported sufficiently, services may be offered to a subscriber. The following chapter identifies requirements for a VPLMN to indicate its support of CAMEL Phase 4 features.

If a CAMEL subscriber attempts to register in a VPLMN which supports at least one CAMEL Phase 4 CSI or the enhanced CSE interrogation, then the VPLMN indicates in the registration request to the HPLMN the phases of CAMEL which the VPLMN supports (i.e. at least Phase 4). In addition, the VPLMN indicates which CAMEL Phase 4 CSIs or enhanced CSE interrogation it offers.

A VPLMN supports a CAMEL Phase 4 CSI if it is capable of initiating contact with the CSE due to that CSI using CAMEL Phase 4 procedures.

If the VPLMN does not support all CSIs or the enhanced CSE interrogation of CAMEL phase 4, then the HPLMN shall take such action (including denying the registration request or transferring to the VPLMN subscription information appropriate to the CAMEL Phase 4 CSIs offered by the VPLMN) as may be decided by the HPLMN operator. If a certain service requires a certain CAMEL Phase 4 CSI (e.g. MT SMS handling) and the VPLMN does not support that CAMEL Phase 4 CSI, the HPLMN may decide to deny roaming or allow roaming without that particular CAMEL OSS.

If the VPLMN initiates contact with the CSE, or acknowledges a CSE initiated contact, the VPLMN shall indicate the CAMEL Phase 4 functionalities offered to the CSE. Examples of functionality which can be offered to the CSE are:

- Creating additional parties in a call;
- Placing an individual call party on hold;
- Mid Call procedure;
- Inclusion of flexible tone injection;
- etc.

16.7 Call setup attempt from an IPLMN which supports only a partial implementation of CAMEL Phase 4

If the IPLMN supports at least one CAMEL Phase 4 CSI, it indicates to the HPLMN (e.g. in the request for routing information) which CAMEL Phase 4 CSIs it supports.

If the IPLMN does not support all CSIs of CAMEL phase 4, the HPLMN shall take such action (including barring the incoming call request or transferring to the IPLMN subscription information appropriate to the CAMEL Phase 4 CSI offered in the IPLMN) as may be decided by the HPLMN operator. If a certain service requires a specific CAMEL Phase 4 CSI and the IPLMN does not support that specific CAMEL Phase 4 CSI, the HPLMN may decide to bar the

incoming call attempt, or force the routing interrogation to take place in the HPLMN, or allow the MT call attempt without that particular CAMEL OSS.

The same principles for the IPLMN shall apply as defined in chapter 16.6 for the VPLMN.

17 CSE related congestion control

It shall be possible for the CSE to suppress either all or some CAMEL interrogations from a V/IPLMN, when the V/IPLMN is the subscriber's HPLMN. If there is a bilateral agreement the operators may also apply congestion control between different networks.

The criterion to suppress CAMEL interrogations is one of:

1. called address or,
2. service key or,
3. called address and service key or,
4. calling address and service key

If the congestion control prevents contact with the CSE, the V/IPLMN shall proceed in accordance with the Default Call Handling.

Congestion Control is applicable to CAMEL control of circuit switched call. It is not applicable to CAMEL control of GPRS session and PDP context, and to CAMEL control of short message.

18 Interactions with supplementary services

18.1 General

This subclause defines the interactions between supplementary services and the CAMEL feature. However, it should be noted that the most effective way to control those service interactions is through managing the provisioning of services. Where possible, subscribers provisioned with services using the CAMEL feature shall not be provisioned with services having an adverse interaction with the CAMEL based services. Supplementary services shall be assumed not to have any knowledge of CAMEL based services.

In general, call independent supplementary service operations (registration, erasure, activation, deactivation and interrogation) are not modified by CAMEL. The exceptions to this for CAMEL phase 2 and later are the call forwarding services, described in subclause 18.3.

18.2 Line Identification

18.2.1 Calling Line Identification Presentation (CLIP)

The CSE shall be able to create or modify an additional calling line identity (additional calling party number) which is presented to the called subscriber via the CLIP supplementary service. There shall be no restriction to the format of the additional calling line identity determined by the CSE.

The CSE shall not be able to modify the calling line identity (calling party number).

18.2.2 Calling Line Identification Restriction (CLIR)

For an MT call or an MF call, the CSE shall not be able to change the presentation indicator given to the called subscriber via the CLIP supplementary service.

For an MO call, the CSE shall be able to send to the VPLMN an instruction that the presentation indicator of the calling party number shall be set to "Presentation Restricted".

18.2.3 Connected Line Identification Presentation (COLP)

No interaction. The CSE shall not be able to change the connected line identity.

The CSE shall be able to send an indication that the identity returned to the calling subscriber's serving PLMN as the connected number shall be the called IN number.

18.2.4 Connected Line Identification Restriction (COLR)

The CSE shall be able to send to the VPLMN/IPLMN:

- An indication that the presentation indicator of the connected number shall be set to "presentation restricted", or
- An indication that the presentation indicator of the called IN number shall be set to "presentation restricted" (this is coupled with the indication that the identity returned to the calling subscriber's serving PLMN as the connected number shall be the called IN number), or
- An indication that the presentation indicator of the called IN number shall be set to "presentation allowed" (this is coupled with the indication that the identity returned to the calling subscriber's serving PLMN as the connected number shall be the called IN number).

18.3 Call Forwarding

For the registration of call forwarding supplementary services the network shall accept any forwarded to number for a subscriber who is provided with a TIF-CSI. In this case the HPLMN shall treat the forwarded-to number transparently at the time of registration, i.e. it shall not perform validity checks or translate the format of the number. The forwarding PLMN shall treat the forwarded-to number transparently when the call forwarding service is invoked. The CSE may modify the forwarded-to number within the MO CAMEL Service provided for the subscriber when the call forwarding service is invoked.

