Technical Specification Group Services and System Aspects
Meeting #10, Bangkok, Thailand, 11-14 December 2000

TSGS#10(00)0516

Source: **SA WG5**

Title: **CRs to Telecommunications Management; Charging and billing; 3G call and event data for the Packet Switched (PS) domain (32.015)**

Document for: **Approval**

Agenda Item: **7.5.3**

Doc-1st-Level	Doc-2nd-Level	Spec	CR	Rev	Phase	Cat	Subject	Version-Current	Version-New	Work item
SP-000516	S5-000476	32.015	013		R99	F	Alignment of Triggers for S-CDR closure	3.3.0	3.4.0	OAM-CH
SP-000516	S5-000528	32.015	014		R99	F	Ambiguities in Packet Transfer Command IE & Data Record Packet IE	3.3.0	3.4.0	OAM-CH
SP-000516	S5-000529	32.015	015		R99	F	Inconsistency of Charging Characteristic size	3.3.0	3.4.0	OAM-CH
SP-000516	S5-000530	32.015	016		R99	F	Alignment of ASN.1 for QoS attributes	3.3.0	3.4.0	OAM-CH
SP-000516	S5-000531	32.015	017		R99	F	Correction of parameter CallEventRecord	3.3.0	3.4.0	OAM-CH
SP-000516	S5-000533	32.015	018		R99	F	Correction of parameter Location Area and Cell	3.3.0	3.4.0	OAM-CH
SP-000516	S5-000534	32.015	019		R99	F	Correction of ASN.1 errors	3.3.0	3.4.0	OAM-CH

3GPP TSG-SA5 (Telecom Management)
Meeting #15, Girdwood, Alaska, USA, 16 - 20 October 2000

SA5#15(00)0476
Tdoc S5B000060

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32.015	CR	013	Current Version:	V.3.3.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	SA#10	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from:* ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

Proposed change affects: (U)SIM [ ] ME [ ] UTRAN / Radio [ ] Core Network [X]
(at least one should be marked with an X)

Source: SA5#15 **Date:** 20/10/2000

Subject: Alignment of Triggers for S-CDR closure

Work item: OAM-CH

Category: *(only one category shall be marked with an X)*

F	Correction	[X]	**Release:**	Phase 2 [ ]
A	Corresponds to a correction in an earlier release	[ ]		Release 96 [ ]
B	Addition of feature	[ ]		Release 97 [ ]
C	Functional modification of feature	[ ]		Release 98 [ ]
D	Editorial modification	[ ]		Release 99 [X]
				Release 00 [ ]

Reason for change: To align the description of S-CDR closure conditions for 2G/3G QoS attributes with the latest versions of 24.008 (CN1) and 23.107 (SA2).

Clauses affected: 5.6.1.2.

Other specs affected:

Other 3G core specifications	[ ]	→ List of CRs:
Other GSM core specifications	[ ]	→ List of CRs:
MS test specifications	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:

5.6.1.2 Triggers for S-CDR Closure

The S-CDR shall be closed on encountering some trigger conditions. Table 2 identifies which conditions are supported to permit the closures of the S-CDR.

Table 2: Triggers for S-CDR closure

Closure Conditions	Description/Behaviour
End of PDP Context within the SGSN	Deactivation of the PDP context in the SGSN shall result in the CDR being closed. The trigger condition covers:- - termination of PDP context, - SGSN change (inter-SGSN routing area update including system handover), - any abnormal release.
Partial Record Reason	O&M reasons permit the closure of the CDR for internal reasons. The trigger condition covers:- - data volume limit, - time (duration) limit, - maximum number of charging condition changes, - management intervention.~~,~~ - ~~Intra system handover (change of radio interface from GSM to 3G or visa versa).~~

3GPP TSG-SA5 (Telecom Management)
Meeting #15, Seattle/Anchorage, USA, 16 - 20 Oct 2000

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32.015	CR	014	Current Version:	V.3.3.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	SA#10	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)* (U)SIM [ ] ME [ ] UTRAN / Radio [ ] Core Network [X]

Source: SA5#15 **Date:** 20/10/2000

Subject: Ambiguities in Packet Transfer Command IE & Data Record Packet IE

Work item: OAM-CH

Category: *(only one category shall be marked with an X)*

F	Correction	X
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
C	Functional modification of feature	
D	Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change:

The current Packet Transfer Command IE & Data Record Packet IE description is ambiguous.

