Technical Specification Group Services and System Aspects ***TSGS#11(01)010025***
Meeting #11, Palm Springs, CA, USA, 19-22 March 2001

Source: **SA WG5**

Title: **3G charging data description for the CS domain (32.xyz) -- New TS for Release 4 replacing R99 TS 32.005**

Document for: **Information**

Agenda Item: **7.5.3**

Work Item: **Charging Management (Release 4/5 Building Block: OAM-CH)**

- Release 99 of TS 32.005 (3G **call and event data** for the Circuit Switched (CS) domain should be discontinued from Release 4 onwards.
  It should be replaced by this new TS 32.xyz (3G **charging data description** for the Circuit Switched (CS) domain), which is presented as version 1.0.0 for Information.

- SA5 plans **not** to progress to Release 4 either 32.005 or 32.015 and to create new specifications on Charging as follows:

Spec No.	Title	Prime resp. WG	2ndary resp. WG(s)	Presented for information at plenary#	Approved at plenary#	Comments
32.xyz	3G charging data description for the Circuit Switched (CS) domain	SA5		TSG#11 (03/01)	TSG#11 (06/01)	Release 4
32.uvw	3G charging data description for the Packet Switched (PS) domain	SA5		TSG#13 (12/01)	TSG#14 (03/02)	Release 5
32.rst	TBD (To concern requirements, architecture, etc.)	SA5		TSG#13 (12/01)	TSG#14 (03/02)	Release 5

Affected existing specifications				
Spec No.	CR	Subject	Approved at plenary#	Comments
~~32.005~~			~~TSG#11 (06/01)~~	~~Release 4~~
~~32.015~~			~~TSG#11 (06/01)~~	~~Release 4~~

Attachment: 32xyz_S5-010128: TS 32.xyz V1.0.0 (2001-03) for Release 4

3GPP TS 32.xyz V1.0.0 (2001-03)

Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Services and System Aspects;
Telecommunication Management;
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3G charging data description for the Circuit Switched (CS) domain
(Release 4)

Keywords
UMTS, circuit mode, charging

3GPP

Postal address

3GPP support office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet
http://www.3gpp.org

Contents

Foreword

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

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

Version x.y.z

where:

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

1 Scope

The GSM and UMTS PLMNs support a wide range of circuit based services. In order to enable operators the ability to provide a commercially viable service there is a need to provide charging functions. The present document specifies the structure and the contents of the CDRs that are collected by the relevant network elements for circuit switched services in 2G (GSM) and 3G (UMTS) networks. It also defines the syntax for the transfer of these CDRs from the collecting nodes to billing post-processing systems using standard file transfer protocols.

The tariff administration and TMN interface definitions of GSM 12.05 are maintained for 2G, in order to assure backward compatibility to earlier GSM releases.

The charging architecture and principles that the present document is based on are specified in TS 32.105 [22].

~~1~~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.

[1] 3GPP TS 21.905: "3G vocabulary".

[2] 3GPP TS 23.003: "Numbering, addressing and identification".

[3] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS); Point-to-Point (PP)".

[4] 3GPP TS 24.008: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".

[5] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".

[6] ITU-T Recommendation X.121: "International Numbering Plan for Public Data Networks".

[7] ISO8824-1 (94) / X.680 (94): "Information technology - Abstract Syntax Notation One (ASN.1) - Specification of Basic Notation".

[8] X.208/9

[9] 3GPP TS 22.024: "Description of Charge Advice Information (CAI)".

[10] 3GPP TS 22.086: "Advice of charge (AoC) supplementary services - Stage 1".

[11] ITU-T D.93

[12] ITU-T E.164

[13] 3GPP TS 29.078

[14] ISUP Q.767

[15] 3GPP TS 23.040

[16] 3GPP TS 23.003

[17] 3GPP TS 23.002

[18] 3GPP TS 22.115

[19] 3GPP TS 22.004

[20] 3GPP TS 22.003

[21] 3GPP TS 22.002

[22] 3GPP TS 32.105

~~1~~3 Definitions, abbreviations and symbols

~~1~~3.1 Definitions

Editor's note: All the Definitions should be removed in 32.105 except CS specific definitions

(GSM only): indicates that this section or paragraph applies only to a GSM system. For multi-system cases this is determined by the current serving radio access network.

(UMTS only): indicates that this section or paragraph applies only to a UMTS system. For multi-system cases this is determined by the current serving radio access network.

In GSM,...: indicates that this paragraph applies only to GSM System. For multi system cases this is determined by the current serving radio access network.

In UMTS,...: indicates that this paragraph applies only to UMTS System. For multi system cases this is determined by the current serving radio access network.

2G- / 3G- : The prefixes 2G- and 3G- refers to functionality that supports only GSM or UMTS, respectively, e.g., 2G-SGSN refers only to the GSM functionality of an SGSN. When the prefix is omitted, reference is made independently from the GSM or UMTS functionality.

accounting: The process of apportioning charges between the Home Environment, Serving Network and User.

accounting meter record: A record containing one or more counters employed to register the usage of resources en masse. Includes simple event counters and/ or cumulative call second counters.

advice of charge: The real-time display of the network utilisation charges incurred by the Mobile Station. The charges are displayed in the form of charging units. If a unit price is stored by the MS then the display may also include the equivalent charge in the home currency.

aoc service: A combination of one or more services, both basic and supplementary, together with a number of other charging relevant parameters to define a customised service for the purpose of advice of charge.

billing: A function whereby CDRs generated by the charging function are transformed into bills requiring payment.

call data: One or more call records.

call detail record (CDR): A formatted collection of information about a chargeable event (e.g. time of call set-up, duration of the call, amount of data transferred, etc) for use in billing and accounting. For each party to be charged for parts of or all charges of a chargeable event a separate CDR shall be generated, i.e more than one CDR may be generated for a single chargeable event, e.g. because of its long duration, or because more than one charged party is to be charged.

CAMEL: A network feature that provides the mechanisms to support operator specific services even when roaming outside HPLMN.

CAMEL subscription information: Identifies a subscriber as having CAMEL services.

charged party: A user involved in a chargeable event who has to pay parts or the whole charges of the chargeable event, or a third party paying the charges caused by one or all users involved in the chargeable event, or a network operator.

charging: A function whereby information related to a chargeable event is formatted and transferred in order to make it

possible to determine usage for which the charged party may be billed.

chargeable event: An activity utilising telecommunications network infrastructure and related services for user to user communication (e.g. a single call, a data communication session or a short message), or for user to network communication (e.g. service profile administration), or for inter-network communication (e.g. transferring calls, signalling, or short messages), or for mobility (e.g. roaming or inter-system handover), which the network operator wants to charge for. The cost of a chargeable event may cover the cost of sending, transporting, delivery and storage. The cost of call related signalling may also be included.

charging calendar: One or more date definitions each of which assigns a day class to a particular day.

charging destination: Also referred to as a destination for charging, this is a nominal reference defining the point of termination of a connection for charging purposes.

charging origin: A nominal reference defining the point of origin of a connection for charging purposes.

charging zone: A distance class (e.g. "local" and "long distance") defined by one or more combinations of charging origins and charging destinations.

day class: A group of days for which the same tariff switch-over pattern applies e.g. public holidays

event data: One or more event records.

event record: A set of parameters related to a single telecommunications event.

inter-system change: a change of radio access between different radio access technologies such as GSM and UMTS.

MS: this specification makes no distinction between MS and UE.

observed IMEI ticket: A record used to describe an EIR relevant event e.g. a blacklisted IMEI **off-line charging: tbd**

on-line charging: tbd

{near} real time: Time, typically in number of seconds, to perform the on-line mechanism used for fraud control and cost control.

service distance dependency: The relationship between an AoC service, a charging zone and the relevant tariff class.

settlement: Payment of amounts resulting from the accounting process.

short time: Time, typically in number of minutes, to perform the off-line mechanism used for accounting.

successful call: A connection that reaches the communication or data transfer phase e.g. the "answered" state for speech connections. All other connection attempts are regarded as unsuccessful.

tariff: A set of parameters defining the network utilisation charges for the use of a particular service.

tariff class: A grouping of one or more service distance dependencies for the purpose of defining the corresponding tariff switching patterns.

tariff period: A part of one (calendar) day during which a particular tariff is applied. Defined by the time at which the period commences (the switch-over time) and the tariff to be applied after switch-over.

tariff switch-over pattern: A set of tariff periods defining the tariffs to be applied over one complete 24 hour period (calendar day).

~~1~~3.2 Abbreviations

{Need to confirm that the abbreviations exist in the text; e.g., EFD only appears in the abbreviation list.}

For the purposes of the present document the following abbreviations apply. Additional applicable abbreviations can be found in TS 21.905 [1].

AoC	Advice of Charge
CAI	Charge Advice Information
CAMEL	Customised Applications for Mobile network Enhanced Logic
CDR	Call Detail Record
CMIP	Common Management Information Protocol

CMIS	Common Management Information Service
CUG	Closed User Group
DP	Detection Point
EDP	Event Detection Point
EFD	Event forwarding discriminator
EIR	Equipment Identity Register
ETSI	European Telecommunications Standard Institute
FTAM	File Transfer, Access and Management
GMSC	Gateway MSC
gsmSCF	GSM Service Control Function
gsmSSF	GSM Service Switching Function
HLR	Home Location Register
HPLMN	Home PLMN
HSCSD	High Speed Circuit Switched Data
ICS	Implementation Conformance Statements
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
ISDN	Integrated Services Digital Network
ISP	Internal Standardized Profiles
MCS	Management Conformance Summary
MMI	Man Machine Interface
MOC	Mobile Originated Call (attempt)
MOCS	Managed Object Conformance Statements
MS	Mobile Station
MSC	Mobile Switching Centre
MSRN	Mobile Station Roaming Number
MTC	Mobile Terminated Call (attempt)
NE	Network Element
NEF	Network Element Function block
NM	Network Management
NSS	Network and Switching Subsystem
OACSU	Off air call set-up
O-CSI	Originating CAMEL Subscription Information
OMC	Operations and Maintenance Centre
OSF	Operations System Function
OSS	Operator Specific Service
PBX	Private Branch eXchange
PDN	Packet Data Network
PICS	Protocol Implementation Conformance Statements
PLMN	Public Land Mobile Network
PPS	Post-processing system
PSPDN	Packet Switched Public Data Network
SCI	Subscriber Controlled (MMI) Input
SCF	Service Control Function
SCS	System Conformance Statement
SDR	Special Drawing Right
SMF	System Management Function
SMS	Short Message Service
SS7	Signalling System No. 7
TAP	Transferred Account Procedure
T-CSI	Terminating CAMEL Subscription Information
TDP	Trigger Detection Point
TMN	Telecommunications Management Network
USIM	User Service Identity Module
USSD	Unstructured Supplementary Service Data
UTRAN	UMTS Terrestrial Radio Access Network
VAS	Value Added Service
VLR	Visitor Location Register
VMSC	Visited MSC
VPLMN	Visited PLMN

13.3 Symbols

All the Symbols should be removed in 32.105

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

A	Interface between an MSC and a BSC.
Ga	Charging data collection interface between a CDR transmitting unit (e.g. GGSN or SGSN) and a CDR receiving functionality (CGF).
Gs	Interface between an SGSN and an MSC/VLR.
Iu	Interface between the RNS and the core network. It is also considered as a reference point.
kbit/s	Kilobits per second.
Mbit/s	Megabits per second. 1 Mbit/s = 1 million bits per second.
R	Reference point between a non-ISDN compatible TE and MT. Typically this reference point supports a standard serial interface.
Service Area	The location accuracy level needed for service management purposes in the 3G-SGSN, e.g., a routeing area or a cell. The 3G-SGSN can request the SRNC to report: i) the MS's current service area; ii) when the MS moves into a given service area; or iii) when the MS moves out of a given service area.
Um	Interface between the mobile station (MS) and the GSM fixed network part. The Um interface is the GSM network interface for providing GPRS services over the radio to the MS. The MT part of the MS is used to access the GPRS services in GSM through this interface.
Uu	Interface between the mobile station (MS) and the UMTS fixed network part. The Uu interface is the UMTS network interface for providing GPRS services over the radio to the MS. The MT part of the MS is used to access the GPRS services in UMTS through this interface.

14 Record types and contents

The following tables describe the contents of each of the call and event records generated in the CS domain, i.e. by the MSCs (see the example scenarios in TS 32.105 [22]). Each table contains the name of the field, a key indicating whether or not the field is mandatory (separate for 2G and 3G), and a description of the contents.

The key field has the following meaning:

M	This field is mandatory and always present in the CDR.
C	This field is only present in the CDR under certain conditions. These conditions are individually described for every applicable parameter.
O_M	This field is a mandatory parameter that can be configured by the EM to be always present or always absent in the CDRs. In other words, a O_M parameter that is configured to be present will behave like a mandatory parameter. For the avoidance of doubt, optional does not mean that the parameter is not supported by the network element. Equipment manufacturers shall be capable of providing all of these fields in order to claim conformance with this document.
O_C	This field is a conditional parameter that can be configured by the EM to be conditionally present or always absent in the CDRs. In other words, an O_C parameter that is configured to be present will behave like a conditional parameter. For the avoidance of doubt, optional does not mean that the parameter is not supported by the network element. Equipment manufacturers shall be capable of providing all of these fields in order to claim conformance with this document.

Camel parameters have been added in a way that backward compatibility for CAMEL2 application has been achieved. We must check if CAMEL2 is required in release 99 ff. CAMEL standards, if not, then the backward compatibility is no issue and we can use a more well-formed CDR encoding.

~~1~~4.1 Mobile originated call attempt

If the generation of these records is enabled then an MOC record shall be created for each outgoing call attempt made by a mobile station. These MOC records shall be produced in the originating MSC.

Table 1: MOC record

Field	2G	3G	Description
Record Type	M	M	Mobile originated.
Served IMSI	M	M	IMSI of the calling party.
Served IMEI	C	?	IMEI of the calling ME, if available. (IMEI in 3G?)
Served MSISDN	O_M	O_M	The primary MSISDN of the calling party.
Called Number	M	M	The address of the called party i.e. the number dialled by the calling subscriber.
Translated Number	O_C	O_C	The called number after digit translation within the MSC (if applicable)
Connected Number	O_C	O_C	The number of the connected party if different to the Called Number
Roaming Number	O_C	O_C	The Mobile Station Roaming Number employed to route this connection, if applicable.
Recording Entity	M	M	The E.164 number of the visited MSC producing the record.
Incoming TKGP	O_M	?	!ATM in 3G! The MSC trunk group on which the call originated , usually from the BSS
Outgoing TKGP	O_M	O_M	The trunk group on which the call left the MSC
Location	M	M	The identity of the cell or the SAC at the time of CDR creation, including the location area code.
Change of Location	O_C	O_C	A list of changes in Location Area Code / Service Area Code / Cell Id. each time-stamped.
Basic service	M	M	Bearer or teleservice employed.
Transparency Indicator	C	C	Only provided for those teleservices which may be employed in both transparent and non-transparent mode.
ChangeOfService	O_C	O_C	A list of changes of basic service during a connection each time-stamped.
Supp. Services	C	C	Supplementary services invoked as a result of this connection.
AOC Parameters	O_C	O_C	The charge advice parameters sent to the MS on call set-up
Change of AOC Parameters	O_C	O_C	New AOC parameters sent to the MS e.g. as a result of a tariff switch over, including the time at which the new set was applied.
MS Classmark	M	M	(Update to MS network capabilities) The mobile station classmark employed on call set-up.
Change of Classmark	O_C	O_C	(Update to MS network capabilities) A list of changes to the classmark during the connection each time-stamped
Event time stamps:	C	C	Seizure of incoming traffic channel (for unsuccessful call attempts)
Call duration	C O_M M	C O_M M	Answer (for successful calls) Release of traffic channel The chargeable duration of the connection for successful calls, the holding time for call attempts.
Radio Chan. Requested	O_M	?	update GSM to AMR, find appr. 3G params The type of radio traffic channel (full / half etc.) requested by the MS.
Radio Chan. Used	M	?	update GSM to AMR, find appr. 3G params The type of radio channel actually used (full or half rate).
Change of Rad. Chan.	O_C	?	update GSM to AMR, find appr. 3G params A list of changes each time stamped
Cause for termination	M	M	The reason for the release of the connection.
Diagnostics	O_M	O_M	A more detailed reason for the release of the connection.
Data volume	C	-	The number of data segments transmitted if available at the MSC
Sequence no.	C	C	Partial record sequence number, only present in case of partial records.
Call reference	M	M	A local identifier distinguishing between transactions on the same MS
Additional Chg. Info	O_C	O_C	Charge/no charge indicator and additional charging parameters
Record extensions	O_C	O_C	A set of network / manufacturer specific extensions to the record.
gsmSCF address	C	C	Identifies the CAMEL server serving the subscriber.
Service key	C	C	The CAMEL service logic to be applied.