NOTE: Network operators should ensure that the TIF-CSI is provided only to subscribers who are provided with an MO CAMEL service which is capable of translating the registered forwarded-to number.

If the forwarding PLMN does not support CAMEL phase 2, the HPLMN shall consider the call forwarding service as not registered if the forwarded-to number is not stored in international format.

NOTE: If the served subscriber requires invocation of call forwarding services even when the forwarding PLMN does not support CAMEL phase 2, she has to register a forwarded-to number in E.164 international format.

NOTE: Network operators should be aware that unpredictable service behaviour could be experienced if the service events for 'Busy', 'Not Reachable' or 'No Answer' are activated when the corresponding conditional call forwarding supplementary service is active.

18.3.1 Call Forwarding Unconditional (CFU)

The Call Forwarding Unconditional service will be invoked after any terminating CAMEL based service. A forwarded call resulting from a Call Forwarding supplementary service may cause invocation of mobile originated CAMEL based services.

18.3.2 Call Forwarding on Busy (CFB)

As for Call Forwarding Unconditional (see subclause 18.3.1).

18.3.3 Call Forwarding on No Reply (CFNRy)

As for Call Forwarding Unconditional (see subclause 18.3.1).

18.3.4 Call Forwarding on Not Reachable (CFNRc)

As for Call Forwarding Unconditional (see subclause 18.3.1).

18.4 Call Completion

18.4.1 Call Hold (CH)

For both originating and terminating calls, the Call Hold service is invoked after the CAMEL feature is invoked. A call created when a call has been put on hold may be subject to the CAMEL feature in the same way as a normal mobile originating call.

When a call is established, the CSE shall be able to instruct the VPLMN of the served subscriber whether to prohibit Call Hold.

18.4.2 Call Waiting (CW)

Incoming, waiting calls are treated by the CSE in the same way as mobile terminating calls which encounter an idle subscriber.

When a call is established the CSE shall be able to instruct the VPLMN of the served subscriber whether to prohibit Call Waiting for any additional MT calls for the duration of the established call.

18.5 Multi Party (MPTY)

A MultiParty call may include one or more call legs subject to CAMEL based services.

If a call leg is subject to CAMEL based services the CSE shall be able to instruct the VPLMN of the served subscriber whether to prohibit the inclusion of that leg in a MultiParty call.

18.6 Closed User Group (CUG)

When a terminating call with CUG information is received for a CAMEL marked subscriber, if the terminating CAMEL based service attempts to modify the called party number then:

- If the called subscriber subscribes to CUG then the IPLMN shall release the call to the calling party;
- If the called subscriber does not subscribe to CUG then the IPLMN shall continue the call establishment to the modified called party number.

For an MO call, an MF call, or an MT call subject to CAMEL forwarding, with CUG information, the CSE shall be able to instruct the VPLMN/IPLMN to:

- Continue the call establishment with the original CUG information, or
- Use modified CUG information for that call, or
- Remove CUG information from the call (i.e. continue the call as a non-CUG call).

For an MT call which is not subject to CAMEL forwarding, the CSE shall not be able to modify the CUG information for the call.

When an MT call with CUG information is received for a CAMEL marked subscriber, if the terminating CAMEL based service attempts to modify the called party number then:

- If the called subscriber subscribes to CUG then the VPLMN shall release the call to the calling party;
- If the called subscriber does not subscribe to CUG then the VPLMN shall continue the call establishment to the destination defined by the modified called party number.

18.7 Advice of Charge (AoC)

Advice of Charge is not guaranteed to operate correctly for calls subject to CAMEL phase 1 based services. It is recommended that subscribers are not provisioned with Advice of Charge and any CAMEL based service for which there is an adverse interaction.

If CAMEL phase 2 or higher is supported and the phase 2 or higher charging function "CSE controlled e-values" is used, the VPLMN shall use the received e-values from the CSE for the purpose of the AoC supplementary service. Once the VPLMN has received e-values from the CSE, only CSE provided e-values are applicable for this call. The e-values shall be sent by the VPLMN to the MS only if the served subscriber is provided with the AoC supplementary service according to TS 22.086. CAMEL phase 3 or higher allows the CSE to modify e-values for MO and MT calls.

18.8 Call Barring

NOTE: CAMEL may be used to establish forwarded-legs and CAMEL based re-routing-legs which violate conditional outgoing call barring and ODB services. Network operators should take care to avoid problems which may arise because of this interaction.

18.8.1 Barring of all outgoing calls

18.8.1.1 Mobile originated calls

No interaction. The Barring of all outgoing calls supplementary service will be invoked. Thus, originating CAMEL based services will not be invoked.

18.8.1.2 Forwarded Calls

No interaction. If the Barring of all outgoing calls supplementary service is active and operative, it shall prevent the registration or activation of Call Forwarding as specified in TS 22.082.

18.8.1.3 Mobile Originated Short Message Service

No interaction. The Barring of all outgoing calls supplementary service will be invoked. No CAMEL service for Mobile Originated SMS will be invoked.

18.8.2 Barring of outgoing international calls

18.8.2.1 Mobile originated calls

. Any originating CAMEL based services shall be invoked before the Barring of outgoing international calls supplementary service.

18.8.2.2 Forwarded Calls

For CAMEL phase 1 based services there shall be no interaction. In this case, the interaction between call forwarding and call barring is not modified by CAMEL. This means that the interaction is applied prior to the invocation of call forwarding. When call forwarding is invoked (possibly with originating CAMEL services in the forwarding leg) then the VPLMN or IPLMN shall not apply outgoing call barring services.

For CAMEL Phase 2 or higher, if the served subscriber is provided with TIF-CSI the network shall not check the interaction of call forwarding services with this barring program, i.e.