Two descriptions proposed herein will clarify the ambiguity.

Clauses affected: 7.3.4.5.3 and 7.3.4.5.4

Other specs Affected:

Other 3G core specifications	[ ]	→ List of CRs:
Other GSM core specifications	[ ]	→ List of CRs:
MS test specifications	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:

7.3.4.5.3 Packet Transfer Command IE

The value of the Packet Transfer Command in its information element tells the nature of the message:

1 = ‘Send Data Record Packet’

2 = ‘Send possibly duplicated Data Record Packet’

3 = ‘Cancel Data Record Packet’

4 = ‘Release Data Record Packet’

The following describes the usage of each Packet Transfer Command.

1) Send Data Record Packet. This is used for the normal CDR sending, and it is the usual Packet Transfer Command, other commands being used only in error recovery cases. Of the conditional IE’s, the "Data Record Packet" is present in the message.

2) Send possibly duplicated Data Record Packet. When the CDR packet is directed to a secondary CGF (by a CDR generating node) because the currently used CGF not working or the CDR transfer is not working properly, then this Packet Transfer Command is used instead of the normal ‘Send Data Record Packet’. Of the conditional IEs, the Data Record Packet" is present in the message, when sending the message to a CGF acting as temporary storage, when the original primary CGF could not be contacted. This Packet Transfer Command is used also when sending "empty" test packets with older (but not yet acknowledged) sequence numbers after a peer node or link recovery, to check if the CGF had received some Data Record Packets (whose acknowledgement did not come to the Data Record Packet sending node) before the link to the recipient node became inoperable.

3) Cancel Data Record Packet. Of the conditional IE’s, the "Sequence Numbers of Cancelled Packets" is present in the message.

4) Release Data Record Packet. Of the conditional IE’s, the "Sequence Numbers of Released Packets" is present in the message.

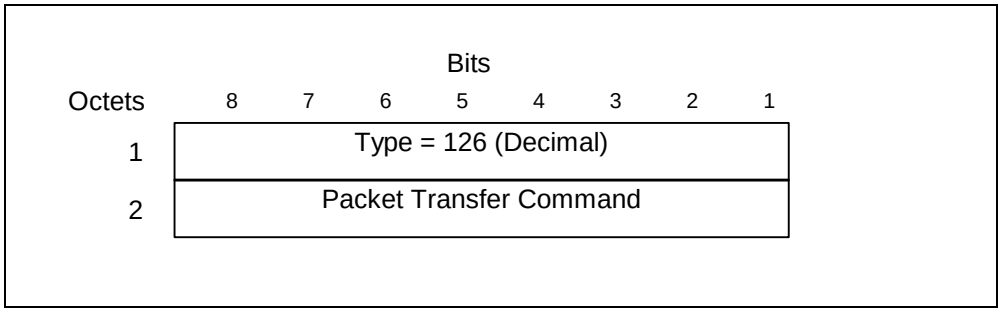

Figure 15: Packet Transfer Command information element

After the CGF has received the Packet Transfer Command ‘Release Data Record Packet’ with the Sequence Number(s) for earlier sent ‘Send possibly duplicated Data Record Packet’ command(s), it can consider itself authorised to send the Data Record Packets previously marked as possibly duplicated towards the Billing System as normal (not duplicated) CDRs.

7.3.4.5.4 Data Record Packet IE

The Data Record Packet element, which is present conditionally if the Packet Transfer Command is ‘Send Data Record Packet’ or ‘Send possibly duplicated Data Record Packet’, may contain one or more data records. If an "empty packet" is to be sent (for testing if a recently recovered peer node has earlier received a packet with this sequence number), then the Data Record Packet IE contains only the Type (with value 252 in decimal) and the Length (with value 0) fields. The format of the records is ASN.1 or another format, identified by the Data Record Format. The Data Record Format Version numbering starts from 1.