Network call reference	C	C	An identifier to correlate transactions on the same call taking place in different network nodes, shall be present if CAMEL is applied.
MSC Address	C	C	This field contains the E.164 number assigned to the MSC that generated the network call reference.
Default call handling	O_C	O_C	Indicates whether or not a CAMEL call encountered default call handling. This field shall be present only if default call handling has been applied.
Number of HSCSD Channels Requested	C	-	The maximum number of HSCSD channels requested as received from the MS at call set-up
Number of HSCSD Channels Allocated	C	-	The number of HSCSD channels allocated to the MS at call set-up
Change of HSCSD Parameters	C	-	A list of network or user initiated changes of number of HSCSD channels during a connection each timestamped. Shall only be present in case of an HSCSD call, if the basic HSCSD parameters are modified due the user or network initiated modification procedure.
Fixed Network User Rate	O_C	-	May be present for HSCSD connections.
Air Interface User Rate Requested	C	-	The total Air Interface User Rate Requested by the MS at call setup. Shall only be present for non-transparent HSCSD connections.
Channel Coding Accepted	C	-	A list of the traffic channels codings accepted by the MS. Shall only be present for HSCSD connections.
Channel Coding Used	C	-	The traffic channels codings negotiated between the MS and the network at call setup. Shall only be present for HSCSD connections.
Speech Version Used	O_M	?	update GSM to AMR, find appr. 3G params Speech version used for that call
Speech Version Supported	O_M	?	update GSM to AMR, find appr. 3G params Speech version supported by the MS with highest priority indicated by MS
Number of DP encountered	O_C	O_C	Number that counts how often armed detection points (TDP and EDP) were encountered.
Level of CAMEL service	O_C	O_C	Indicator for the complexity of the CAMEL feature used.
Free format Data	C	C	This field contains data sent by the gsmSCF in the FCI message(s). The data can be sent either in one FCI message or several FCI messages with append indicator.
CAMEL call leg information	C	C	Set of CAMEL information IEs. Each of these IEs contains information related to one outgoing CAMEL call leg.
Free format data append indicator	C	C	Indicator if free format data from this CDR is to be appended to free format data in previous partial CDR.
Default call handling 2	O_C	O_C	Indicates whether or not a CAMEL call encountered default call handling for 2nd service such as dialled service. This field shall be present only if default call handling has been applied.
GsmSCF address 2	C	C	Identifies the CAMEL server serving the subscriber for 2nd service such as dialled service.
Service key 2	C	C	The CAMEL service logic to be applied for 2nd service such as dialled service.
Free format Data 2	C	C	This field contains data sent by the gsmSCF in the FCI message(s) for 2nd service such as dialled service. The data can be sent either in one FCI message or several FCI messages with append indicator.
Free format data append indicator 2	C	C	Indicator if free format data for 2nd service from this CDR is to be appended to free format data in previous partial CDR.
System Type	-	M	Indicates the use of the UTRAN or GERAN radio access

In analogy to HSCSD for GSM, it is necessary to specify parameters (or new CDR types) for CS connections >64kB in UMTS (i.e. more than one CN channel).

~~1~~4.2 Mobile originated emergency call attempt

If the generation of MOC records is enabled then an MOC emergency record shall be created for each outgoing emergency call attempt made by a mobile station. These records shall be produced in the originating MSC.

Table 2: MOC emergency record

Field	2G	3G	Description
Record Type	M	M	Mobile originated.
Served IMSI	C	C	IMSI of the calling party in case of an emergency call with a SIM card.
Served IMEI	C	?	IMEI of the calling mobile equipment if available. (IMEI in 3G?)
Served MSISDN	O_C	O_C	The primary MSISDN of the calling party, if supplied by the UE.

Translated Number	O_C	O_C	The called number after digit translation within the MSC (if applicable)
Recording Entity	M	M	The E.164 number of the visited MSC producing the record.
Incoming TKGP	O_M	?	!ATM in 3G! The MSC trunk group on which the call originated, usually from the BSS
Outgoing TKGP	O_M	O_M	The trunk group on which the call left the MSC
Location	M	M	The identity of the cell or the SAC in which the call originated including the location area code.
Change of Location	O_C	O_C	A list of changes in Location Area Code / Service Area Code / Cell Id. each time-stamped.
Basic service	M	M	Teleservice 'emergency call'.
AOC Parameters	O_C	O_C	The charge advice parameters sent to the MS on call set-up
Change of AOC Parameters	O_C	O_C	New AOC parameters sent to the MS e.g. as a result of a tariff switch over, including the time at which the new set was applied.
MS Classmark	M	M	(Update to MS network capabilities) The mobile station classmark employed on call set-up.
Change of classmark	O_C	O_C	(Update to MS network capabilities) A list of changes to the classmark during the connection each time-stamped
Event time stamps:	C C O_M	C C O_M	Seizure of incoming traffic channel (for unsuccessful call attempts) Answer (for successful calls) Release of traffic channel
Call duration	M	M	The chargeable duration of the connection for successful calls, the holding time for call attempts.
Radio Chan. Requested	O_M	?	update GSM to AMR, find appr. 3G params The type of radio traffic channel (full / half etc.) requested by the MS.
Radio Chan. Used	M	?	update GSM to AMR, find appr. 3G params The type of radio channel used (full or half rate).
Change of Rad. Chan.	O_C	?	update GSM to AMR, find appr. 3G params A list of changes each time stamped
Cause for termination	M	M	The reason for the release of the connection.
Diagnostics	O_M	O_M	A more detailed reason for the release of the connection.
Sequence no.	C	C	Partial record sequence number, only present in case of partial records.
Call reference	M	M	A local identifier distinguishing between transactions on the same MS
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.
System Type	-	M	Indicates the use of the UTRAN or GERAN radio access

~~1~~4.3 Mobile originated call forwarding attempt

If the generation of MOC records is enabled in the forwarding MSC then the forwarding MSC shall produce an MOC record for the forwarded-leg of the call.

Table 3: MOC, call forwarding record

Field	2G	3G	Description
Record Type	M	M	Mobile originated. ?change to “m.o. call forwarding”?
Served IMSI	M	M	IMSI of the calling party.
Served MSISDN	O_M	O_M	The MSISDN of the forwarding party.
Calling Number	O_M	O_M	The address of the calling party.
Called Number	M	M	The address of the "forwarded-to" party.
Translated Number	O_C	O_C	The called number after digit translation within the MSC (if applicable)
Connected Number	O_C	O_C	The number of the connected party if different to the Called Number
Roaming Number	O_C	O_C	The Mobile Station Roaming Number employed to route this connection, if applicable.
Recording Entity	M	M	The E.164 number of the forwarding MSC
Incoming TKGP	O_M	O_M	The MSC trunk group on which the call originated at the forwarding MSC.
Outgoing TKGP	O_M	O_M	The trunk group on which the call left the forwarding MSC
Basic service	C	C	Bearer or teleservice employed, not always available e.g. in case of call forwarding unconditional.
Transparency Indicator	C	C	Only provided for those teleservices which may be employed in both transparent and non-transparent mode.
ChangeOfService	O_C	O_C	A list of changes of basic service during a connection each time-stamped.
Supplementary Services	C	C	Supplementary services invoked as a result of this connection, if this information is available to the forwarding node.

Event time stamps:	C C O_M	C C O_M	Seizure of incoming traffic channel (for unsuccessful call attempts) Answer (for successful calls) Release of traffic channel
Call duration	M	M	The chargeable duration of the connection for successful calls, the holding time of call attempts.
Cause for termination	M	M	The reason for the release of the connection.
Diagnostics	O_M	O_M	A more detailed reason for the release of the connection.
Data volume	C	-	The number of data segments transmitted if available at the MSC
Sequence no.	C	C	Partial record sequence number, only present in case of partial records.
Call reference	M	M	A local identifier distinguishing between transactions on the same MS
Additional Chg. Info	O_C	O	Charge/no charge indicator and additional charging parameters
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.
gsmSCF address	C	C	Identifies the CAMEL server serving the subscriber.
Service key	C	C	The CAMEL service logic to be applied.
Network call reference	C	C	An identifier to correlate transactions on the same call taking place in different network nodes, shall be present if CAMEL is applied.
MSC Address	C	C	This field contains the E.164 number assigned to the MSC that generated the network call reference.
CAMEL initiated CF indicator	C	C	Indicates that the CAMEL server initiated call forwarding.
Default call handling	O_C	O_C	Indicates whether or not a CAMEL call encountered default call handling. This field shall be present only if default call handling has been applied.
Number of DP encountered	O_C	O_C	Number that counts how often armed detection points (TDP and EDP) were encountered.
Level of CAMEL service	O_C	O_C	Indicator of the complexity of the CAMEL feature used.
Free format Data	C	C	This field contains data sent by the gsmSCF in the FCI messages. The data can be sent either in one FCI message or several FCI messages with append indicator.
CAMEL call leg information	C	C	Set of CAMEL information IEs. Each of these IEs contains information related to one outgoing CAMEL call leg.
Free format data append indicator	C	C	Indicator if free format data from this CDR is to be appended to free format data in previous partial CDR.
Default call handling 2	O_C	O_C	Indicates whether or not a CAMEL call encountered default call handling for 2^{nd} service such as dialled service. This field shall be present only if default call handling has been applied.
GsmSCF address 2	C	C	Identifies the CAMEL server serving the subscriber for 2^{nd} service such as dialled service.
Service key 2	C	C	The CAMEL service logic to be applied for 2^{nd} service such as dialled service.
Free format Data 2	C	C	This field contains data sent by the gsmSCF in the FCI message(s) for 2^{nd} service such as dialled service. The data can be sent either in one FCI message or several FCI messages with append indicator.
Free format data append indicator 2	C	C	Indicator if free format data for 2^{nd} service from this CDR is to be appended to free format data in previous partial CDR.

~~1~~4.4 Mobile terminated call attempt

If the generation of these records is enabled, then an MTC record shall be created for each incoming call attempt made for a mobile station. The MTC records shall be produced in the terminating MSC.

Table 4: MTC record

Field	2G	3G	Description
Record Type	M	M	Mobile Terminated.
Served IMSI	M	M	IMSI of the called party.
Served IMEI	C	?	IMEI of the called ME, if available. (IMEI in 3G?)
Served MSISDN	O_M	O_M	The MSISDN of the called party.
Calling Number	C	C	The number of the calling party if available.
Connected Number	O_C	O_C	Only relevant in case of call forwarding where the "forwarded-to" number is recorded.
Recording Entity	M	M	The E.164 number of the visited (terminating) MSC
Incoming TKGP	O_M	O_M	The MSC trunk group on which the call originated.

Outgoing TKGP	O_M	?	!ATM in 3G if connected to RNC (i.e. no call forwarding by T-MSC)! The trunk group on which the call left the MSC, usually to the BSS
Location	C	C	The identity of the cell or the SAC occupied by the called party when the call was set up, including the location area code.
Change of Location	O_C	O_C	A list of changes in Location Area Code / Service Area Code / Cell Id. each time-stamped.
Basic Service	M	M	Bearer or teleservice employed
Transparency Indicator	C	C	Only provided for those teleservices which may be employed in both transparent and non-transparent mode.
Change of Service	O_C	O_C	A list of changes of basic service during a connection each time-stamped.
Supplementary services	C	C	Supplementary services invoked as a result of this connection.
AOC Parameters	O_C	O_C	The charge advice parameters sent to the MS on call set-up
Change of AOC Parameters.	O_C	O_C	New AOC parameters sent to the MS e.g. as a result of a tariff switch-over, including the time at which the new set was applied.
MS Classmark	M	M	The mobile station class mark
Change of Classmark	O_C	O_C	A list of changes to the classmark during the connection each time-stamped
Event time stamps:	C C O_M	C C O_M	Seizure of traffic channel for unsuccessful call attempts Answer time for successful calls Release of traffic channel
Call duration	M	M	The chargeable duration of the connection if successful, the holding time of the call if unsuccessful.
Radio Chan. Requested	O_M	O_M	Update GSM to AMR, find appr. 3G params The type of radio traffic channel (full / half etc.) requested by the MS.
Radio Chan. Used	M	M	Update GSM to AMR, find appr. 3G params The type of radio channel used (full or half rate).
Change of Rad. Chan	O_C	O_C	Update GSM to AMR, find appr. 3G params A list of changes each time stamped
Cause for termination	M	M	The reason for the release of the call.
Diagnostics	O_M	O_M	A more detailed reason for the release of the connection.
Data volume	C	-	The number of data segments transmitted, if available at the MSC
Sequence no.	C	C	Partial record sequence number, only present in case of partial records.
Call reference	M	M	A local identifier distinguishing between transactions at the same MS
Additional Chg. Info	O_C	O_C	Charge/no charge indicator and additional charging parameters
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.
Network call reference	C	C	An identifier to correlate transactions on the same call taking place in different network nodes, shall be present if CAMEL is applied.
MSC Address	C	C	This field contains the E.164 number assigned to the MSC that generated the network call reference.
Number of HSCSD Channels Requested	O_C	-	The maximum number of HSCSD channels requested as received from the MS at call set-up
Number of HSCSD Channels Allocated	O_C	-	The number of HSCSD channels allocated to the MS at call set-up
Change of HSCSD Parameters	O_C	-	A list of network or user initiated changes of number of HSCSD channels during a connection each timestamped. Shall only be present in case of an HSCSD call, if the basic HSCSD parameters are modified due the user or network initiated modification procedure.
Fixed Network User Rate	O_C	-	May be present for HSCSD connections.
Air Interface User Rate Requested	C	C	The total Air Interface User Rate Requested by the MS at call setup. Shall only be present for non-transparent HSCSD connections.
Channel Coding Accepted	C	-	A list of the traffic channels codings accepted by the MS. Shall only be present for HSCSD connections.
Channel Coding Used	C	-	The traffic channels codings negotiated between the MS and the network at call setup. Shall only be present for HSCSD connections.
Speech Version Used	O_M	?	Update GSM to AMR, find appr. 3G params Speech version used for that call
Speech Version Supported	O_M	?	Update GSM to AMR, find appr. 3G params Speech version supported by the MS with highest priority indicated by MS
gsmSCF address	C	C	Identifies the CAMEL server serving the subscriber.
Service Key	C	C	The CAMEL service logic to be applied.
Default call handling	O_C	O_C	Indicates whether or not a CAMEL call encountered defeault call handling. This field shall be present only if default call handling has been applied.
Number of DP encountered	O_C	O_C	Number that counts how often armed detection points (TDP and EDP) were encountered.
Level of CAMEL service	O_C	O_C	Indicator for the complexity of the CAMEL feature used.

Free format Data	C	C	This field contains data sent by the gsmSCF in the FCI messages. The data can be sent either in one FCI message or several FCI messages with append indicator.
CAMEL call leg information	C	C	Set of CAMEL information IEs. Each of these IEs contains information related to one outgoing CAMEL call leg.
Free format data append indicator	C	C	Indicator if free format data from this CDR is to be appended to free format data in previous partial CDR.
System Type	-	C	Indicates the use of the UTRAN or GERAN radio access

We need to identify the parameters that are not present if the terminating MSC fails to set up the radio connection (MS not reachable, call forwarding conditional, ...), as part of the presence condition for those parameters.

Are there cases where the GMSC produces a MTC record (instead of or in addition to the incoming gateway record)?