- The registration or activation of Call Forwarding is accepted even if this barring program is active and operative;
- The activation of this barring program is accepted even if a Call Forwarding supplementary service is active.

When Call Forwarding is invoked (possibly with originating CAMEL services in the forwarding leg) the VPLMN or IPLMN shall not invoke outgoing Call Barring services.

The following note applies to CAMEL phase 1 only

NOTE: This behaviour means that CAMEL may be used to establish forwarded-legs which violate conditional outgoing call barring and ODB services. Network operators should take care to avoid problems which may arise because of this interaction.

18.8.2.3 Mobile Originated Short Message Service

The CAMEL Service for Mobile Originated SMS shall be invoked before the Barring of outgoing international calls supplementary service.

18.8.3 Barring of outgoing international calls except those directed to the HPLMN country

As for Barring of outgoing international calls (see subclause 18.8.2).

18.8.4 Barring of all incoming calls

18.8.4.1 Mobile Terminated calls

No interaction. The Barring of all incoming calls supplementary service shall be invoked. Thus, terminating CAMEL based services will not be invoked.

18.8.4.2 Mobile Terminated Short Message Service

No interaction. The Barring of all incoming calls supplementary service shall be invoked. No CAMEL service for Mobile Terminated SMS will be invoked.

18.8.5 Barring of incoming calls when roaming

Same as Barring of all incoming calls (see subclause 18.8.4).

18.9 Explicit Call Transfer (ECT)

One or both legs of an ECT call may be subject to CAMEL based services.

If a call leg is subject to CAMEL based services the CSE shall be able to instruct the VPLMN of the served subscriber whether to prohibit the inclusion of that leg in an explicitly transferred call.

18.10 Completion of Call to Busy Subscriber (CCBS)

When a call is established the CSE shall be able to instruct the VPLMN/IPLMN whether Subscriber A is prohibited from activating a CCBS request if a subsequent "CCBS possible" indication is received from the destination network or the terminating served subscriber is busy.

18.11 Call Deflection

When an MT call is established the CSE shall be able to instruct the VPLMN of the served subscriber whether to prohibit Call Deflection.

19 Interactions with Operator Determined Barring (ODB)

19.1 Barring of all outgoing calls

Same principle as for subclause 18.8.1.

19.2 Barring of all outgoing international calls

Same principle as for subclause 18.8.2.

19.3 Barring of all outgoing international calls except those directed to the home PLMN country

Same principle as for subclause 18.8.3.

19.4 Barring of outgoing calls when roaming outside the home PLMN country

If the subscriber is outside her home PLMN country the Barring of outgoing calls when roaming outside the home PLMN country service will be invoked. Thus, originating CAMEL based services will not be invoked.

19.5 Barring of outgoing inter-zonal calls

Same principle as for subclause 18.8.2.

19.6 Barring of outgoing inter-zonal calls except those directed to the home PLMN country

Same principle as for subclause 18.8.2.

19.7 Barring of outgoing international calls except those directed to the home PLMN country AND barring of outgoing inter-zonal calls

Same principle as for subclause 18.8.2.

19.8 Barring of outgoing premium rate calls

Same principle as for subclause 19.2. The serving network analyses the destination number to determine whether the destination corresponds to a premium rate number. The handling will be the same both for Premium rate information and Premium rate entertainment.

19.9 Barring of incoming calls

Same principle as for subclause 18.8.4.

19.10 Barring of incoming calls when roaming outside the home PLMN country

Same principle as for subclause 18.8.5.

19.11 Barring of incoming calls when roaming outside the zone of the home PLMN country

Same principle as for subclause 18.8.5.

19.12 Operator Specific Barring

No interaction. Any originating or terminating CAMEL based services shall be invoked before Operator Specific Barring of type 1,2,3,4. Operator Specific Barring is applicable only when the subscriber is registered in the HPLMN.

NOTE: Operators should be aware of this interaction when defining Operator Specific ODB categories.

19.13 Barring of Supplementary Services Management

No interaction.

19.14 Barring of registration of forwarded-to numbers

No interaction. The HPLMN will apply the barring of registration of the forwarded-to number as specified in TS 22.041 and TS 23.015.

If the served subscriber is provided with TIF-CSI the HPLMN shall not check the forwarded-to number; hence only the category Barring of registration of any call forwarded-to number will take effect.

19.15 Barring of invocation of call transfer

No interaction. The serving network will apply the barring of invocation of call transfer as specified in TS 22.041 and TS 23.015 after any CAMEL handling of the call legs to be joined by the ECT invocation.

If the CSE instructs the serving network to bar the invocation of call transfer involving a specific call leg, this instruction shall have priority over the possible Operator Determined Barring of invocation of call transfer.

19.16 Barring of Packet Oriented Services

No interaction. Any originating CAMEL based services shall be invoked before the barring of packet oriented services.

20 Interactions with Optimal Routeing (OR)

If OR is applied to a late Call Forward then the interrogating PLMN shall invoke a mobile originated CAMEL based service, if required for the served subscriber.

If a call is subject to basic OR, VPLMN-A shall pass the address defining the ultimate destination of the call (whether VPLMN-B, HPLMN-B or the forwarded-to destination) to the CSE of the originating subscriber.

If a call is subject to OR of late call forwarding from an IPLMN which is also the forwarding subscriber's HPLMN, then the IPLMN shall pass the forwarded-to number to the CSE which handles mobile terminating CAMEL-based services for the forwarding subscriber.

Specific interaction is described in TS 22.079 [2].

21 Reserved clause

22 Location Information

The purpose of this procedure is to obtain the location of a particular subscriber. The resolution of the location information may be based on the Cell Identity, Service Area Identity or Routing Area Identity of the subscriber's location, or may be based on more accurate positioning information.

The CSE may interrogate the HLR in order to obtain a particular subscriber's location based on the Cell Identity, Service Area Identity or the Routing Area Identity.

The HLR may return location information as defined in TS 23.018 [9] and TS 23.078.

The HLR may return information based on the current service area identity, cell identity or the routing area identity as a result of paging the subscriber.

The CSE may interrogate the GMLC in order to obtain a particular subscriber's current location based on accurate geographical information as defined by LCS in TS 22.071 [8]. The GMLC has the possibility to reject any interrogation from any CSE.

23 Cross Phase compatibility with future Phases of CAMEL

Where different entities support different phases of CAMEL they shall operate at the highest common phase. CAMEL phase 1 is the lowest common phase.

Annex A (normative):
Void

Annex B (normative): Procedures for IP multimedia sessions

B.1 General

When a mobile originated or mobile terminated IPMM session is detected by the IM CN subsystem, the IM CN subsystem shall decide whether the CSE shall be contacted. If the CSE is contacted the IM CN subsystem shall provide information which includes information taken from the IPMM session and information previously stored in the IM CN subsystem. When the IM CN subsystem contacts the CSE, the IM CN subsystem shall suspend the handling of the IPMM session and make contact with a CSE to ask for instructions.

The IM CN subsystem shall accept the instructions from the CSE and continue IPMM session processing with the received information.

B.2 Mobile Originated Events

B.2.1 Initial contact with the CSE

When the IM CN subsystem initiates contact with the CSE, the IPMM session processing is suspended and the IM CN subsystem waits for instructions from the CSE. It shall be possible to specify which of the following initial events shall initiate contact with the CSE:

- Called identity received at the IM CN subsystem,
- Analysis of called identity
- Unsuccessful IPMM session setup.

After initial contact with the CSE, the CSE shall provide the IM CN subsystem with further instructions as detailed in table C-1.

B.2.2 Criteria for initial contact with the CSE

B.2.2.1 CSI criteria applicable at IPMM session setup when called identity is received

CSI criteria may be defined for a subscriber for the case when the called identity is received at IPMM session setup .

- Criteria on the called identity; these consist of:
 - The contents of the identity (a list of up to 10 identities may be defined in the criteria)
- The criteria on the called identity may be collectively defined to be either "enabling" triggering criteria or "inhibiting" triggering criteria (see below). The HPLMN may also choose not to define any criteria on the called identity.

B.2.2.2 CSI criteria applicable at IPMM session setup after analysis of called identity

A CSI criterion on the contents of the called identity shall be defined for subscribed dialled services. A list of up to 10 called identities may be defined in the criterion. Each entry in the called identity list has associated with it a CSE identity and a service key which defines the service to be triggered if the criterion is satisfied.

If any other CAMEL dialogue has changed the called number, then the modified called identity shall be used for the conditional triggering check.

The called identity criterion is satisfied if the called identity matches a called identity string defined in the criterion.

B.2.2.3 CSI criterion applicable on detection of unsuccessful IPMM session establishment

A criterion on the release cause may be defined. This may consist of a list of up to 5 cause values. The criterion on the release cause is satisfied if the received call release cause corresponds to any cause value defined in the list or if no criterion is defined.

B.2.3 Subsequent events reported to the CSE

After initial contact with the CSE, the CSE may request the IM CN subsystem to detect and report subsequent events. These events are listed below. With each of these events, the CSE shall indicate the type of monitoring (ie suspension of IPMM session processing or notification). If the CSE requests the suspension of IPMM session processing, it shall provide the IM CN subsystem with further instructions as detailed in table C-1.

The subsequent events that may be detected by the IM CN subsystem and reported to the CSE are:

- The called party answers;
- Additional information received from the originating party;
- The IPMM session is disconnected;
- The originating party abandons the IPMM session;
- Unsuccessful IPMM session setup. The following events shall be possible:
 - The called party is busy;
 - The called party does not respond in specified time period;
 - The called party can not be reached.

B.2.4 Instruction by the CSE

After initial contact with the CSE, or after the reporting of subsequent events to the CSE, the CSE shall be able to instruct the IM CN subsystem with the following;

- To bar the IPMM session;
- To arm one or more subsequent events;
- To perform the charging activity;
- To perform the in-band user interaction;
- To continue the IPMM session;
- To continue the IPMM session with modified information;
- To release the IPMM session.

The combination of the event reported to the CSE and the instruction by the CSE is provided in the table C-1. Table C-1 Actions performed by the CSE at specific service event for MO and MT IP multimedia session can be found in Annex C.

B.2.5 IM Application Level Registration procedure

When a user registers on application level with the IM CN subsystem, initial trigger information shall be provided to the IM CN subsystem. Initial trigger information shall be sufficient to enable the IM CN subsystem to detect relevant IPMM sessions and to contact the proper CSE.

The set of information shall at least include the CSE identity to be contacted, the user for which it is valid, the originating and terminating initial event including specific criteria if needed and the service key for the CSE service subscribed to. The initial trigger information for IM CN subsystem shall contain information for the IM CN subsystem only.

B.3 Mobile Terminated Events

B.3.1 Initial contact with the CSE

It shall be possible to specify which of the following initial service events shall initiate contact with the CSE:

- Incoming IPMM session to subscriber;
- Detection of unsuccessful IPMM session establishment.

Unsuccessful IPMM session establishment may be caused by:

- Called subscriber busy;
- Called subscriber not reachable;
- No answer from called subscriber in specified time period.

When the IM CN subsystem initiates contact with the CSE, the IPMM session processing is suspended and the IM CN subsystem waits for instructions from the CSE. After initial contact with the CSE, the CSE shall provide the IM CN subsystem with further instructions as detailed in table C-1.