~~1~~4.5 Roaming call attempt

If the generation of these records is enabled then, a roaming record shall be created for each call redirected to a mobile subscriber roaming outside the HPLMN. These roaming records shall be produced in the GMSC of the roaming subscriber's HPLMN.

This will not work with optimal routing because the GMSC is not involved if OR is applied.

Is the basic service code applicable in this CDR type? ASN.1 says it is optional anyway! (this is also contradictory in the MOC CDR).

The question above also applies to the three next following parameters.

Table 5: Roaming record

Field	2G	3G	Description
Record Type	M	M	Roaming record.
Served IMSI	M	M	IMSI of the called (roaming) party.
Served MSISDN	O_M	O_M	The MSISDN of the called (roaming) party.
Calling Number	C	C	The address of the calling party, if available.
Roaming Number	M	M	The Mobile Station Roaming Number employed to route this connection.
Recording Entity	M	M	The E.164 number of the GMSC
Incoming TKGP	O_M	O_M	The GMSC trunk group on which the call originated.
Outgoing TKGP	O_M	O_M	The trunk group on which the call left the GMSC
Basic service	M	M	Bearer or teleservice employed.
Transparency Indicator	C	C	Only provided for those teleservices which may be employed in both transparent and non-transparent mode.
ChangeOfService	O_C	O_C	A list of changes of basic service during a connection each time-stamped.
Supplementary Services	C	C	Supplementary services invoked as a result of this connection.
Event time stamps	C C O_M	C C O_M	Seizure of incoming traffic channel (for unsuccessful call attempts) Answer (for successful calls) Release of traffic channel
Call duration	M	M	The chargeable duration of the connection for successful calls, the holding time of call attempts.
Cause for termination	M	M	The reason for the release of the connection.
Diagnostics	O_M	O_M	A more detailed reason for the release of the connection.
Data volume	C	C	The number of data segments transmitted if available at the GMSC
Sequence no.	C	C	Partial record sequence number, only present in case of partial records.
Call reference	M	M	A local identifier distinguishing between transactions on the same MS
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.
Network call reference	C	C	An identifier to correlate transactions on the same call taking place in different network nodes, shall be present if CAMEL is applied.
MSC Address	C	C	This field contains the E.164 number assigned to the MSC that generated the network call reference.

~~1~~4.6 Incoming gateway call attempt

If generation of these records is enabled, an incoming gateway record shall be created for each incoming call attempt received by a gateway MSC from another network. These records, produced in the gateway MSC, may be used to settle accounts with other networks. The generation of gateway records shall not be influenced by the production of MTC records i.e. even if the GMSC and terminating MSC are co-located a gateway record shall still be produced.

Table 6: Incoming gateway record

Field	2G	3G	Description
Record Type	M	M	Incoming gateway record
Calling Number	C	C	The number of the calling party if available at this node.
Called Number	M	M	The address of the called party as seen by the GMSC. This is the number employed by the GMSC for routing.
Recording Entity	M	M	The E.164 number of the GMSC
Incoming TKGP	M	M	The incoming GMSC trunk group on which the call originated.
Outgoing TKGP	O_M	?	!ATM in 3G if connected to the RNC (GMSC co-located with T-MSC)! The trunk group on which the call left the GMSC.
Event time stamps:	M C O_M	M C O_M	Seizure of incoming trunk Answer (successful calls only) Release of incoming trunk
Call duration	M	M	The accountable duration (answer -> release of incoming trunk) of the connection if successful, the call holding time of the incoming trunk for call attempts.
Data Volume	C	-	If applicable and known at the GMSC
Cause for termination	M	M	The reason for the release of the connection.
Diagnostics	O_M	O_M	A more detailed reason for the release of the connection.
Sequence no.	C	C	Partial record sequence number, if applicable.
Call Reference	M	M	A local identifier distinguishing between transactions.
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.

~~1~~4.7 Outgoing gateway call attempt

If generation of these records is enabled, an outgoing gateway record shall be created for each outgoing call attempt from a gateway MSC to another network. These records, produced in the gateway MSC, may be used to settle accounts with other networks. The generation of gateway records shall not be influenced by the production of MOC records i.e. even if the GMSC and originating MSC are co-located a gateway record shall still be produced.

Table 7: Outgoing gateway record

Field	2G	3G	Description
Record Type	M	M	Outgoing gateway record
Calling Number	C	C	The number of the calling party if available at this node.
Called Number	M	M	The address of the called party as seen by the GMSC. This is the number employed by the GMSC for routing.
Recording Entity	M	M	The E.164 number of the GMSC
Incoming TKGP	O_M	?	!ATM in 3G in co-located case (→ incoming from the RNC)! The incoming GMSC trunk group on which the call originated.
Outgoing TKGP	M	M	The trunk group on which the call left the GMSC.
Event time stamps:	M C O_M	M C O_M	Seizure of outgoing trunk Answer (successful calls only) Release of outgoing trunk
Call duration	M	M	The accountable duration (answer -> release of outgoing trunk) of the connection if successful, the call holding time of the outgoing trunk for call attempts.
Data Volume	C	-	If applicable and known at the GMSC
Cause for termination	M	M	The reason for the release of the connection.
Diagnostics	O_M	O_M	A more detailed reason for the release of the connection.
Sequence no.	C	C	Partial record sequence number, if applicable.
Call Reference	M	M	A local identifier distinguishing between transactions.
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.

~~1~~4.8 Transit call attempt

If generation of these records is enabled then a transit record may be generated for each incoming call attempt received by a Transit MSC i.e. neither originating nor terminating. For the avoidance of doubt, a transit record shall only be produced if no MOC or MTC record is produced for this call attempt by this MSC. The transit records, produced in the TMSC, may be used to record traffic from particular origins or to particular destinations.

Table 8: Transit record

Field	2G	3G	Description
Record Type	M	M	Transit.
Calling Number	C	C	The number of the calling party if available at this node.
Called Number	M	M	The address of the called party as seen by the TMSC.
ISDN Basic Service	O_M	O_M	The ISDN basic service employed
Recording Entity	M	M	The E.164 number of the transit MSC
Incoming TKGP	M	M	The TMSC trunk group on which the call originated.
Outgoing TKGP	M	M	The trunk group on which the call left the TMSC.
Event time stamps:	C C O_M	C C O_M	Seizure of incoming trunk for unsuccessful call attempts Answer (successful calls only) Release of traffic channel
Call duration	M	M	The chargeable duration of the connection if successful, the call holding time for call attempts.
Data Volume	C	-	If applicable and known at the transit MSC
Cause for term.	M	M	The reason for the release of the connection.
Diagnostics	O_M	O_M	A more detailed reason for the release of the connection.
Sequence no.	C	C	Partial record sequence number, if applicable.
Call Reference	M	M	A local identifier distinguishing between transactions.
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.

~~1~~4.9 Supplementary service actions

A supplementary service record may be produced in the NEF of the appropriate MSC or HLR for each supplementary service action (activation, deactivation, invocation etc.) performed or initiated by the subscriber.

There are two basic types of SS-actions:

- Call related i.e. as a result of a connection e.g. Invocation of CLIP / CLIR / AOC etc.
- Non-call related i.e. as a result of subscriber controlled input (SCI) e.g. Registration of call forwarding

Each supplementary service action shall be performed on one or more basic service groups. If the action applies to all tele- and all bearer services (i.e. to all basic services) then the basic services field shall be omitted.

SCI actions may be recorded in individual SS-action records. Call related actions may be recorded in either the appropriate call record (MOC/MTC) or in separate SS-action records.

Additional non-standard supplementary service actions may be made available within some networks in the form of Unstructured Supplementary Service Data (USSD). These actions may also be recorded in SS-action records. However, as these actions are non-standard they may not include an appropriate action type, supplementary service code or basic service code.

Table 9: SS-action record

Field	2G	3G	Description
Record Type	M	M	Supplementary service action.
Served IMSI	M	M	The IMSI of the MS performing the action.
Served IMEI	O_C	O_C	The IMEI of the ME performing the action.
Served MSISDN	O_M	O_M	The primary MSISDN of the party performing the action.
MS Classmark	M	M	Upgrade to “MS network capability” The mobile station classmark.
Recording Entity	M	M	The E.164 number of the visited MSC / HLR.

Location	O_M	O_M	The identity of the cell or the SAC, including the location area code, from which the request originated.
Supplementary Service	C	C	The supplementary service or group of supplementary services for which the request was made. May not be available in case of USSD.
Basic Services	C	C	The basic service group(s) to which the supplementary service applies. This field is not provided if the action applies to all basic services.
SS Action	C	C	Activation, deactivation, interrogation etc. May not be available in case of USSD.
SS Action time stamp	M	M	The time at which the action was requested.
SS Parameters	C	C	Service dependent parameters or unstructured supplementary service data, if defined for the SS action recorded in this CDR.
SS Action Result	C	C	Result of the requested transaction if unsuccessful.
Call Reference	M	M	A local identifier distinguishing between transactions at the same MS.
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.
System Type	-	M	Indicates the use of the UTRAN or GERAN radio access.

~~1~~4.10 HLR interrogation

If enabled, a HLR interrogation record shall be created for each interrogation performed for a mobile subscriber. These records may be produced in either the HLR itself or the interrogating MSC.

Table 10: HLR interrogation record

Field	2G	3G	Description
Record Type	M	M	HLR interrogation.
Served IMSI	C	C	The IMSI of the party being interrogated, if successful
Served MSISDN	M	M	The MSISDN of the subscriber being interrogated.
Recording Entity	M	M	The E.164 Number of the HLR / MSC.
Routing Number	C	C	Routing number (MSRN, forwarding no.) provided by the HLR if the interrogation was successful.
Basic Service	O_C	O_C	Only for teleservice 21 (SMS-MT).
Interrogation time stamp	M	M	Time at which the interrogation was invoked.
Number of Forwarding	C	C	The number of times the call has been forwarded if provided by ISUP.
Interrogation Result	C	C	The result of the interrogation request if unsuccessful.
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.

~~1~~4.11 Location update (VLR)

If enabled, a VLR location update record shall be produced in the VLR for each location registration or location update received by the VLR for a mobile subscriber.

Table 11: Location update (VLR) record

Field	2G	3G	Description
Record Type	M	M	Location update.
Served IMSI	M	M	IMSI of the served MS.
Served MSISDN	O_M	O_M	The primary MSISDN of the party performing the location update
Recording Entity	M	M	The E.164 number of the entity (VLR or MSC/VLR) generating the record.
Old location	C C	C C	Not present for registration: is “registration” the correct term for a MS using IMSI attach and not TMSI+old location? VMSC E.164 Number Location Area Code
New location	M M O_M	M M O_M	VMSC E.164 Number Location Area Code Cell Identification or Service Area Code
MS Classmark	M	M	Change to “MS network capability” The mobile station classmark
Update time stamp	M	M	Time at which the update was invoked.
Update Result	C	C	The result of the location update if unsuccessful.
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.

System Type			Ffs for this CDR type

14.12 Location update (HLR)

If enabled, an HLR location update record shall be produced in the HLR for each location registration or location update received by the HLR for a mobile subscriber including location updates received from subscribers roaming in foreign PLMNs.

Table 12: Location Update (HLR) record

Field	2G	3G	Description
Record Type	M	M	Location update.
Served IMSI	M	M	IMSI of the served MS.
Recording Entity	M	M	The E.164 Number of the HLR.
Old location	O_C O_C	O_C O_C	VMSC E.164 Number !wrong ASN.1, need to correct it! VLR E.164 Number
New location	M M	M M	VMSC E.164 Number !wrong ASN.1, need to correct it! VLR E.164 Number
Update time stamp	M	M	Time at which the update was invoked.
Update Result	C	C	The result of the location update if unsuccessful.
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.

14.13 Short message service, mobile originated

If enabled, an SMS-MO record shall be produced, within the originating MSC, for each short message sent by a mobile subscriber.

Table 13: SMS-MO record

Field	2G	3G	Description
Record Type	M	M	SMS-Mobile originated.
Served IMSI	M	M	The IMSI of the subscriber sending the short message.
Served IMEI	O_C	O_C	The IMEI of the ME sending the message, if available.
Served MSISDN	O_M	O_M	The primary MSISDN of the subscriber sending the message.
MS Classmark	M	M	Update to “MSNetworkCapability” required The mobile station classmark.
Service Centre	M	M	The address (E.164) of the SMS-service centre.
Recording Entity	M	M	The E.164 number of the visited MSC
Location	O_M	O_M	The Location Area Code and Cell Identity / Service Area Code from which the message originated.
Event Time stamp	M	M	The time at which the message was received by the MSC from the subscriber.
Message Reference	M	M	A reference, provided by the MS uniquely identifying this message.
SMS Result	C	C	The result of the attempted delivery if unsuccessful.
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.
Destination number	O_M	O_M	The destination number dialled by the MS sending the short message.
CAMELSMSInformation {Was in V.320, needed?}	C	C	Set of CAMEL information IEs. Each of these IEs contains information related to CAMEL call leg related for the SMS.
System Type	-	M	Indicates the use of the UTRAN or GERAN radio access.

14.14 Short message service, mobile terminated

If enabled, an SMS-MT record shall be produced, within the terminating MSC, for each short message received by a mobile subscriber.

Table 14: SMS-MT record

Field			Description
Record Type	M	M	SMS-Mobile Terminated.
Service Centre	M	M	The E.164 address of the SMS centre.
Served IMSI	M	M	The IMSI of the receiving party.
Served IMEI	O_C	O_C	The IMEI of the receiving party, if available.
Served MSISDN	O_M	O_M	The MSISDN of the receiving party.
MS Classmark	M	M	Update to "MSNetworkCapability" required The mobile station classmark.
Recording Entity	M	M	The E.164 number of the visited MSC.
Location	O_M	O_M	The Location Area Code and Cell Identity /Service Area Code to which the message was delivered.
Event time stamp	M	M	Delivery time stamp, time at which message was sent to the MS by the MSC.
SMS Result	C	C	The result of the attempted delivery if unsuccessful.
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.
System Type	-	M	Indicates the use of the UTRAN or GERAN radio access.

~~1~~4.15 SMS-MO interworking record

If enabled, an SMS-MO interworking record shall be produced, within the interworking MSC, for each short message generated by a mobile subscriber. These records may be used to settle accounts between PLMNs and SMS service centres. Also a SMS-MO CDR if I/W MSC = originating MSC.

Table 15: SMS-MO interworking record

Field	2G	3G	Description
Record Type	M	M	SMS-MO interworking record.
Service Centre	M	M	The E.164 address of the SMS service centre.
Served IMSI	M	M	The IMSI of the sending party.
Recording Entity	M	M	The E.164 number of the visited MSC.
Time stamp	M	M	The time at which the message was received by the interworking function.
SMS Result	C	C	The result of the attempted delivery if unsuccessful.
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.

The system type is not known to the I/W MSC.

~~1~~4.16 SMS-MT gateway record

If enabled, an SMS-MT gateway record shall be produced, within the gateway MSC, for each short message sent to a mobile subscriber. Also a SMS-MT CDR if G/W MSC = terminating MSC.

Table 16: SMS-MT gateway record

Field	2G	3G	Description
Record Type	M	M	SMS-MT gateway record.
Service Centre	M	M	The E.164 address of the SMS service centre.
Served IMSI	M	M	The IMSI of the receiving party.
Served MSISDN	O_M	O_M	The MSISDN of the receiving party.
Recording Entity	M	M	The E.164 number of the visited MSC.
Time stamp	M	M	The time at which the message was received by the gateway.
SMS Result	C	C	The result of the attempted delivery if unsuccessful.
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.

The system type is not known to the G/W MSC.

14.17 Common equipment usage record

If enabled, a common equipment usage record shall be created in the VMSC to record the usage (duration) of common equipment, e.g. conference circuits, employed by a mobile subscriber.