B.3.2 Criteria for initial contact with the CSE

B.3.2.1 Void

B.3.2.2 CSI criteria applicable on detection of unsuccessful IPMM session establishment

A criterion on the failure reason may be defined. This consists of a list of up to 5 failure reasons. A failure reason can denote an error response or can denote that the HPLMN determined that the called subscriber was not reachable. The criterion on the failure reason is satisfied if the reason for failure of the IPMM session corresponds to any failure reason defined in the list or if no criterion is defined.

B.3.3 Subsequent events reported to the CSE

After initial contact with the CSE, the CSE may request the IM CN subsystem to detect and report subsequent events. These events are listed below. With each of these events, the CSE shall indicate the type of monitoring (ie suspension of IPMM session processing or notification). If the CSE requests the suspension of IPMM session processing, it shall provide the IM CN subsystem with further instructions as detailed in table C-1.

The subsequent events that may be detected by the IM CN subsystem and reported to the CSE are:

- The called party is alerted
- The called party answers;

- Additional information received from the terminating party;
- The IPMM session is disconnected;
- The calling party abandons;
- Unsuccessful IPMM session setup. The following events shall be possible:
 - The called party does not respond in specified time period.

B.3.4 Instruction by the CSE

After initial contact with the CSE, or after the reporting of subsequent events to the CSE, the CSE shall be able to instruct the IM CN subsystem with the following;

- To bar the IPMM session;
- To arm one or more subsequent events;
- To perform the charging activity;
- To perform the in-band user interaction;
- To continue the IPMM session;
- To continue the IPMM session with modified information;
- To release the IPMM session;
- To suppress tones and announcements which may be played to the calling party, if an unsuccessful IPMM session establishment occurs

The combination of the event reported to the CSE and the instruction by the CSE is provided in the table C-1. Table C-1 Actions performed by the CSE at specific service event for MO and MT IP multimedia session can be found in Annex C.

Annex C (normative): Actions performed by the CSE at specific service event for MO and MT IP multimedia session

Table C-1: Actions performed by the CSE at specific service event for MO and MT IP multimedia session

Instructions by the CSE	Service Events reported to the CSE																
	Mobile Originated									Mobile Terminated							
	Called identity received at the IM CN sub-system	Analysis of called identity	Unsuccessful IPMM session setup (initial event)	The called party answers	Additional information received from the originating party	The IMPP session is disconnected call	The originating party abandons the call	Unsuccessful IPMM session setup (subsequent event)		Incoming IPMM session to subscriber	Unsuccessful IPMM session establishment (initial event)	The called party is alerted	The called party answers	Additional information received from the terminating party	The IPMM session is disconnected	The calling party abandons	Unsuccessful IPMM session establishment (subsequent event)
To bar the IPMM session	X									X							
To arm one or more subsequent events	X		X	X						X	X	X	X	X	X		
To perform the charging activities	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X
To perform in-band user interaction	X	X	X	X						X	X	X	X	X	X		
To continue the IPMM session	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

To continue the IPMM session with modified information	X	X	X		X					X	X				X		
To release the IPMM session	X	X	X		X			X	X	X	X		X	X			X

Annex B (informative): Change history

Change history											
TSG SA#	SA Doc.	SA1 Doc	Spec	CR	Rev	Rel	Cat	Subject/Comment	Old	New	WI
Jun 1999			02.78					Transferred to 3GPP SA1	8.0.0		
SA#04			22.078					Version 3.0.0 Approved		3.0.0	
SP-05	SP-99443	S1-99268	22.078	001		R99	F	CAMEL control of packet switched MO SMS	3.0.0	3.1.0	
SP-05	SP-99443	S1-99272	22.078	002		R99	C	CAMEL control of packet switched MO SMS	3.0.0	3.1.0	
SP-05	SP-99443	S1-99290	22.078	003		R99	C	CSE related overload control	3.0.0	3.1.0	
SP-05	SP-99443	S1-99333	22.078	004		R99	F	Clarify the serving network behaviour when instructions from the CSE are received.	3.0.0	3.1.0	
SP-05	SP-99443	S1-99338	22.078	005		R99	C	Inclusion of Service Key in Mobility Management event notifications + editorial modifications	3.0.0	3.1.0	
SP-05	SP-99443	S1-99339	22.078	006		R99	F	Clarification the behaviour when network provided dialled services are used.	3.0.0	3.1.0	
SP-05	SP-99443	S1-99341	22.078	007		R99	F	Correct the unsuccessful call establishment procedure for MT calls	3.0.0	3.1.0	
SP-05	SP-99443	S1-99342	22.078	008		R99	F	GSM 02.78 Clean-up of CAMEL phase information	3.0.0	3.1.0	
SP-05	SP-99443	S1-99345	22.078	009		R99	F	Clarification on the type of number used by mobile stations.	3.0.0	3.1.0	
SP-05	SP-99443	S1-99590	22.078	010		R99	D	Editorial update of references for GSM/3GPP use.	3.0.0	3.1.0	
SP-05	SP-99443	S1-99594	22.078	011		R99	B	CAMEL3 interworking with GPRS; Change of position	3.0.0	3.1.0	
SP-05	SP-99443	S1-99596	22.078	012		R99	C	CAMEL3 DTMF Mid-Call corrections and clarifications	3.0.0	3.1.0	
SP-05	SP-99443	S1-99597	22.078	013		R99	F	CAMEL3 clean-up of IPLMN and VPLMN references	3.0.0	3.1.0	
SP-05	SP-99443	S1-99598	22.078	014		R99	C	Defining successful SM submission to SMSC as EDP (CAMEL3)	3.0.0	3.1.0	
SP-05	SP-99443	S1-99673	22.078	015		R99	F	Interworking with SAT and MExE!	3.0.0	3.1.0	
SP-05	SP-99443	S1-99675	22.078	016		R99	F	Correction Annex A.2; Information sent by the CSE	3.0.0	3.1.0	
SP-05	SP-99443	S1-99677	22.078	017		R99	F	Corrections to CAMEL interworking with GPRS	3.0.0	3.1.0	
SP-05	SP-99443	S1-99681	22.078	018		R99	C	Short Message Submission Handling	3.0.0	3.1.0	
SP-05	SP-99443	S1-99684	22.078	019		R99	C	Removing the restriction on the total number of trigger criteria.	3.0.0	3.1.0	
SP-05	SP-99443	S1-99686	22.078	020		R99	C	Removing the 40-octet restriction of free format data	3.0.0	3.1.0	
SP-05	SP-99443	S1-99689	22.078	021		R99	C	Defining Successful SM submission and Unsuccessful SM submission as EDP-N and EDP-R.	3.0.0	3.1.0	
SP-05	SP-99443	S1-99770	22.078	022		R99	C	CAMEL3 corrections to new Trigger Detection Points (TDP)	3.0.0	3.1.0	
SP-05	SP-99443	S1-99771	22.078	023		R99	C	Description of CAMEL Subscription Information	3.0.0	3.1.0	
SP-05	SP-99443	S1-99773	22.078	024		R99	F	CAMEL3 corrections and clarifications to dialled services (subscribed & serving network)	3.0.0	3.1.0	
SP-05	SP-99443	S1-99774	22.078	025		R99	D	Charging clarifications for MO-SMS	3.0.0	3.1.0	
SP-05	SP-99443	S1-99775	22.078	026		R99	B	CAMEL3 Call Forwarding and new TDP interworking	3.0.0	3.1.0	