Table 17: Common equipment usage record

Field	2G	3G	Description
Record Type	M	M	Common equipment usage record.
Equipment type	M	M	e.g. Conference circuit.
Equipment Id.	C	?	The local id. of the equipment employed.
Served IMSI	M	M	The IMSI of the party responsible for the seizure of the equipment..
Served MSISDN	O_M	O_M	The primary MSISDN of the served party..
Recording Entity	M	M	The E.164 number of the MSC in which the equipment is located.
Basic service	C	C	Bearer or teleservice employed, if appropriate.
ChangeOfService	O_C	O_C	A list of changes of basic service during a connection each time-stamped.
Supp. Services	C	C	Supplementary services invoked in connection with this equipment.
Event Time Stamp	M O_M	M O_M	Seizure time: the time at which the equipment was seized. Release time: the time at which the equipment was released.
Call Duration	M	M	The total duration of the usage of the equipment.
Call Reference	M	M	A local identifier distinguishing between transactions.
Sequence no.	C	C	Partial record sequence number if applicable.
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.
System Type	-	M	Indicates the use of the UTRAN or GERAN radio access.

14.18 Reduced partial records

In order to minimise the amount of data transferred, the contents of partial record may be reduced to those fields required to uniquely identify the connection and those fields that actually change. Table 18 contains an example of such a record for a mobile originated call attempt. Reduced partial records may be generated for any of the relevant call records.

Table 18: Reduced partial (MOC) record

Field	2G	3G	Description
Record Type	M	M	Mobile originated.
Served IMSI	C	C	IMSI of the calling party, if available
Called Number	C	C	If available.
Recording Entity	M	M	The E.164 number of the visited MSC producing the record.
Change of Location	C	C	A list of changes in Location Area Code / Cell Id. each time-stamped.
ChangeOfService	C	C	A list of changes of basic service during a connection each time-stamped.
Change of AOC Parameters	O_C	O_C	New AOC parameters sent to the MS e.g. as a result of a tariff switch over, including the time at which the new set was applied.
Change of Classmark	C	C	Upgrade to “MS network capability” A list of changes to the classmark during the connection each time-stamped
Event time stamps	M	M	Answer time, start of this partial record.
Call duration	M	M	The chargeable duration of this partial record.
Change of Radio Channel	C	C	A list of changes each time stamped
Cause for termination	M	M	The reason for the release of the connection.
Diagnostics	O_C	O_C	Only relevant for the last record in the sequence.
Data volume	C	-	The number of data segments transmitted during this partial output
Sequence no.	M	M	Partial record sequence number, only present in case of partial records.
Call reference	M	M	A local identifier distinguishing between transactions on the same MS
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.

14.19 Terminating CAMEL interrogation call attempt

If the generation of these records is enabled, a terminating CAMEL interrogation call attempt record shall be generated for each call toward a subscriber with a T-CSI and if the terminating trigger criteria are met. The record is generated in

the GMSC/gsmSSF carrying out the terminating CAMEL call handling.

Table 19: Terminating CAMEL interrogation record

Field	2G	3G	Description
Record Type	M	M	Terminating CAMEL interrogation.
Served IMSI	M	M	IMSI of the called party
Served MSISDN	O_M	O_M	The MSISDN of the called party.
Recording Entity	M	M	The E.164 number of the GMSC.
Interrogation time stamp	M	M	Time at which the interrogation was invoked.
CAMEL Destination Number	M	M	The number available for routing after the CAMEL server enquiry.
gsmSCF Address	M	M	The CAMEL server serving the subscriber.
Service key	M	M	The CAMEL service logic to be applied.
Network call reference	M	M	An identifier to correlate transactions on the same call taking place in different network nodes, shall be present ?if – mandatory? CAMEL is applied.
MSC Address	M	M	This field contains the E.164 number assigned to the MSC that generated the network call reference.
Default call handling	O_C	O_C	Indicates whether or not a CAMEL call encountered default call handling. This field shall be present only if default call handling has been applied.
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.
Called Number	M	M	The address of the called party as received by the GMSC/gsmSSF.
Calling Number	C	C	The address of the calling party, if available.
Incoming TKGP	O_M	?	!ATM in 3G if connected to the RNC (GMSC co-located with O-MSC)! The GMSC trunk group on which the call originated.
Outgoing TKGP	O_M	?	!ATM in 3G if connected to the RNC (GMSC co-located with T-MSC)! The trunk group on which the call left the GMSC
Event time stamps: 	C C O_M	C C O_M	Seizure of incoming traffic channel (for unsuccessful call attempts) Answer (for successful calls) Release of traffic channel
Call duration	M	M	The chargeable duration of the connection for successful calls, the holding time of call attempts.
Data volume	C	-	The number of data segments transmitted if available at the GMSC
Cause for termination	M	M	The reason for the release of the connection.
Diagnostics	O_M	O_M	A more detailed reason for the release of the connection.
Call reference	M	M	A local identifier distinguishing between transactions on the same MS
Sequence no.	C	C	Partial record sequence number, only present in case of partial records.
Number of DP encountered	O_C	O_C	Number that counts how often armed detection points (TDP and EDP) were encountered.
Level of CAMEL service	O_C	O_C	Indicator of the complexity of the CAMEL feature used.
Free format Data	C	C	This field contains data sent by the gsmSCF in the FCI message(s). The data can be sent either in one FCI message or several FCI messages with append indicator.
CAMEL call leg information	C	C	Set of CAMEL information IEs. Each of these IEs contains information related to one outgoing CAMEL call leg.
Free format data append indicator	C	C	Indicator if free format data from this CDR is to be appended to free format data in previous partial CDR.

"The record is generated in the GMSC/gsmSSF carrying out the terminating CAMEL call handling" (see introductory text above). Is it possible for this GMSC/gsmSSF to know the System Type, e.g. when it is identical to the terminating MSC? If so, is the System Type relevant in this CDR type? I expect if the GMSC/gsmSSF = terminating MSC we would also get a MTC record which includes the System Type.

~~1~~4.20 IMEI observation ticket

An observed IMEI ticket is generated whenever greylisted, blacklisted or non-whitelisted mobile equipment is detected during an IMEI check. The purpose of the ticket is to link the mobile equipment under observation with its current user (IMSI). The ticket also includes information describing when and where the equipment was used to enable the tracking of such equipment. Finally, if the ticket was triggered by a call attempt, a call reference is provided in order to locate the corresponding call record.

The IMEI tickets are generated by the NEF of the MSC performing the IMEI check.

Table 20: IMEI ticket

Field	2G	3G	Description
Served IMEI	M	M	IMEI of the observed mobile equipment
IMEI Status	M	M	The result of the IMEI check e.g. blacklisted, greylisted, unknown.
Served IMSI	M	M	The IMSI of the subscriber currently using the mobile equipment.
Served MSISDN	C	C	The MSISDN of the subscriber currently using the observed mobile equipment, only available if the event that triggered the IMEI check was an MOC, MTC, SMS-MO or SMS-MT
Recording Entity	M	M	The E.164 number of the recording MSC.
Event Time Stamp	M	M	The time at which the IMEI check was performed.
Location	M	M	The location area code and cell identity of the cell from which the mobile equipment was used.
IMEI Check Event	O_M	O_M	The event that caused IMEI checking to take place
Call Reference	O_C	O_C	Only available if the IMEI check was related to an MOC or MTC
Record extensions	O_C	O_C	A set of network/ manufacturer specific extensions to the record.

15 Description of Record Fields

This subclause contains a brief description of each field of the CDRs described in the previous subclause.

15.1 Additional Charging Information

This field consists of two parts, a charge indicator and additional charging parameters. The charge indicator is derived from the information contained within the ISUP "backward call indicator" and may be used to store a charge indicator (charge/no charge) received from another network node. The additional charging parameters are non-standard and intended to permit the inclusion of further charging information received from Intelligent Network and/or Value Added Service nodes.

15.2 AoC parameters / change of AoC parameters

The AoC parameter field contains the set of charge advice (AoC) parameters sent to the MS on call set-up. If further sets of parameters are sent during the call, as a result of a tariff switch-over for example, then this may be recorded in the Change of AoC Parameter field including the time at which the change occurred.

It should be noted that the Change of AoC Parms. field is optional and not required if partial records are generated on tariff switch-over.

The AoC parameters are defined in TS 22.024 [09].

15.3 Basic Service / change of service / ISDN Basic Service

The basic service field contains the code of the basic service employed on call set-up. Any alteration to the basic service during the connection may be recorded in the change of service field including the time at which the change took place.

The change of service field is optional and may be omitted if partial records are created whenever the basic service is changed.

The coding of basic services is defined in detail in TS 29.002 [05].

In the case of the transit record the GSM basic service employed is generally not available. However, if the device on which the call originates/terminates is connected via ISDN digital subscriber signalling then the appropriate ISDN basic

service code may be recorded in the record. One possible example includes the direct connection of an ISDN PABX to an MSC/VLR.

~~1~~5.4 Call duration

This field contains the relevant call duration in seconds. For incomplete calls (call attempts) the relevant duration is the call holding time from the seizure to the release of the traffic channel. For complete (answered) calls this is the chargeable duration from answer to release of the traffic channel. For partial records this is the duration of the individual partial record and not the cumulative duration of the call.

It should be noted that the time stamps may be expressed in terms of tenths of seconds or even milliseconds and, as a result, the calculation of the call duration may result in the rounding or truncation of the measured duration to a whole number of seconds.

Whether or not rounding or truncation is to be used is considered to be outside the scope of the present document subject to the following restrictions:

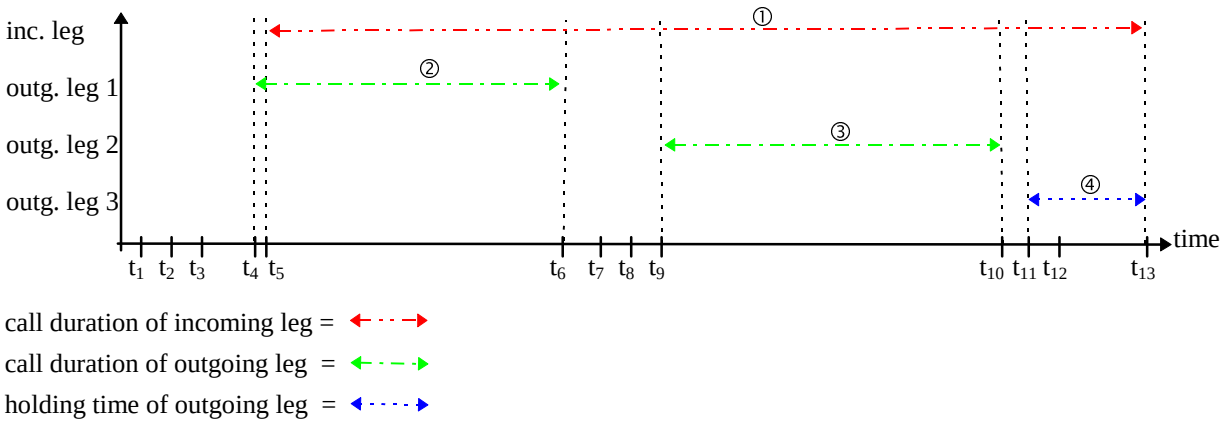
1) A call duration of zero seconds shall not be accepted.
2) The same method of truncation/rounding shall be applied to both single and partial records.

If CAMEL is invoked for the call and a control relationship is existing, the call might continue after a RELEASE or a DISCONNECT from the called party side received by the gsmSSF. The call duration of the incoming leg is stored in the main body of the call record. For each outgoing leg the call duration is stored in the respective 'CAMELInformation' module. If a call leg does not reach answer status and attempt charging is enabled a 'CAMELInformation' module containing the holding time is generated.

An example of how to use the call duration and the timestamps is given in Figure B.0. It shows a CAMEL controlled mobile originated follow-on scenario. The uppermost arrow ① marks the over all duration of the call that is to be measured and stored in the main body of the respective MOC record. The duration before t_5 (incoming leg) or t_4 (outgoing leg) needs not to be stored since the call is answered later on. The call duration in the first outgoing leg module contains the time interval from t_4 to t_6 (period ②). The call duration measurement of the second outleg is started with t_9 and ended with t_{10} (interval ③).

Since the last outgoing leg is not answered, the respective module contains the holding time starting with t_{11} and ending with t_{13} (period ④).

(The timestamps t_1, t_2, t_3, t_7, t_8 and t_{12} are mentioned for completion reasons only.)



Point in time	Signalling message sent/received trigger detection point encountered	Duration logging
t_1	SETUP; TDP(control)	
t_2	IAM	seizure of outg. leg 1
t_3	ACM	
t_4	ANSWER	start of call duration (outg. leg 1)
t_5	CONNECT	start of call duration (inc. leg)
t_6	RELEASE; EDP(control)	stop of call duration (outg. leg 1)
t_7	IAM	seizure of outg. leg 2
t_8	ACM	
t_9	ANSWER	start of call duration (outg. leg 2)
t_{10}	RELEASE; EDP(control)	stop of call duration (outg. leg 2)
t_{11}	IAM	seizure of outg. leg 3 start of holding time (outg. leg 3)
t_{12}	ACM	
t_{13}	RELEASE; EDP(control)	stop of holding time (outg. leg 3)

Figure B.0: Call duration measurement in follow-on scenarios

~~1~~5.5 Call reference

This field uniquely identifies a call or transaction on one side of the interface (i.e. 'A' or 'B' side) and is derived from the transaction identifier of TS 24.008 [04]. It is also used to identify all partial records and transactions belonging to the same connection.

For the avoidance of doubt, there is **no** global call reference defined within GSM and the call reference field **cannot** be used to combine, for example, the MOC and MTC records of a mobile-to-mobile connection.

~~1~~5.5.1.1 Network call reference

Whenever CAMEL is applied, this field is used for correlation of call records outputted from the originating MSC (when applicable), the GMSC and the terminating MSC, and a network optional call record from the gsmSCF.

~~1~~5.6 Calling / called / connected / translated number

In general a CCITT E.164 [12] number but may also include other numbering plans e.g. X.121. Each of these fields includes the type of number and number plan as specified in detail in TS 24.008 [04]. Where appropriate, these fields may also contain the presentation and screening information also specified in TS 24.008 [04].

The called number is the number received from the mobile station on mobile originated call set-up as defined in TS 24.008 [04]. Similarly, the calling number is the number received from the network on mobile terminated call set-up. In case of CAMEL initiated CF, the called (forwarded-to) number is returned by CAMEL.

The translated number is the result of any digit translation performed by the MSC on the called number received from the mobile station on mobile originated call set-up. This parameter is not included in the CDR if no digit translation has taken place. (or should it alternatively be allowed to include the called number --> tbc)

The connected number is the number of the actual party reached as defined in TS 24.008 [04]. Although this is normally identical to the called number it may differ. This parameter is not included if identical to the called number. (same as above --> tbc)

The following examples are intended to explain the use of these fields:

Example 1: Called Number = Connected Number
Normal call from a mobile subscriber to a mobile subscriber or to a PSTN subscriber.

Example 2: Called Number != Connected Number
In case of routing to a PABX with Automatic Call Distribution or to an ISDN Basic Access with several devices attached. The connected number is that of the party actually reached. N.B. The recording of the actual number connected may be limited by the capability of intermediate signalling connections.

Example 3: MTC record for Call Forwarding ("A" -> "B" -> "C")
In case of call forwarding, the connected number recorded in the MTC record of the "B" subscriber is that of the forwarded-to party or "C" subscriber. The calling party field contains the number of the "A" subscriber.

Example 4: Translated Number
This field is only present if digit translation is applied by the MSC to the called number received from the mobile station. Examples include abbreviated dialling codes and service numbers.

~~1~~5.7 Calling Party Number

This field contains Calling Party Number modified by CAMEL service.

~~1~~5.8 CAMEL call leg information

This field contains a set of CAMEL information IEs according to the number of outgoing CAMEL call legs.

~~1~~5.9 CAMEL information

This field contains a list of parameters with information related to one CAMEL outgoing call leg.

As a network option, parameters that are identical to the corresponding values in the top level structure of the record are not recorded again. That means whenever a value is not mentioned in this set the value provided in the basic record is valid instead. This might lead to an empty or even absent structure, if no parameter was modified.

~~1~~5.10 CAMEL initiated CF indicator

The purpose of this field is to distinguish CAMEL call forwarding service scenarios from standard GSM call forwarding scenarios.