SP-05	SP-99443	S1-99776	22.078	027		R99	C	Support For MSP Phase 2	3.0.0	3.1.0	
SP-05	SP-99443	S1-99777	22.078	028		R99	B	Addition of CCBS to the SS Invocation Notification	3.0.0	3.1.0	
SP-05	SP-99443	S1-99772	22.078	029		R99	F	Clarification the behaviour when network provided dialled services are used	3.0.0	3.1.0	
SP-06	SP-99526	S1-991048	22.078	030	1	R99	B	CSE ability to change CLI PI for an MO call	3.1.0	3.2.0	
SP-06	SP-99526	S1-991035	22.078	031		R99	B	Enhancement of the capabilities of dialled services	3.1.0	3.2.0	
SP-07	SP-000062	S1-000095	22.078	032	1	R99	F	Call gapping / congestion control in HPLMN only	3.2.0	3.3.0	
SP-07	SP-000062	S1-000065	22.078	033		R99	F	In-band user interaction for dialled services in CAMEL ph3	3.2.0	3.3.0	
SP-07	SP-000062	S1-000159	22.078	034		R99	F	Correction of GPRS session description	3.2.0	3.3.0	
SP-07	SP-000062	S1-000167	22.078	035		R99	F	Reduced scope of CAMEL Phase 3 in release 99	3.2.0	3.3.0	
SP-07	SP-000123	S1-000158	22.078	036		R99	F	Correction of announcement capabilities	3.2.0	3.3.0	
SP-08		S1-000232	22.078	037		R99	F	Correction to the reduced scope of CAMEL Phase 3 in release 99 – enhancements to call forwarding	3.3.0	3.4.0	
SP-08		S1-000247	22.078	038		R99	F	Correction to the reduced scope of CAMEL Phase 3 in release 99 – deletion of MEXE / SAT free format data parameter in Annex A.1	3.3.0	3.4.0	
SP-08		S1-000251	22.078	039		R99	F	Correction to description of subscriber dialled services	3.3.0	3.4.0	
SP-08		S1-000252	22.078	040		R99	F	Clarification for conditional triggering for subscribed dialled services	3.3.0	3.4.0	
SP-08		S1-000255	22.078	041		R99	C	Removal of NPI from conditional triggering	3.3.0	3.4.0	
SP-08	SP-000198	S1-000395	22.078	042		R99	D	Corrections to Interactions with Supplementary Services	3.3.0	3.4.0	
SP-08	SP-000198	S1-000396	22.078	043		R99	D	Removal of question marks from the A.1 information flow table	3.3.0	3.4.0	
SP-08	SP-000198	S1-000402	22.078	044		R99	D	Definition of Geodetic Information	3.3.0	3.4.0	
SP-08	SP-000198	S1-000403	22.078	045		R99	D	Distinction between initial and subsequent service events	3.3.0	3.4.0	
SP-08	SP-000198	S1-000404	22.078	046		R99	D	Update of CAMEL roaming issues (section 16)	3.3.0	3.4.0	
SP-08	SP-000198	S1-000390	22.078	047		R99	D	Removal of Editor's notes and corrections to Annex 1	3.3.0	3.4.0	
SP-08	SP-000198	S1-000445	22.078	048	2	R99	D	CR to 22.078 R99 on Corrections to CAMEL interworking with GPRS re3	3.3.0	3.4.0	
SP-09	SP-000381	S1-000638	22.078	050		R4	D	Change of MEXE name	3.4.1	4.0.0	
SP-09	SP-000425	S1-000510	22.078	054		R5	B	Introduction of MT SMS interworking with CAMEL4	3.4.1	5.0.0	
SP-09	SP-000425	S1-000512	22.078	056		R5	C	Removal of tags associated with previous releases of CAMEL	3.4.1	5.0.0	
SP-09	SP-000425	S1-000514	22.078	058		R5	B	Inclusion of Mid call event	3.4.1	5.0.0	
SP-09	SP-000425	S1-000515	22.078	059		R5	B	Inclusion of flexible tone injection	3.4.1	5.0.0	
SP-09	SP-000425	S1-000417	22.078	061		R5	C	GPRS AC/ACR alignment of shared data volume control (Stage 1 vs. 2)	3.4.1	5.0.0	
SP-09	SP-000425	S1-000596	22.078	064		R5	B	Transport of Charging Information to the Home Network	3.4.1	5.0.0	
SP-10	SP-000698	S1-000752	22.078	063		Rel-5	B	Introduction of Call Party Handling	5.0.0	5.1.0	CAMEL4
SP-10	SP-000537	S1-000857	22.078	067		Rel-5	A	Introduction of GGSN Address	5.0.0	5.1.0	CAMEL3
SP-10	SP-000545	S1-000783	22.078	068		Rel-5	B	Enhancement to the Mid Call event to include out band information	5.0.0	5.1.0	CAMEL4-MCP
SP-10	SP-000545	S1-000754	22.078	073		Rel-5	C	Criteria for the Mid-Call event detection point	5.0.0	5.1.0	CAMEL4-MCP

SP-11	SP-010046	S1-010242	22.078	078	3	Rel-5	F	Support of previous phases of CAMEL	5.1.0	5.2.0	CAMEL4
SP-11	SP-010045	S1C01045	22.078	080		Rel-5	A	Alignment with stage 2 & 3, and some editorial corrections	5.1.0	5.2.0	CAMEL4
SP-11	SP-010051	S1C0160	22.078	081	2	Rel-5	C	Clarification on Call Party Handling requirements	5.1.0	5.2.0	CAMEL4
SP-11	SP-010051	S1C0141	22.078	082		Rel-5	B	Enhancements to mobility management reporting	5.1.0	5.2.0	CAMEL4
SP-11	SP-010051	S1C0151	22.078	083	2	Rel-5	F	Corrections of Call Barring interaction for CSE created call / new party	5.1.0	5.2.0	CAMEL4
SP-11	SP-010051	S1C0150	22.078	084	1	Rel-5	D	Changing of naming for SMS-CSI	5.1.0	5.2.0	CAMEL4
SP-11	SP-010051	S1C0164	22.078	087	2	Rel-5		Transport of Charging Information from serving PLMN to the CSE	5.1.0	5.2.0	CAMEL4
SP-11	SP-010051	S1C0153	22.078	088	1	Rel-5	C	Enhanced CSE capability for Subscribed Dialed Services.	5.1.0	5.2.0	CAMEL4
SP-11	SP-010050	S1-010090	22.078	089	2	Rel-5	A	Corrections of congestion control procedure	5.1.0	5.2.0	CAMEL4
SP-11	SP-010051	63	22.078	090	2	Rel-5	B	Provide Location Information in case a terminating call is alerted	5.1.0	5.2.0	CAMEL4
SP-11	SP-010047	S1C0165	22.078	094	1	Rel-5	F	Interaction between CAMEL control of MO-/MT-SMS and Call Barring & ODB	5.1.0	5.2.0	CAMEL4
SP-11	SP-010048	S1C0168	22.078	097		Rel-5	F	Correction of interaction between CAMEL and BOIC	5.1.0	5.2.0	CAMEL4
SP-11	SP-010049	S1-010205	22.078	100		Rel-5	A	New subclause is added regarding to the CAMEL interactions with ODB for the Packet Oriented Services	5.1.0	5.2.0	ODB Enh.
SP-12	SP-010251	S1-010466	22.078	102		Rel-5	B	Enhance ATI operation (CAMEL4) - GPRS Location	5.2.0	5.3.0	CAMEL4
SP-12	SP-010250	S1-010310	22.078	106		Rel-5	A	CR 22.078-106 on "Clarification of CUG requirements" (CAMEL3, REL-5, Category A, version 5.2.0)	5.2.0	5.3.0	CAMEL3
SP-12	SP-010251	S1-010464	22.078	107		Rel-5	B	Location information during an ongoing call (CAMEL4)	5.2.0	5.3.0	CAMEL4
SP-12	SP-010251	S1-010463	22.078	108		Rel-5	F	Clarification of CPH requirements (CAMEL4)	5.2.0	5.3.0	CAMEL4
SP-12	SP-010251	S1-010341	22.078	109		Rel-5	B	Inclusion of ODB data in ATM	5.2.0	5.3.0	CAMEL4
SP-12	SP-010251	S1-010306	22.078	110		Rel-5	F	CR 22.078-xxx on "Clarification on creating a new call" CAMEL4, REL-5, Category F, version 5.2.0)	5.2.0	5.3.0	CAMEL4
SP-12	SP-010251	S1-010342	22.078	111		Rel-5	C	Introduction of the new CSI for the mobility management for the GPRS subscriber	5.2.0	5.3.0	CAMEL4
SP-13	SP-010432	S1-010782	22.078	112	3	Rel-5	B	Enhanced charging for Call Party Handling. 22.078-112; Rel 5; F	5.3.0	5.4.0	CAMEL4
SP-13	SP-010432	S1-010851	22.078	113	2	Rel-5	F	CR to 22.078 (Rel-5) on Introduction of definitions for CPH 22.078-113; Rel 5; F	5.3.0	5.4.0	CAMEL4
SP-13	SP-010432	S1-010691	22.078	114	1	Rel-5	F	CR to 22.078 (Rel-5) on Editorial corrections to subclause 8.1. 22.078-114; Rel 5; F	5.3.0	5.4.0	CAMEL4
SP-13	SP-010432	S1-010873	22.078	115	1	Rel-5	B	Introduction service requirements for CAMEL interworking with the IP multimedia subsystem 22.078-115; Rel 5; B	5.3.0	5.4.0	CAMEL4
SP-13	SP-010432	S1-010693	22.078	116		Rel-5	C	CR additional procedure description to Charging Notification 22.078-116; Rel 5; C	5.3.0	5.4.0	CAMEL4
SP-13	SP-010432	S1-010695	22.078	118		Rel-5	C	CR additional information called party connection procedure 22.078-118; Rel 5; C	5.3.0	5.4.0	CAMEL4
SP-13	SP-010432	S1-010852	22.078	119	2	Rel-5	B	Tones support for CAMEL phase 4	5.3.0	5.4.0	CAMEL4
SP-13	SP-010432	S1-010806	22.078	120		Rel-5	F	Correction of on line charging procedures in case of CPH	5.3.0	5.4.0	CAMEL4
SP-13	SP-010432	S1-010853	22.078	121	1	Rel-5	B	Applicability of CAMEL to IMS	5.3.0	5.4.0	CAMEL4