From the BCSM's point of view this field is set to 'CF' whenever the O_CSI was applied after terminating CAMEL call processing had been taken place changing the call destination. For the avoidance of doubt: this flag does not depend on other modified call parameter(s) (e.g.: redirection information, e.t.c.) received in the CAP_CONNECT message of the T_CSI service.

This flag also indicates that another record might be generated, one containing the charging information related to the terminating CAMEL service and one containing the charging information related to the originating CAMEL service.

~~1~~5.11 CAMEL modified Service Centre

This field contains SMS-C address modified by CAMEL service. If this field is present the field Service Centre contain SMS-C address before CAMEL modification.

(Is following needed? Seems to be covered by "Default call/SMS handling" --

~~1~~5.12 CAMEL SMS Information

This field contains following CAMEL information for mobile originated SMS:

- Default SMS handling

  This field indicates whether or not a CAMEL encounteres default SMS handling. This field shall be present only if default SMS handling has been applied.

- Free format data

  See subclause B.3.13.

- Calling Party Number

  This field contains Calling Party Number modified by CAMEL service.

- CAMEL modified Service Centre

  This field contains SMS-C address modified by CAMEL service.

- CAMELDestination Subscriber Number

  This field contains short message Destination Number modified by CAMEL service.}

~~1~~5.13 Cause for termination

This field contains a generalised reason for the release of the connection including the following:

- normal release;
- CAMEL initiated call release;
- partial record generation;
- partial record call re-establishment;
- unsuccessful call attempt;
- abnormal termination during the stable phase.

A more detailed reason may be found in the diagnostics field.

~~1~~5.14 Data volume

This field includes the number of 64 octet segments transmitted during the use of data services if known (see B.1.3 Packet Data Services).

~~1~~5.15 Default call/SMS handling

This field indicates whether or not a CAMEL encountered default call/SMS handling. This field shall be present only if default call/SMS handling has been applied. Parameter is defined in HLR as part of CAMEL subscription information.

~~1~~5.16 Destination Subscriber Number

This field contains Destination/Called Subscriber Number modified by CAMEL service. If not modified then this field may contain original Destination Number also when CAMEL is not active.

~~1~~5.17 Diagnostics

This field includes a more detailed technical reason for the release of the connection and may contain one of the following:

- a MAP error from TS 29.002 [05];
- a Cause from TS 24.008 [04];
- a Cause from TS 29.078 [13];
- a Cause from ISUP Q.767 [14].

The diagnostics may also be extended to include manufacturer and network specific information.

{Following were in V.320, but omitted here --

~~1~~5.18 Entity number

This field contains the CCITT E.164 [2] number assigned to the entity (MSC, VLR, HLR etc.) that produced the record. For further details concerning the structure of MSC and location register numbers see 3GPP TS 23.003 [14].

15.19 Equipment id

This field contains a local identifier used to distinguish between equipment of the same equipment type e.g. the number of the conference circuit employed if more than one is available.

15.20 Equipment type

This field contains the type of common equipment employed e.g. conference circuit for multi-party service.

15.21 Event time stamps

These fields contain the event time stamps relevant for each of the individual record types.

The call records may contain three significant call handling time stamps:

- The time at which the resource in question was seized (Seizure time)
- The time at which the call was answered or at which charging commences. (Answer time)
- The time at which the resource was released (Release time)

For both Mobile Originated and Mobile Terminated calls, the Seizure time is the time at which the traffic channel is allocated i.e. the time at which the ASSIGN COMMAND message is sent to the MS.

For Mobile Originated calls the Answer time is the time at which the CONNECT message is sent to the calling party. For Mobile Terminated calls the time at which the CONNECT message is received from the called party. However, if the subscriber has subscribed to the advice of charge charging level service, then the answer time shall be derived from the time at which the FACILITY message is received from the MS containing the acknowledgement of receipt of the AOC parameters. Similarly, if the AOC parameters are changed during the call then the change time recorded for a subscriber with AOC charging level is the receipt of the FACILITY message from the MS. For a subscriber with AOC information level the change time recorded is the time at which the FACILITY is sent to the MS. Finally, in case of call re-establishment (see subclause B.1.5) the answer time is the time at which the new traffic channel is allocated by the MSC i.e. when the ASSIGN COMMAND is sent to the MS.

The Release time is the time at which the connection is released by either party i.e. a DISCONNECT or RELEASE is sent by the network or a DISCONNECT is received from the MS. In the case of a radio link failure, the release time is the time at which the failure was detected by the MSC.

For unsuccessful call attempts the Seizure time is mandatory. The Release time is optional and the call duration recorded is the call holding time i.e. the difference between the two.

For successful calls the Answer time is mandatory and both the Seizure and Release times are optional. The call duration recorded is the chargeable duration i.e. the difference between the Answer and Release time stamps.

The event records include the following time stamps:

- HLR-int time:The receipt of a MAP_SEND_ROUTING_INFO request by the HLR.

- Loc.Upd. time: The receipt of a MAP_UPDATE_LOCATION_AREA request by the VLR or the receipt of a MAP_UPDATE_LOCATION request by the HLR.

- SS-Action: The receipt of a supplementary service request by the VLR.
  e.g. MAP_REGISTER_SS, MAP_INVOKE_SS

- SMS-MO: The receipt of an RP_DATA message from the MS containing an SMS_SUBMIT PDU.

- SMS-MT: The transmission of an RP_DATA message to the MS containing anSMS_DELIVER PDU.

It should be noted that the events listed above are only examples in order to demonstrate the principles and that the list is by no means exhaustive.

All time-stamps include a minimum of date, hour, minute and second.

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15.22 Free format data

This field contains charging information sent by the gsmSCF in the FCI messages as defined in TS 29.078 [13]. The data can be sent either in one FCI message or several FCI messages with append indicator. This data is transferred transparently in the CAMEL sections of the relevant call records. 'Free format data' sent to the legID=1 is always stored in the top level of the respective record. 'Free format data' sent to the legID >1 is stored in the appropriate CAMEL call leg information field.

If the FCI is received more then once during one continuing incoming/outgoing CAMEL call leg, the append indicator defines whether the FCI information is appended to previous FCI and stored in the relevant record or the information of the last FCI received is stored in the relevant record (the previous FCI information shall be overwritten).

In the event of partial output the currently valid 'Free format data' is stored in the partial record.

15.23 Free format data append indicator

This field contains an indicator whether free format data is to be appended to free format data stored in previous partial CDR. This field is needed in CDR postprocessing to sort out valid free format data for that call leg from sequence of partial records. Creation of partial records is independent on received FCIs and thus valid free format data may be divided to different partial records.

If field is missing then free format data in this CDR replaces all received free format data in previous CDRs. Append indicator is not needed in the first partial record. In following partial records indicator shall get value true if all FCIs received during that partial record have append indicator. If one or more of the received FCIs for that call leg during the partial record do not have append indicator then this field shall be missing.

15.24 GsmSCF address

This field identifies the CAMEL server serving the subscriber. Address is defined in HLR as part of CAMEL subscription information.

{Following not in alphabetical order --

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15.25 HSCSD parameters / Change of HSCSD parameters

The basic HSCSD parameters are negotiated between the MS and the network at call setup time. They comprise of the following parameters:

- the FNUR (Fixed Network User Rate) (optionally)
- the total AIUR (Air Interface User Rate) requested by the MS (for non-transparent HSCSD connections only)
- a list of the channel codings accepted by the MS
- the maximum number of traffic channels accepted by the MS (this is noted in the channels requested field)
- the channel coding and the number of traffic channels actually used for the call.

In case the network or user initiated modification procedure takes place during the call, the AIUR requested, the channel coding used and the number of traffic channel requested/used might be recorded in the Change of HSCSD parameters field including the time at which the change occurred and which entity requested the change.

It should be noted that the Change of HSCSD Parameters field is optional and not required if partial records are generated when a Change of HSCSD Parameters takes place.

15.26 Incoming/ outgoing trunk group

The incoming trunk group describes the trunk on which the call originates as seen from the MSC. For mobile originated calls this will generally be a BSS trunk. Similarly, the outgoing trunk group describes the trunk on which the call leaves the MSC.

15.27 Interrogation result

This field contains the result of the HLR interrogation attempt as defined in the MAP (TS 29.002 [05]).

NOTE: This field is only provided if the attempted interrogation was unsuccessful.

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15.28 IMEI Check Event

This field identifies the type of event that caused the IMEI check to take place:

- Mobile originating call attempt;
- Mobile terminating call attempt;
- Mobile originating SMS;
- Mobile terminating SMS;
- Supplementary service actions performed by the subscriber;
- Location update

15.29 IMEI Status

This field contains the result of the IMEI checking procedure:

- Greylisted;
- Blacklisted;
- Non-whitelisted.

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15.30 Level of CAMEL service

This field describes briefly the complexity of CAMEL invocation.

- 'Basic' means that CAMEL feature is invoked during the setup phase (e.g.: to modify the destination) of the call only.

- 'Online charging' means that CAMEL supported AoC parameter were sent to the mobile station (SCI is received from the gsmSCF).

- The flag 'call duration supervision' is set whenever the call duration supervision is applied in the gsmSSF of the VPLMN (apply charging message is received from the gsmSCF).

15.31 Location / change of location

The location field contains a combination of the location area code (LAC) and cell identity (CI) of the cell in which the served party is currently located. Any change of location may be recorded in the change of location field including the time at which the change took place.

The change of location field is optional and not required if partial records are generated when the location changes.

The LAC and CI are both 2 octet quantities and coded according to TS 24.008 [04].

15.32 Message reference

This field contains a unique message reference number allocated by the mobile station when transmitting a short message to the service centre. This field corresponds to the TP-Message-Reference element of the SMS_SUBMIT PDU defined in TS 23.040 [15].

15.33 Mobile station classmark / change of classmark

This MS classmark field contains the mobile station classmark employed by the served MS on call set-up as defined in TS 24.008 [04] (see mobile station classmark 2). Any alteration in the classmark during the connection may be recorded in the change of classmark field and will include the time at which the change took place.

It should be noted that the change of classmark field is optional and not required if partial records are created when the classmark is altered.

15.34 Number of DP encountered

This field indicates how often CAMEL armed detection points (TDP and EDP) were encountered and is a measure of signalling between serving network and CAMEL service and complements 'Level of CAMEL service' field. Detection points from all applied CAMEL services for a single call leg and processed in the same gsmSSF shall be counted together.

15.35 Number of forwarding

This field, if provided via ISUP signalling, contains the number of times a call has been forwarded prior to the interrogation of the HLR and is defined in TS 29.002 [05].

15.36 Old /new location

These fields contain the location of a mobile subscriber before and after a location update. In case of VLR location update the location information consists of a VMSC number and location area code. In case of HLR location update the field contains the VMSC number and the VLR number.

15.37 Radio channel requested / rad. channel used / change of rad. channel / speech version supported / speech version used

The radio channel requested field contains the type of channel requested by the user. The following values are permitted:

- full rate;
- half rate;
- dual mode half rate preferred;
- dual mode full rate preferred.

The radio channel used field indicates the type of traffic channel actually employed for the connection i.e. either full rate (Bm) or half rate (Lm) as described in GSM 05.01. Any change in the type of channel used may be recorded in the change of radio channel used field including the time at which the change occurred and the speech version used after the change of radio channel.

The speech version supported field contains the speech version supported by the MS with the highest priority. The speech version used field contains the speech codec version assigned for that call. The coding is according GSM 08.08 speech version identifier with the extension bit 8 set to 0.

It should be noted that the change of radio channel field is optional and not required if partial records are generated.

15.38 Record extensions

The field enables network operators and/ or manufacturers to add their own extensions to the standard record definitions.

15.39 Record type

The field identifies the type of the record e.g. mobile originated, mobile terminated etc.

15.40 Routing number / roaming number

The routing number field of the HLR interrogation record contains either a mobile station roaming number or, in case of call forwarding, a forwarded-to number.

The roaming number field of the MOC record contains the mobile subscriber roaming number as defined in TS 23.003 [16] and coded according to TS 29.002 [05].

15.41 Sequence number

This field contains a running sequence number employed to link the partial records generated for a particular connection (see 7.2.4 Partial records).

15.42 Served IMEI

This fields contains the international mobile equipment identity (IMEI) of the equipment served. The term "served" equipment is used to describe the ME involved in the transaction recorded e.g. the called ME in case of an MTC record.

The structure of the IMEI is defined in TS 23.003 [16].

15.43 Served IMSI

This fields contains the international mobile subscriber identity (IMSI) of the served party. The term "served" party is used to describe the mobile subscriber involved in the transaction recorded e.g. the calling subscriber in case of an MOC record.

The structure of the IMSI is defined in TS 23.003 [16].

15.44 Served MSISDN

This fields contains the mobile station ISDN number (MSISDN) of the served party. The term "served" party is used to describe the mobile subscriber involved in the transaction recorded e.g. the called subscriber in case of an MTC record. In case of multi-numbering the MSISDN stored in a MOC record will be the primary MSISDN of the calling party.

The structure of the MSISDN is defined in TS 23.003 [16].

15.45 Service centre address

This field contains a CCITT E.164 [12] number identifying a particular service centre e.g. short message service centre (see TS 23.040 [15]).

15.46 Service key

This field identifies the CAMEL service logic applied. Service key is defined in HLR as part of CAMEL subscription information.

15.47 Short message service result

This field contains the result of an attempt to deliver a short message either to a service centre or to a mobile subscriber (see TS 29.002 [05]). Note that this field is only provided if the attempted delivery was unsuccessful.

15.48 Sub-system type

Indicates 3G-UMTS Sub-System Support.

15.49 Supplementary service(s)

The supplementary service field in the Supplementary Service record type contains the code of the supplementary service on which the action was performed.

The supplementary services field in the MOC / MTC records contains the codes of the supplementary services invoked as a result of, or during, a connection.

The coding of supplementary service is described in detail in TS 29.002 [05].

15.50 Supplementary service action

This field contains the type of supplementary service action requested by the subscriber or performed by the network. Possible values include:

- registration;
- erasure;
- activation;
- deactivation;
- interrogation;
- invocation.

For further details see TS 22.004 [19].

15.51 Supplementary service action result

This field contains the result of an attempted supplementary service action (see TS 29.002 [05]). Note that this field is only provided if the SS-action was at least partially unsuccessful.

15.52 Supplementary service parameters

This field contains the parameters associated with a supplementary service action requested by the subscriber. For further details of the parameters involved see the GSM 02.8n series of documents.

{Following in V.320, but omitted here. --

15.53 Supplementary service(s)

The supplementary service field in the Supplementary Service record type contains the code of the supplementary service on which the action was performed.

The supplementary services field in the MOC / MTC records contains the codes of the supplementary services invoked as a result of, or during, a connection.

The coding of supplementary service is described in detail in 3GPP TS 29.002 [17].

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15.54 Transparency indicator

This field indicates whether the basic service was employed in transparent or non-transparent mode. It should also be noted that this field is only relevant for those services which may be operated in both transparent and non-transparent modes.

15.55 Update result

This field contains the result of the location update request as defined in the MAP (TS 29.002 [05]). Note that this field is only provided if the attempted update was unsuccessful.

16 Charging Data Record Structure

16.1 ASN.1 definitions for CDR information

Within the current 3GPP TS 32-series of specifications the ASN.1 definitions are based on X.208 [08] which has been superseded by X.680. This newer version not only includes new features but also removes some that were present in X.208. It was agreed that where possible, the GPRS work would be based on those ASN.1 features that were common to both. However, where necessary, the new features in X.680 [07] be used in some places. X.208 [08] feature that are no longer in X.680 [07] will not be used.