SP-13	SP-010432	S1-010878	22.078	122	1	Rel-5	B	Applicability of CAMEL to IP Multimedia sessions	5.3.0	5.4.0	CAMEL4
SP-13	SP-010432	S1-010666	22.078	123		Rel-5	B	CAMEL and IM application registration	5.3.0	5.4.0	CAMEL4
SP-14	SP-010674	S1-011314	22.078	125		Rel-5	A	Removal of Volume charging for GPRS Session	5.4.0	5.5.0	
SP-14	SP-010674	S1-010965	22.078	126		Rel-5	C	Use of start digit string as only criteria in Mid Call DP	5.4.0	5.5.0	CAMEL4
SP-14	SP-010674	S1-010968	22.078	127		Rel-5	C	Ability to arm Mid Call DP for the duration of a call	5.4.0	5.5.0	CAMEL4
SP-14	SP-010674	S1-011312	22.078	128	1	Rel-5	C	Introduction of subscriber status information in PS domain	5.4.0	5.5.0	CAMEL4
SP-14	SP-010674	S1-010977	22.078	129		Rel-5	C	CR to 22.078 (Ability to re-arm the event in the change of position procedures during a call)	5.4.0	5.5.0	CAMEL4
SP-14	SP-010674	S1-011293	22.078	130		Rel-5	F	CR to 22.078 (Removal of call suspension in the change of position procedures)	5.4.0	5.5.0	CAMEL4
SP-15	SP-020048	S1-020625	22.078	134	1	Rel-5	B	Removal of CAMEL4 Dialed Services enhancements	5.5.0	5.6.0	CAMEL4
SP-15	SP-020048	S1-020008	22.078	135		Rel-5	C	Liaison Statement on Mobility Management event reporting in the PS domain	5.5.0	5.6.0	CAMEL4
SP-15	SP-020044	S1-020629	22.078	138		Rel-5	A	CR to 22.078 on removal of handling of e-parameters provided by the SCP	5.5.0	5.6.0	CAMEL3
SP-15	SP-020048	S1-020418	22.078	139		Rel-5	C	CR 22.078 Rel.5 Transferring the MS classmark & IMEI to the CSE (update of 301)	5.5.0	5.6.0	CAMEL4
SP-15	SP-020048	S1-020358	22.078	140		Rel-5	C	Clarification on Releasing Individual Call Parties	5.5.0	5.6.0	CAMEL4
SP-15	SP-020048	S1-020317	22.078	141		Rel-5	B	Introduction of functional subsets for CAMEL Phase 4	5.5.0	5.6.0	CAMEL4
SP-15	SP-020045	S1-020457	22.078	143		Rel-5	A	Editorial CR to correct terms and references	5.5.0	5.6.0	CORRECT
SP-16	SP-020247	S1-021021	22.078	144		Rel-5	F	Annex of Information Tables (A.1, A.2, A.3 and A.4) in 22.078	5.6.0	5.7.0	CAMEL4
SP-16	SP-020247	S1-020923	22.078	145		Rel-5	F	Functional split in CAMEL4	5.6.0	5.7.0	CAMEL4
SP-16	SP-020247	S1-021179	22.078	147		Rel-5	F	Removal of Charging Notification	5.6.0	5.7.0	CAMEL4
SP-17	SP-020550	S1-021675	22.078	148	1	Rel-5	F	Clarification on re-connecting held parties in a CPH configuration	5.7.0	5.8.0	CAMEL4
SP-17	SP-020550	S1-021538	22.078	149		Rel-5	C	Handling of partial implementations of CAMEL phase 4	5.7.0	5.8.0	CAMEL4
SP-18	SP-020653	S1-022218	22.078	150		Rel-5	F	LS on Disappearance of CN2 endorsed CAMEL4 22.078 CR	5.8.0	5.9.0	CAMEL4
SP-18	SP-020653	S1-022157	22.078	151		Rel-5	F	CAMEL: Remove References to the old Annex A in 22.078	5.8.0	5.9.0	TEI4
SP-18	SP-020653	S1-022306	22.078	152		Rel-5	F	CAMEL: Removal of media type as a trigger criterion for CAMEL/IMS	5.8.0	5.9.0	CAMEL4
			22.078	--		Rel-5		Fixing of missing headers and footers	5.9.0	5.9.1	
SP-19	SP-030014	S1-030071	22.078	154	-	Rel-5	F	Correction to CAMEL interworking with CLIR and COLR	5.9.1	5.10.0	CAMEL4
SP-19	SP-030015	S1-030254	22.078	156	-	Rel-5	F	Removal of duplicate text in procedure describing 'subscribed dialed services'	5.9.1	5.10.0	EDCAMEL
SP-19	SP-030016	S1-030135	22.078	157	-	Rel-5	F	Removal of \$(CAMEL4)\$ markers	5.9.1	5.10.0	CAMEL4
SP-21	SP-030458	S1-030956	22.078	161		Rel-5	F	Alignment of stage 1 with stage 2 & stage 3	5.10.0	5.11.0	CAMEL4

History

Document history		
V5.6.0	March 2002	Publication
V5.7.0	June 2002	Publication
V5.8.0	September 2002	Publication
V5.9.0	December 2002	Publication
V5.10.0	March 2003	Publication
V5.11.0	September 2003	Publication