{Some of the comments went beyond a single line and lost the ”—” symbol.}

```
GSM1205-DataTypes {  ccitt (0) identified-organization (4) etsi (0) mobileDomain (0) gsm-Operation-
Maintenance (3) gsm-12-05 (5) informationModel (0) asn1Module (2) 1 }

DEFINITIONS IMPLICIT TAGS   ::=

BEGIN

-- EXPORTS everything

IMPORTS

NumberOfForwarding, CallReferenceNumber
FROM MAP-CH-DataTypes { ccitt identified-organization (4) etsi(0) mobileDomain (0) gsmNetworkId (1)
moduleId (3) map-CH-DataTypes (13) version2 (2) }

AddressString, ISDN-AddressString, BasicServiceCode, IMSI, IMEI
FROM MAP-CommonDataTypes { ccitt identified-organization (4) etsi(0) mobileDomain (0) gsmNetworkId
(1) moduleId (3) map-CommonDataTypes (18) version2 (2) }

DestinationRoutingAddress,
FROM CAP-DataTypes { ccitt identified-organization (4) etsi(0) mobileDomain (0)
gsm-Network(1) modules(3) cap-datatypes (52) version1 (0) }

ServiceKey, DefaultCallHandling, DefaultSMS-Handling
FROM MAP-MS-DataTypes { ccitt identified-organization (4) etsi(0) mobileDomain (0)
gsm-Network(1) modules(3) map-MS-DataTypes (11) version6 (6) }


BearerServiceCode
FROM MAP-BS-Code { ccitt identified-organization (4) etsi(0) mobileDomain(0) gsmNetworkId (1)
moduleId (3) map-BS-Code (20) version2 (2) }

TeleserviceCode
```

```
FROM MAP-TS-Code { ccitt identified-organization (4) etsi(0) mobileDomain(0) gsmNetworkId (1)
moduleId (3) map-TS-Code (19) version2 (2) }

SS-Code
FROM MAP-SS-Code { ccitt identified-organization (4) etsi(0) mobileDomain(0) gsmNetworkId (1)
moduleId (3) map-SS-Code (15) version2 (2) }

BasicService
FROM Basic-Service-Elements { ccitt identified-organization (4) etsi (0)
196 basic-service-elements (8) }
--
-- See "Digital Subscriber Signalling System No. one (DSS1) protocol"
-- ETS 300 196
--

ObjectInstance
FROM CMIP-1 {joint-iso-ccitt ms(9) cmip(1) version1 (1) protocol (3)}

ManagementExtension
FROM Attribute-ASN1Module {joint-iso-ccitt ms(9) smi(3) part2 (2) asn1Module(2) 1}

AE-title
FROM ACSE-1 {joint-iso-ccitt association-control(2) abstract-syntax(1) apdus(0) version(1) };
--
-- Note that the syntax of AE-title to be used is from
-- CCITT Rec. X.227 / ISO 8650 corrigendum and not "ANY"
-------------------------------------------------------------------------------
--
--  CALL AND EVENT RECORDS
--
-------------------------------------------------------------------------------

CallEventRecord ::= CHOICE
{
    moCallRecord        [0] MOCallRecord,
    mtCallRecord        [1] MTCallRecord,
    roamingRecord       [2] RoamingRecord,
    incGatewayRecord    [3] IncGatewayRecord,
    outGatewayRecord    [4] OutGatewayRecord,
    transitRecord       [5] TransitCallRecord,
    moSMSRecord         [6] MOSMSRecord,
    mtSMSRecord         [7] MTSMSRecord,
    moSMSIWRecord       [8] MOSMSIWRecord,
    mtSMSGWRecord       [9] MTSMSGWRecord,
    ssActionRecord      [10] SSActionRecord,
    hlrIntRecord        [11] HLRIntRecord,
    locUpdateHLRRecord  [12] LocUpdateHLRRecord,
    locUpdateVLRRecord  [13] LocUpdateVLRRecord,
    commonEquipRecord   [14] CommonEquipRecord,
    recTypeExtensions   [15] ManagementExtensions,
    termCAMELIntRecord  [16] TermCAMELIntRecord
}

MOCallRecord    ::= SET
{
    recordType          [0] CallEventRecordType,
    servedIMSI          [1] IMSI OPTIONAL,
    servedIMEI          [2] IMEI OPTIONAL,
    servedMSISDN        [3] MSISDN OPTIONAL,
    callingNumber       [4] CallingNumber OPTIONAL,
    calledNumber        [5] CalledNumber OPTIONAL,
    translatedNumber    [6] TranslatedNumber OPTIONAL,
    connectedNumber     [7] ConnectedNumber OPTIONAL,
    roamingNumber       [8] RoamingNumber OPTIONAL,
    recordingEntity     [9] RecordingEntity,
    mscIncomingTKGP     [10] TrunkGroup OPTIONAL,
    mscOutgoingTKGP     [11] TrunkGroup OPTIONAL,
    location            [12] LocationAreaAndCell OPTIONAL,
    changeOfLocation    [13] SEQUENCE OF LocationChange OPTIONAL,
    basicService        [14] BasicServiceCode OPTIONAL,
    transparencyIndicator   [15] TransparencyInd OPTIONAL,
    changeOfService     [16] SEQUENCE OF ChangeOfService OPTIONAL,
    supplServicesUsed   [17] SEQUENCE OF  SuppServiceUsed OPTIONAL,
    aocParameters       [18] AOCParameters OPTIONAL,
    changeOfAOCParms    [19] SEQUENCE OF AOCParmChange OPTIONAL,
    msClassmark         [20] Classmark OPTIONAL,
    changeOfClassmark   [21] ChangeOfClassmark OPTIONAL,
    seizureTime         [22] TimeStamp OPTIONAL,
    answerTime          [23] TimeStamp OPTIONAL,
    releaseTime         [24] TimeStamp OPTIONAL,
    callDuration        [25] CallDuration,
    dataVolume          [26] DataVolume OPTIONAL,
    radioChanRequested  [27] RadioChanRequested OPTIONAL,
```

```
    radioChanUsed       [28] TrafficChannel OPTIONAL,
    changeOfRadioChan   [29] ChangeOfRadioChannel OPTIONAL,
    causeForTerm        [30] CauseForTerm,
    diagnostics         [31] Diagnostics OPTIONAL,
    callReference       [32] CallReference,
    sequenceNumber      [33] INTEGER OPTIONAL,
    additionalChgInfo   [34] AdditionalChgInfo OPTIONAL,
    recordExtensions    [35] ManagementExtensions OPTIONAL,
    gsm-SCFAddress      [36] Gsm-SCFAddress OPTIONAL,
    serviceKey          [37] ServiceKey OPTIONAL,
    networkCallReference    [38] NetworkCallReference OPTIONAL,
    mSCAddress              [39] MSCAddress OPTIONAL,
    cAMELInitCFIndicator    [40] CAMELInitCFIndicator OPTIONAL,
    defaultCallHandling     [41] DefaultCallHandling OPTIONAL,
    hSCSDChanRequested      [42] NumOfHSCSDChanRequested OPTIONAL,
    hSCSDChanAllocated      [43] NumOfHSCSDChanAllocated OPTIONAL,
    changeOfHSCSDParms      [44] SEQUENCE OF HSCSDParmsChange OPTIONAL,
    fnur                    [45] Fnur OPTIONAL,
    aiurRequested           [46] AiurRequested OPTIONAL,
    chanCodingsAcceptable   [47] SEQUENCE OF ChannelCoding OPTIONAL,
    chanCodingUsed          [48] ChannelCoding OPTIONAL,
    speechVersionSupported  [49] SpeechVersionIdentifier OPTIONAL,
    speechVersionUsed       [50] SpeechVersionIdentifier OPTIONAL,
    numberOfDPEncountered   [51] INTEGER OPTIONAL,
    levelOfCAMELService     [52] LevelOfCAMELService OPTIONAL,
    freeFormatData          [53] FreeFormatData OPTIONAL,
    cAMELCallLegInformation [54] SEQUENCE OF CAMELInformation OPTIONAL,
    freeFormatDataAppend    [55] BOOLEAN OPTIONAL,
    defaultCallHandling_2   [56] DefaultCallHandling OPTIONAL,
    gsm-SCFAddress_2        [57] Gsm-SCFAddress OPTIONAL,
    serviceKey_2            [58] ServiceKey OPTIONAL,
    freeFormatData_2        [59] FreeFormatData OPTIONAL,
    freeFormatDataAppend_2  [55] BOOLEAN OPTIONAL,
    systemType          [56] SystemType

}


MTCallRecord            ::= SET
{
    recordType          [0] CallEventRecordType,
    servedIMSI          [1] IMSI,
    servedIMEI          [2] IMEI OPTIONAL,
    servedMSISDN        [3] CalledNumber OPTIONAL,
    callingNumber       [4] CallingNumber OPTIONAL,
    connectedNumber     [5] ConnectedNumber OPTIONAL,
    recordingEntity     [6] RecordingEntity,
    mscIncomingTKGP     [7] TrunkGroup OPTIONAL,
    mscOutgoingTKGP     [8] TrunkGroup OPTIONAL,
    location            [9] LocationAreaAndCell OPTIONAL,
    changeOfLocation    [10] SEQUENCE OF LocationChange OPTIONAL,
    basicService        [11] BasicServiceCode OPTIONAL,
    transparencyIndicator   [12] TransparencyInd OPTIONAL,
    changeOfService     [13] SEQUENCE OF ChangeOfService OPTIONAL,
    supplServicesUsed   [14] SEQUENCE OF SuppServiceUsed OPTIONAL,
    aocParameters       [15] AOCParameters OPTIONAL,
    changeOfAOCParms    [16] SEQUENCE OF AOCParmChange OPTIONAL,
    msClassmark         [17] Classmark OPTIONAL,
    changeOfClassmark   [18] ChangeOfClassmark OPTIONAL,
    seizureTime         [19] TimeStamp OPTIONAL,
    answerTime          [20] TimeStamp OPTIONAL,
    releaseTime         [21] TimeStamp OPTIONAL,
    callDuration        [22] CallDuration,
    dataVolume          [23] DataVolume OPTIONAL,
    radioChanRequested  [24] RadioChanRequested OPTIONAL,
    radioChanUsed       [25] TrafficChannel OPTIONAL,
    changeOfRadioChan   [26] ChangeOfRadioChannel OPTIONAL,
    causeForTerm        [27] CauseForTerm,
    diagnostics         [28] Diagnostics OPTIONAL,
    callReference       [29] CallReference,
    sequenceNumber      [30] INTEGER OPTIONAL,
    additionalChgInfo   [31] AdditionalChgInfo OPTIONAL,
    recordExtensions    [32] ManagementExtensions OPTIONAL,
    networkCallReference    [33] NetworkCallReference OPTIONAL,
    mSCAddress              [34] MSCAddress OPTIONAL,
    hSCSDChanRequested      [35] NumOfHSCSDChanRequested OPTIONAL,
    hSCSDChanAllocated      [36] NumOfHSCSDChanAllocated OPTIONAL,
    changeOfHSCSDParms      [37] SEQUENCE OF HSCSDParmsChange OPTIONAL,
    fnur                    [38] Fnur OPTIONAL,
    aiurRequested           [39] AiurRequested OPTIONAL,
    chanCodingsAcceptable   [40] SEQUENCE OF ChannelCoding OPTIONAL,
    chanCodingUsed          [41] ChannelCoding OPTIONAL,
    speechVersionSupported  [42] SpeechVersionIdentifier OPTIONAL,
```

```
    speechVersionUsed       [43] SpeechVersionIdentifier OPTIONAL,
    gsm-SCFAddress          [44] Gsm-SCFAddress OPTIONAL,
    serviceKey              [45] ServiceKey OPTIONAL,
    networkCallReference    [46] NetworkCallReference OPTIONAL,
    mSCAddress              [47] MSCAddress OPTIONAL,
    defaultCallHandling     [48] DefaultCallHandling OPTIONAL,
    numberOfDPEncountered   [49] INTEGER OPTIONAL,
    levelOfCAMELService     [50] LevelOfCAMELService OPTIONAL,
    freeFormatData          [51] FreeFormatData OPTIONAL,
    freeFormatDataAppend    [52] BOOLEAN OPTIONAL,
    systemType          [53] SystemType
}

RoamingRecord           ::= SET
{
    recordType          [0] CallEventRecordType,
    servedIMSI          [1] IMSI,
    servedMSISDN        [2] MSISDN OPTIONAL,
    callingNumber       [3] CallingNumber OPTIONAL,
    roamingNumber       [4] RoamingNumber OPTIONAL,
    recordingEntity     [5] RecordingEntity,
    mscIncomingTKGP     [6] TrunkGroup OPTIONAL,
    mscOutgoingTKGP     [7] TrunkGroup OPTIONAL,
    basicService        [8] BasicServiceCode OPTIONAL,
    transparencyIndicator   [9] TransparencyInd OPTIONAL,
    changeOfService     [10] SEQUENCE OF ChangeOfService OPTIONAL,
    supplServicesUsed   [11] SEQUENCE OF  SuppServiceUsed OPTIONAL,
    seizureTime         [12] TimeStamp OPTIONAL,
    answerTime          [13] TimeStamp OPTIONAL,
    releaseTime         [14] TimeStamp OPTIONAL,
    callDuration        [15] CallDuration,
    dataVolume          [16] DataVolume OPTIONAL,
    causeForTerm        [17] CauseForTerm,
    diagnostics         [18] Diagnostics OPTIONAL,
    callReference       [19] CallReference,
    sequenceNumber      [20] INTEGER OPTIONAL,
    recordExtensions    [21] ManagementExtensions OPTIONAL,
    networkCallReference    [22] NetworkCallReference OPTIONAL,
    mSCAddress          [23] MSCAddress OPTIONAL
}
TermCAMELIntRecord  ::= SET
{
    recordtype                  [0] CallEventRecordType,
    servedIMSI                  [1] IMSI,
    servedMSISDN                [2] MSISDN OPTIONAL,
    recordingEntity             [3] RecordingEntity,
    interrogationTime           [4] TimeStamp,
    destinationRoutingAddress   [5] DestinationRoutingAddress,
    gsm-SCFAddress              [6] Gsm-SCFAddress,
    serviceKey                  [7] ServiceKey,
    networkCallReference        [8] NetworkCallReference OPTIONAL,
    mSCAddress                  [9] MSCAddress OPTIONAL,
    defaultCallHandling         [10] DefaultCallHandling OPTIONAL,
    recordExtensions            [11] ManagementExtensions OPTIONAL,
    calledNumber                [12] CalledNumber,
    callingNumber               [13] CallingNumber OPTIONAL,
    mscIncomingTKGP             [14] TrunkGroup OPTIONAL,
    mscOutgoingTKGP             [15] TrunkGroup OPTIONAL,
    seizureTime                 [16] TimeStamp OPTIONAL,
    answerTime                  [17] TimeStamp OPTIONAL,
    releaseTime                 [18] TimeStamp OPTIONAL,
    callDuration                [19] CallDuration,
    dataVolume                  [20] DataVolume OPTIONAL,
    causeForTerm                [21] CauseForTerm,
    diagnostics                 [22] Diagnostics OPTIONAL,
    callReference               [23] CallReference,
    sequenceNumber              [24] INTEGER OPTIONAL,
    numberOfDPEncountered       [25] INTEGER OPTIONAL,
    levelOfCAMELService         [26] LevelOfCAMELService OPTIONAL,
    freeFormatData              [27] FreeFormatData OPTIONAL,
    cAMELCallLegInformation     [28] SEQUENCE OF CAMELInformation OPTIONAL,
    freeFormatDataAppend        [29] BOOLEAN OPTIONAL,
    systemType              [30] SystemType

}

IncGatewayRecord        ::= SET
{
    recordType          [0] CallEventRecordType,
    callingNumber       [1] CallingNumber OPTIONAL,
    calledNumber        [2] CalledNumber,
    recordingEntity     [3] RecordingEntity,
    mscIncomingTKGP     [4] TrunkGroup OPTIONAL,
```

```
    mscOutgoingTKGP     [5] TrunkGroup OPTIONAL,
    seizureTime         [6] TimeStamp OPTIONAL,
    answerTime          [7] TimeStamp OPTIONAL,
    releaseTime         [8] TimeStamp OPTIONAL,
    callDuration        [9] CallDuration,
    dataVolume          [10] DataVolume OPTIONAL,
    causeForTerm        [11] CauseForTerm,
    diagnostics         [12] Diagnostics OPTIONAL,
    callReference       [13] CallReference,
    sequenceNumber      [14] INTEGER OPTIONAL,
    recordExtensions    [15] ManagementExtensions OPTIONAL,
    systemType          [16] SystemType
}

OutGatewayRecord        ::= SET
{
    recordType          [0] CallEventRecordType,
    callingNumber       [1] CallingNumber OPTIONAL,
    calledNumber        [2] CalledNumber,
    recordingEntity     [3] RecordingEntity,
    mscIncomingTKGP     [4] TrunkGroup OPTIONAL,
    mscOutgoingTKGP     [5] TrunkGroup OPTIONAL,
    seizureTime         [6] TimeStamp OPTIONAL,
    answerTime          [7] TimeStamp OPTIONAL,
    releaseTime         [8] TimeStamp OPTIONAL,
    callDuration        [9] CallDuration,
    dataVolume          [10] DataVolume OPTIONAL,
    causeForTerm        [11] CauseForTerm,
    diagnostics         [12] Diagnostics OPTIONAL,
    callReference       [13] CallReference,
    sequenceNumber      [14] INTEGER OPTIONAL,
    recordExtensions    [15] ManagementExtensions OPTIONAL,
    systemType          [16] SystemType

}

TransitCallRecord       ::= SET
{
    recordType          [0] CallEventRecordType,
    recordingEntity     [1] RecordingEntity,
    mscIncomingTKGP     [2] TrunkGroup OPTIONAL,
    mscOutgoingTKGP     [3] TrunkGroup OPTIONAL,
    callingNumber       [4] CallingNumber OPTIONAL,
    calledNumber        [5] CalledNumber,
    isdnBasicService    [6] BasicService OPTIONAL,
    seizureTimestamp    [7] TimeStamp OPTIONAL,
    answerTimestamp     [8] TimeStamp OPTIONAL,
    releaseTimestamp    [9] TimeStamp OPTIONAL,
    callDuration        [10] CallDuration,
    dataVolume          [11] DataVolume OPTIONAL,
    causeForTerm        [12] CauseForTerm,
    diagnostics         [13] Diagnostics OPTIONAL,
    callReference       [14] CallReference,
    sequenceNumber      [15] INTEGER OPTIONAL,
    recordExtensions    [16] ManagementExtensions OPTIONAL,
    systemType          [17] SystemType

}

MOSMSRecord             ::= SET
{
    recordType          [0] CallEventRecordType,
    servedIMSI          [1] IMSI,
    servedIMEI          [2] IMEI OPTIONAL,
    servedMSISDN        [3] MSISDN OPTIONAL,
    msClassmark         [4] Classmark,
    serviceCentre       [5] AddressString,
    recordingEntity     [6] RecordingEntity,
    location            [7] LocationAreaAndCell OPTIONAL,
    messageReference    [8] MessageReference,
    originationTime     [9] TimeStamp,
    smsResult           [10] SMSResult OPTIONAL,
    recordExtensions    [11] ManagementExtensions OPTIONAL,
    destinationNumber   [12] CalledNumber OPTIONAL,
    cAMELSMSInformation [13] CAMELSMSInformation OPTIONAL,
    systemType          [14] SystemType


}

MTSMSRecord             ::= SET
{
    recordType          [0] CallEventRecordType,
```

```
    serviceCentre       [1] AddressString,
    servedIMSI          [2] IMSI,
    servedIMEI          [3] IMEI OPTIONAL,
    servedMSISDN        [4] MSISDN OPTIONAL,
    msClassmark         [5] Classmark,
    recordingEntity     [6] RecordingEntity,
    location            [7] LocationAreaAndCell OPTIONAL,
    deliveryTime        [8] TimeStamp,
    smsResult           [9] SMSResult OPTIONAL,
    recordExtensions    [10] ManagementExtensions OPTIONAL,
    systemType      [11] SystemType

}

MOSMSIWRecord           ::= SET
{
    recordType          [0] CallEventRecordType,
    serviceCentre       [1] AddressString,
    servedIMSI          [2] IMSI,
    recordingEntity     [3] RecordingEntity,
    eventTime           [4] TimeStamp,
    smsResult           [5] SMSResult OPTIONAL,
    recordExtensions    [6] ManagementExtensions OPTIONAL
}

MTSMSGWRecord           ::= SET
{
    recordType          [0] CallEventRecordType,
    serviceCentre       [1] AddressString,
    servedIMSI          [2] IMSI,
    servedMSISDN        [3] MSISDN OPTIONAL,
    recordingEntity     [4] RecordingEntity,
    eventTime           [5] TimeStamp,
    smsResult           [6] SMSResult OPTIONAL,
    recordExtensions    [7] ManagementExtensions OPTIONAL
}

SSActionRecord          ::= SET
{
    recordType          [0] CallEventRecordType,
    servedIMSI          [1] IMSI,
    servedIMEI          [2] IMEI OPTIONAL,
    servedMSISDN        [3] MSISDN OPTIONAL,
    msClassmark         [4] Classmark,
    recordingEntity     [5] RecordingEntity,
    location            [6] LocationAreaAndCell OPTIONAL,
    basicServices       [7] BasicServices OPTIONAL,
    supplService        [8] SS-Code OPTIONAL,
    ssAction            [9] SSActionType OPTIONAL,
    ssActionTime        [10] TimeStamp,
    ssParameters        [11] SSParameters OPTIONAL,
    ssActionResult      [12] SSActionResult OPTIONAL,
    callReference       [13] CallReference,
    recordExtensions    [14] ManagementExtensions OPTIONAL,
    systemType      [15] SystemType

}

HLRIntRecord            ::= SET
{
    recordType          [0] CallEventRecordType,
    servedIMSI          [1] IMSI,
    servedMSISDN        [2] MSISDN,
    recordingEntity     [3] RecordingEntity,
    basicService        [4] BasicServiceCode OPTIONAL,
    routingNumber       [5] RoutingNumber,
    interrogationTime   [6] TimeStamp,
    numberOfForwarding  [7] NumberOfForwarding OPTIONAL,
    interrogationResult [8] HLRIntResult OPTIONAL,
    recordExtensions    [9] ManagementExtensions OPTIONAL,
    systemType          [10] SystemType

}

LocUpdateHLRRecord      ::= SET
{
    recordType          [0] CallEventRecordType,
    servedIMSI          [1] IMSI,
    recordingEntity     [2] RecordingEntity,
    oldLocation         [3] Location-info OPTIONAL,
    newLocation         [4] Location-info,
    updateTime          [5] TimeStamp,
    updateResult        [6] LocUpdResult OPTIONAL,
```

```
    recordExtensions    [7] ManagementExtensions OPTIONAL,
    systemType      [8] SystemType

}

LocUpdateVLRRecord      ::= SET
{
    recordType          [0] CallEventRecordType,
    servedIMSI          [1] IMSI,
    servedMSISDN        [2] MSISDN OPTIONAL,
    recordingEntity     [3] RecordingEntity,
    oldLocation         [4] Location-info OPTIONAL,
    newLocation         [5] Location-info,
    msClassmark         [6] Classmark,
    updateTime          [7] TimeStamp,
    updateResult        [8] LocUpdResult OPTIONAL,
    recordExtensions    [9] ManagementExtensions OPTIONAL,
    systemType      [10] SystemType

}


CommonEquipRecord       ::= SET
{
    recordType          [0] CallEventRecordType,
    equipmentType       [1] EquipmentType,
    equipmentId         [2] EquipmentId,
    servedIMSI          [3] IMSI,
    servedMSISDN        [4] MSISDN OPTIONAL,
    recordingEntity     [5] RecordingEntity,
    basicService        [6] BasicServiceCode OPTIONAL,
    changeOfService     [7] SEQUENCE OF ChangeOfService OPTIONAL,
    supplServicesUsed   [8] SEQUENCE OF SuppServiceUsed OPTIONAL,
    seizureTime         [9] TimeStamp,
    releaseTime         [10] TimeStamp OPTIONAL,
    callDuration        [11] CallDuration,
    callReference       [12] CallReference,
    sequenceNumber      [13] INTEGER OPTIONAL,
    recordExtensions    [14] ManagementExtensions OPTIONAL
}

--------------------------------------------------------------------------------
--
--  OBSERVED IMEI TICKETS
--
--------------------------------------------------------------------------------

ObservedIMEITicket      ::= SET
{
    servedIMEI          [0] IMEI,
    imeiStatus          [1] IMEIStatus,
    servedIMSI          [2] IMSI,
    servedMSISDN        [3] MSISDN OPTIONAL,
    recordingEntity     [4] RecordingEntity,
    eventTime           [5] TimeStamp,
    location            [6] LocationAreaAndCell ,
    imeiCheckEvent      [7] IMEICheckEvent OPTIONAL,
    callReference       [8] CallReference OPTIONAL,
    recordExtensions    [9] ManagementExtensions OPTIONAL,
    systemType      [10] SystemType

}


--------------------------------------------------------------------------------
--
--  FTAM / FTP / TFTP FILE CONTENTS
--
--------------------------------------------------------------------------------

CallEventDataFile       ::= SEQUENCE
{
    headerRecord        [0] HeaderRecord,
    callEventRecords    [1] SEQUENCE OF CallEventRecord,
    trailerRecord       [2] TrailerRecord,
    extensions          [3] ManagementExtensions
}

ObservedIMEITicketFile  ::= SEQUENCE
{
    productionDateTime  [0] TimeStamp,
    observedIMEITickets [1] SEQUENCE OF ObservedIMEITicket,
    noOfRecords         [2] INTEGER,
```

```
    extensions          [3] ManagementExtensions
}

HeaderRecord            ::= SEQUENCE
{
    productionDateTime  [0] TimeStamp,
    recordingEntity     [1] RecordingEntity,
    extensions          [2] ManagementExtensions
}

TrailerRecord           ::= SEQUENCE
{
    productionDateTime  [0] TimeStamp,
    recordingEntity     [1] RecordingEntity,
    firstCallDateTime   [2] TimeStamp,
    lastCallDateTime    [3] TimeStamp,
    noOfRecords         [4] INTEGER,
    extensions          [5] ManagementExtensions
}

--------------------------------------------------------------------------------
--
--  COMMON DATA TYPES
--
--------------------------------------------------------------------------------

AdditionalChgInfo       ::= SEQUENCE
{
    chargeIndicator [0] ChargeIndicator OPTIONAL,
    chargeParameters    [1] OCTET STRING OPTIONAL
}

AiurRequested           ::= ENUMERATED
{
    --
    -- See Bearer Capability TS 24.008
    -- (note that value "4" is intentionally missing
    --  because it is not used in TS 24.008)
    --

    aiur09600BitsPerSecond      (1),
    aiur14400BitsPerSecond      (2),
    aiur19200BitsPerSecond      (3),
    aiur28800BitsPerSecond      (5),
    aiur38400BitsPerSecond      (6),
    aiur43200BitsPerSecond      (7),
    aiur57600BitsPerSecond      (8),
    aiur38400BitsPerSecond1     (9),
    aiur38400BitsPerSecond2     (10),
    aiur38400BitsPerSecond3     (11),
    aiur38400BitsPerSecond4     (12)
}

AOCParameters           ::= SEQUENCE
{
    --
    -- See TS 22.024.
    --
    e1                  [1] EParameter OPTIONAL,
    e2                  [2] EParameter OPTIONAL,
    e3                  [3] EParameter OPTIONAL,
    e4                  [4] EParameter OPTIONAL,
    e5                  [5] EParameter OPTIONAL,
    e6                  [6] EParameter OPTIONAL,
    e7                  [7] EParameter OPTIONAL
}

AOCParmChange           ::= SEQUENCE
{
    changeTime          [0] TimeStamp,
    newParameters       [1] AOCParameters
}

BasicServices           ::= SET OF BasicServiceCode

BCDDirectoryNumber      ::= OCTET STRING
    -- This type contains the binary coded decimal representation of
    -- a directory number e.g. calling/called/connected/translated number.
    -- The encoding of the octet string is in accordance with the
    -- the elements "Calling party BCD number", "Called party BCD number"
    -- and "Connected number" defined in TS 24.008.
    -- This encoding includes type of number and number plan information
    -- together with a BCD encoded digit string.
```

```
    -- It may also contain both a presentation and screening indicator
    -- (octet 3a).
    -- For the avoidance of doubt, this field does not include
    -- octets 1 and 2, the element name and length, as this would be
    -- redundant.

CallDuration            ::= INTEGER
    --
    -- The call duration in seconds.
    -- For successful calls this is the chargeable duration.
    -- For call attempts this is the call holding time.
    --

CallEventRecordType     ::= INTEGER
{
    moCallRecord        (0),
    mtCallRecord        (1),
    roamingRecord       (2),
    incGatewayRecord    (3),
    outGatewayRecord    (4),
    transitCallRecord   (5),
    moSMSRecord         (6),
    mtSMSRecord         (7),
    moSMSIWRecord       (8),
    mtSMSGWRecord       (9),
    ssActionRecord      (10),
    hlrIntRecord        (11),
    locUpdateHLRRecord  (12),
    locUpdateVLRRecord  (13),
    commonEquipRecord   (14),
    moTraceRecord       (15),
    mtTraceRecord       (16),
    termCAMELIntRecord  (17),
--
--  Record values 18..22 are GPRS specific.
--  The contents are defined in TS 32.015
--
    sgsnPDPRecord       (18),
    ggsnPDPRecord       (19),
    sgsnMMRecord        (20),
    sgsnSMORecord       (21),
    sgsnSMTRecord       (22)
}

CalledNumber            ::= BCDDirectoryNumber

CallingNumber           ::= BCDDirectoryNumber

CallingPartyCategory    ::= Category

CallReference           ::= INTEGER

CallType                ::= INTEGER
{
    mobileOriginated    (0),
    mobileTerminated    (1)
}

CallTypes               ::= SET OF CallType

CAMELDestinationNumber  ::= DestinationRoutingAddress

CAMELInformation        ::= SET
{
    cAMELDestinationNumber  [1] CAMELDestinationNumber OPTIONAL,
    connectedNumber         [2] ConnectedNumber OPTIONAL,
    roamingNumber           [3] RoamingNumber OPTIONAL,
    mscOutgoingTKGP         [4] TrunkGroup OPTIONAL,
    seizureTime             [5] TimeStamp OPTIONAL,
    answerTime              [6] TimeStamp OPTIONAL,
    releaseTime             [7] TimeStamp OPTIONAL,
    callDuration            [8] CallDuration OPTIONAL,
    dataVolume              [9] DataVolume OPTIONAL,
    cAMELInitCFIndicator    [10] CAMELInitCFIndicator OPTIONAL,
    causeForTerm            [11] CauseForTerm OPTIONAL,
    cAMELModification       [12] ChangedParameters OPTIONAL,
    freeFormatData          [13] FreeFormatData OPTIONAL,
    diagnostics             [14] Diagnostics OPTIONAL,
    freeFormatDataAppend    [15] BOOLEAN OPTIONAL,
    freeFormatData_2        [16] FreeFormatData OPTIONAL,
    freeFormatDataAppend_2  [17] BOOLEAN OPTIONAL
}
```

```
CAMELSMSInformation     ::= SET
{
    gsm-SCFAddress                      [1] Gsm-SCFAddress OPTIONAL,
    serviceKey                          [2] ServiceKey OPTIONAL,
    defaultSMSHandling                  [3] DefaultSMS-Handling OPTIONAL,
    freeFormatData                      [4] FreeFormatData OPTIONAL,
    CallingPartyNumber                  [5] CallingNumber OPTIONAL,
    DestinationSubscriberNumber         [6] CalledNumber OPTIONAL,
    cAMELSMSCAddress                    [7] AddressString OPTIONAL
}

CAMELInitCFIndicator    ::= ENUMERATED
{
    noCAMELCallForwarding   (0),
    cAMELCallForwarding     (1)
}

CAMELModificationParameters ::= SET
    --
    -- The list contains only parameters changed due to CAMEL call
    -- handling.
    --
{
    callingPartyNumber          [0] CallingNumber OPTIONAL,
    callingPartyCategory        [1] CallingPartyCategory OPTIONAL,
    originalCalledPartyNumber   [2] OriginalCalledNumber OPTIONAL,
    genericNumbers              [3] GenericNumbers OPTINAL,
    redirectingPartyNumber      [4] RedirectingNumber OPTIONAL,
    redirectionCounter          [5] NumberOfForwarding OPTIONAL
}


Category        ::= OCTET STRING (SIZE(1))
    --
    -- The internal structure is defined in CCITT Rec Q.763.
    --

CauseForTerm            ::= INTEGER
    --
    -- Cause codes from 16 up to 31 are defined in GSM12.15 as 'CauseForRecClosing'
    -- (cause for record closing).
    -- There is no direct correlation between these two types.
    --
{
    normalRelease                       (0),
    partialRecord                       (1),
    partialRecordCallReestablishment    (2),
    unsuccessfulCallAttempt             (3),
    stableCallAbnormalTermination       (4),
    cAMELInitCallRelease                (5)
}

CellId  ::= OCTET STRING (SIZE(2))
    --
    -- Coded according to TS 24.008
    --

ChangedParameters       ::= SET
{
    changeFlags     [0] ChangeFlags,
    changeList      [1] CAMELModificationParameters OPTIONAL
}

ChangeFlags             ::= BIT STRING
{
callingPartyNumberModified          (0),
callingPartyCategoryModified        (1),
originalCalledPartyNumberModified   (2),
genericNumbersModified              (3),
redirectingPartyNumberModified      (4),
redirectionCounterModified          (5)
}

ChangeOfClassmark       ::= SEQUENCE
{
    classmark           [0] Classmark,
    changeTime          [1] TimeStamp
}

ChangeOfRadioChannel    ::= SEQUENCE
{
    radioChannel        [0] TrafficChannel,
```

```
    changeTime          [1] TimeStamp,
    speechVersionUsed   [2] SpeechVersionIdentifier OPTIONAL
}

ChangeOfService         ::= SEQUENCE
{
    basicService        [0] BasicServiceCode,
    transparencyInd     [1] TransparencyInd OPTIONAL,
    changeTime          [2] TimeStamp
}

ChannelCoding           ::= ENUMERATED
{
   tchF4800             (1),
   tchF9600             (2),
   tchF14400            (3)
}

ChargeIndicator         ::= INTEGER
{
    noCharge            (0),
    charge              (1)
}

Classmark               ::= OCTET STRING
    --
    -- See Mobile station classmark  2,  TS 24.008
    --

ConnectedNumber         ::= BCDDirectoryNumber

DataVolume              ::= INTEGER
    --
    -- The volume of data transferred in segments of 64 octets.
    --

Day                     ::= INTEGER (1..31)

DayClass                ::= ObjectInstance

DayClasses              ::= SET OF DayClass

DayDefinition           ::= SEQUENCE
{
    day                 [0] DayOfTheWeek,
    dayClass            [1] ObjectInstance
}

DayDefinitions          ::= SET OF DayDefinition

DateDefinition          ::= SEQUENCE
{
    month               [0] Month,
    day                 [1] Day,
    dayClass            [2] ObjectInstance
}

DateDefinitions         ::= SET OF DateDefinition

DayOfTheWeek            ::= ENUMERATED
{
    allDays             (0),
    sunday              (1),
    monday              (2),
    tuesday             (3),
    wednesday           (4),
    thursday            (5),
    friday              (6),
    saturday            (7)
}

Diagnostics                     ::= CHOICE
{
    gsm0408Cause                [0] INTEGER,
    -- See TS 24.008
    gsm0902MapErrorValue        [1] INTEGER,
    -- Note: The value to be stored here corresponds to
    -- the local values defined in the MAP-Errors and
    -- MAP-DialogueInformation modules, for full details
    -- see TS 29.002.
    ccittQ767Cause              [2] INTEGER,
    -- See CCITT Q.767
    networkSpecificCause        [3] ManagementExtension,
```

```
    -- To be defined by network operator
    manufacturerSpecificCause   [4] ManagementExtension
    -- To be defined by manufacturer
}

Destinations            ::= SET OF AE-title

EmergencyCallIndEnable  ::= BOOLEAN

EmergencyCallIndication ::= SEQUENCE
{
    cellId              [0] CellId,
    callerId            [1] IMSIorIMEI
}

EParameter  ::= INTEGER (0..1023)
    --
    -- Coded according to  TS 22.024  and TS 24.080
    --

EquipmentId             ::= INTEGER

EquipmentType           ::= INTEGER
{
    conferenceBridge    (0)
}

FileType                ::= INTEGER
{
    callRecords         (1),
    traceRecords        (9),
    observedIMEITicket  (14)
}

Fnur                    ::= ENUMERATED
{
   --
   -- See Bearer Capability TS 24.008
   --
   Fnur9600-BitsPerSecond    (1),
   Fnur14400BitsPerSecond    (2),
   Fnur19200BitsPerSecond    (3),
   Fnur28800BitsPerSecond    (4),
   Fnur38400BitsPerSecond    (5),
   Fnur48000BitsPerSecond    (6),
   Fnur56000BitsPerSecond    (7),
   Fnur64000BitsPerSecond    (8)
}

ForwardToNumber         ::= AddressString

FreeFormatData          ::= OCTET STRING (SIZE(1..160))
    --
    -- Free formated data as sent in the FCI message
    -- See TS 29.078
    --

GenericNumber           ::= BCDDirectoryNumber

GenericNumbers          ::= SET OF GenericNumber

Gsm-SCFAddress          ::= ISDNAddressString
    --
    -- See TS 29.002
    --

HLRIntResult            ::= Diagnostics

HSCSDParmsChange        ::= SEQUENCE
{
    changeTime              [0] TimeStamp,
    hSCSDChanAllocated      [1] NumOfHSCSDChanAllocated,
    initiatingParty         [2] InitiatingParty OPTIONAL,
    aiurRequested           [3] AiurRequested OPTIONAL,
    chanCodingUsed          [4] ChannelCoding,
    hSCSDChanRequested      [5] NumOfHSCSDChanRequested OPTIONAL,
}

IMEICheckEvent          ::= INTEGER
{
    mobileOriginatedCall    (0),
    mobileTerminatedCall    (1),
    smsMobileOriginating    (2),
```

```
    smsMobileTerminating    (3),
    ssAction                (4),
    locationUpdate          (5)
}

IMEIStatus              ::= ENUMERATED
{
    greyListedMobileEquipment   (0),
    blackListedMobileEquipment  (1),
    nonWhiteListedMobileEquipment   (2)
}

IMSIorIMEI              ::= CHOICE
{
    imsi                [0] IMSI,
    imei                [1] IMEI
}

InitiatingParty         ::= ENUMERATED
{
    network             (0),
    subscriber          (1)
}

LevelOfCAMELService     ::= BIT STRING
{
    basic                   (0),
    callDurationSupervision (1),
    onlineCharging          (2)
}

LocationAreaAndCell     ::= SEQUENCE
{
    locationAreaCode    [0] LocationAreaCode,
    cellId              [1] CellId
}

LocationAreaCode        ::= OCTET STRING (SIZE(2))
    --
    -- See TS 24.008
    --

LocationChange          ::= SEQUENCE
{
    location            [0] LocationAreaAndCell,
    changeTime          [1] TimeStamp
}

Location-info           ::= SEQUENCE
{
    mscNumber           [1] MscNo OPTIONAL,
    location-area       [2] LocationAreaCode,
    cell-identification [3] CellId OPTIONAL
}

LocUpdResult            ::= Diagnostics

ManagementExtensions    ::= SET OF ManagementExtension

MCCMNC  ::= GraphicString (SIZE(5))
    --
    -- This type contains the mobile country code (MCC) and the mobile      -- network code (MNC) of
a PLMN.
    --

MessageReference        ::= OCTET STRING

Month                   ::= INTEGER (1..12)

MSCAddress              ::= AddressString

MscNo                   ::= ISDN-AddressString
    --
    -- See TS 23.003
    --

MSISDN  ::= ISDN-AddressString
    --
    -- See TS 23.003
    --

MSPowerClasses          ::= SET OF RFPowerCapability
```

```
NetworkCallReference    ::= CallReferenceNumber --
    -- See TS 29.002
    --

NetworkSpecificCode     ::= INTEGER
    --
    -- To be defined by network operator
    --

NetworkSpecificServices ::= SET OF NetworkSpecificCode

NumOfHSCSDChanRequested     ::= INTEGER

NumOfHSCSDChanAllocated     ::= INTEGER

ObservedIMEITicketEnable    ::= BOOLEAN

OriginalCalledNumber        ::= BCDDirectoryNumber

OriginDestCombinations      ::= SET OF OriginDestCombination

OriginDestCombination       ::= SEQUENCE
{
    origin                  [0] INTEGER OPTIONAL,
    destination             [1] INTEGER OPTIONAL
    --
    -- Note that these values correspond to the contents
    -- of the attributes originId and destinationId
    -- respectively. At least one of the two must be present.
    --
}

PartialRecordTimer      ::= INTEGER

PartialRecordType       ::= ENUMERATED
{
    timeLimit               (0),
    serviceChange           (1),
    locationChange          (2),
    classmarkChange         (3),
    aocParmChange           (4),
    radioChannelChange      (5),
    hSCSDParmChange         (6),
    changeOfCAMELDestination    (7)
}

PartialRecordTypes      ::= SET OF PartialRecordType

RadioChannelsRequested  ::= SET OF RadioChanRequested

RadioChanRequested      ::= ENUMERATED
{
    --
    -- See Bearer Capability TS 24.008
    --
    halfRateChannel         (0),
    fullRateChannel         (1),
    dualHalfRatePreferred   (2),
    dualFullRatePreferred   (3)
}

RecordClassDestination  ::= CHOICE
{
    osApplication       [0] AE-title,
    fileType            [1] FileType
}

RecordClassDestinations ::= SET OF RecordClassDestination

RecordingEntity         ::= AddressString

RecordingMethod         ::= ENUMERATED
{
    inCallRecord        (0),
    inSSRecord          (1)
}

RedirectingNumber       ::= BCDDirectoryNumber

RFPowerCapability       ::= INTEGER
    --This field contains the RF power capability of the
    --  Mobile station
    -- classmark 1 and 2 of TS 24.008 expressed as an integer.
```

```
    --

RoamingNumber           ::= ISDN-AddressString
    --
    -- See TS 23.003
    --

RoutingNumber           ::= CHOICE
{
    roaming             [1] RoamingNumber,
    forwarded           [2] ForwardToNumber
}

Service                     ::= CHOICE
{
    teleservice             [1] TeleserviceCode,
    bearerService           [2] BearerServiceCode,
    supplementaryService    [3] SS-Code,
    networkSpecificService  [4] NetworkSpecificCode
}

ServiceDistanceDependencies ::= SET OF ServiceDistanceDependency

ServiceDistanceDependency   ::= SEQUENCE
{
    aocService              [0] INTEGER,
    chargingZone            [1] INTEGER OPTIONAL
    --
    -- Note that these values correspond to the contents
    -- of the attributes aocServiceId and zoneId
    -- respectively.
    --
}

SimpleIntegerName           ::= INTEGER

SimpleStringName            ::= GraphicString

SMSResult                   ::= Diagnostics

SpeechVersionIdentifier ::= OCTET STRING (SIZE(1))

--  see GSM 08.08

--  000 0001    GSM speech full rate version 1
--  001 0001    GSM speech full rate version 2   used for enhanced full rate
--  010 0001    GSM speech full rate version 3   for future use
--  000 0101    GSM speech half rate version 1
--  001 0101    GSM speech half rate version 2  for future use
--  010 0101    GSM speech half rate version 3  for future use

SSActionResult              ::= Diagnostics

SSActionType                ::= ENUMERATED
{
    registration            (0),
    erasure                 (1),
    activation              (2),
    deactivation            (3),
    interrogation           (4),
    invocation              (5),
    passwordRegistration    (6)
}

SSParameters                ::= CHOICE
{
    forwardedToNumber       [0] ForwardToNumber,
    unstructuredData        [1] OCTET STRING
}

SystemType              ::= ENUMERATED
{
    unknown             (0),
    iuUTRAN             (1)
}

SupplServices               ::= SET OF SS-Code

SuppServiceUsed             ::= SEQUENCE
{
    ssCode                  [0] SS-Code,
    ssTime                  [1] TimeStamp OPTIONAL
}
```

```
SwitchoverTime              ::= SEQUENCE
{
    hour                    INTEGER (0..23),
    minute                  INTEGER (0..59),
    second                  INTEGER (0..59)
}

TariffId                    ::= INTEGER

TariffPeriod                ::= SEQUENCE
{
    switchoverTime          [0] SwitchoverTime,
    tariffId                [1] INTEGER
    -- Note that the value of tariffId corresponds
    -- to the attribute tariffId.
}

TariffPeriods               ::= SET OF TariffPeriod

TariffSystemStatus          ::= ENUMERATED
{
    available               (0),    -- available for modification
    checked                 (1),    -- "frozen" and checked
    standby                 (2),    -- "frozen" awaiting activation
    active                  (3) -- "frozen" and active
}

TimeStamp                   ::= OCTET STRING (SIZE(9))
    --
    -- The contents of this field are a compact form of the UTCTime format
    -- containing local time plus an offset to universal time. Binary coded
    -- decimal encoding is employed for the digits to reduce the storage and
    -- transmission overhead
    -- e.g. YYMMDDhhmmssShhmm
    -- where
    -- YY   =   Year 00 to 99       BCD encoded
    -- MM   =   Month 01 to 12      BCD encoded
    -- DD   =   Day 01 to 31        BCD encoded
    -- hh   =   hour 00 to 23       BCD encoded
    -- mm   =   minute 00 to 59     BCD encoded
    -- ss   =   second 00 to 59     BCD encoded
    -- S    =   Sign 0 = "+", "-"   ASCII encoded
    -- hh   =   hour 00 to 23       BCD encoded
    -- mm   =   minute 00 to 59     BCD encoded
    --

TrafficChannel          ::= ENUMERATED
{
    fullRate            (0),
    halfRate            (1)
}

TranslatedNumber        ::=     BCDDirectoryNumber

TransparencyInd         ::= ENUMERATED
{
    transparent         (0),
    nonTransparent      (1)
}

TrunkGroup              ::=  CHOICE
{
    tkgpNumber          [0] INTEGER,
    tkgpName            [1] GraphicString
}

TSChangeover            ::= SEQUENCE
{
    newActiveTS         [0] INTEGER,
    newStandbyTS        [1] INTEGER,
    changeoverTime      [2] GeneralizedTime OPTIONAL,
    authkey             [3] OCTET STRING OPTIONAL,
    checksum            [4] OCTET STRING OPTIONAL,
    versionNumber       [5] OCTET STRING OPTIONAL
    -- Note that if the changeover time is not
    -- specified then the change is immediate.
}

TSCheckError            ::= SEQUENCE
{
    errorId             [0] TSCheckErrorId,
    fail                [1] ANY DEFINED BY errorId OPTIONAL
```

```
}

TSCheckErrorId          ::= CHOICE
{
    globalForm          [0] OBJECT IDENTIFIER,
    localForm           [1] INTEGER
}

TSCheckResult           ::= CHOICE
{
    success             [0] NULL,
    fail                [1] SET OF TSCheckError
}

TSCopyTariffSystem      ::= SEQUENCE
{
    oldTS               [0] INTEGER,
    newTS               [1] INTEGER
}

TSNextChange            ::= CHOICE
{
    noChangeover        [0] NULL,
    tsChangeover        [1] TSChangeover
}

TypeOfSubscribers       ::= ENUMERATED
{
    home                (0),    -- HPLMN subscribers
    visiting            (1),    -- roaming subscribers
    all (2)
}

TypeOfTransaction       ::= ENUMERATED
{
    successful          (0),
    unsuccessful        (1),
    all                 (2)
}

END
```

1Annex A (informative): Change history

Change history					
TSG SA#	Version	CR	Tdoc SA	New Version	Subject/Comment
SA_11	1.0.0	-	SP-010025		Replaces Release 99 of 3GPP 32.005, which will be discontinued from Release 4 onwards.