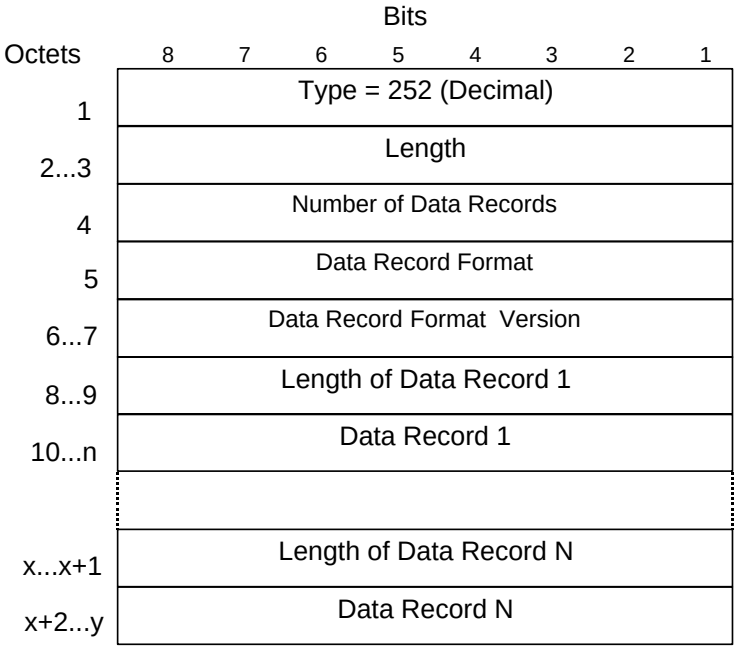

Figure 16: Data Record Packet information element

3GPP TSG-SA5 (Telecom Management)
Meeting #15, Girdwood, Alaska, USA, 16 - 20 October 2000

SA5#15(00)0529
Tdoc S5B000045

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32.015	CR	015	Current Version:	V.3.3.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	SA#10	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)* (U)SIM [ ] ME [ ] UTRAN / Radio [ ] Core Network [X]

Source: SA5#15 **Date:** 20/10/2000

Subject: Inconsistency of Charging Characteristic size

Work item: OAM-CH

Category: *(only one category shall be marked with an X)*

F	Correction	X	
A	Corresponds to a correction in an earlier release		
B	Addition of feature		
C	Functional modification of feature		
D	Editorial modification		

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: The Charging Characteristic field defined in 32.015 is currently a one-octet value. The charging characteristics are therefore now inconsistent between 32.015 and the other relevant TSs (23.060, 29.002 and 29.060). To correct this inconsistency, it is necessary to increase the Charging Characteristic value to two octets also in 32.015.

Clauses affected: 6.1.6.2a, 8.1

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments: The required changes to TSs 23.060, 29.002 and 29.060 have already been implemented.

6.1.6.2a Charging Characteristics

The Charging Characteristics field as defined in Figure 8a allows the operator to apply different kind of charging methods for the CDRs. The N flag in the Charging Characteristics indicates normal charging, the P flag indicates prepaid charging, the F flag indicates flat rate charging and the H flag indicates charging by hot billing. The 2nd octet is reserved for future use. One or more of the flags shall be set according to the charging characteristics received from the HLR and transmitted by the CDR generating node over the Ga interface.

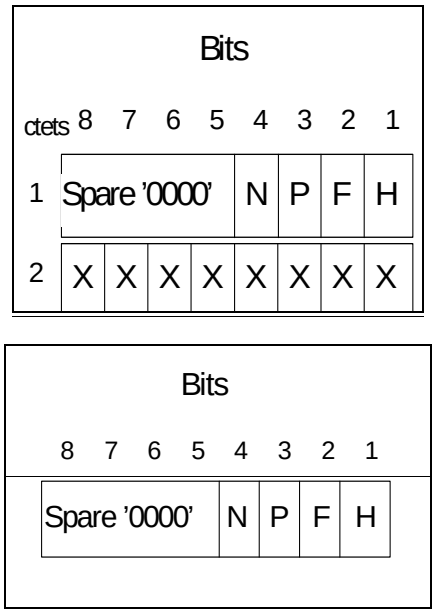

Figure 8a: Charging Characteristics flags

Charging Characteristics in S-CDR is determined by the SGSN as follows:

- If a "PDP context Charging Characteristics" is present in the subscriber's data for this PDP context, than it shall be used,
- If there is no "PDP context Charging Characteristics" but a "Subscribed Charging Characteristics" is present in the subscriber's data, the "Subscribed Charging Characteristics" shall be used.

Charging Characteristics in G-CDR corresponds to the "Charging characteristics" information of the PDP context data in the GGSN.

8 Charging Data Record Structure

8.1 ASN.1 definitions for CDR information

ChargingCharacteristics ::= OCTET STRING (SIZE(~~1~~2))

3GPP TSG-SA5 (Telecom Management) **SA5#16(00)0530**
Meeting #16, Tokyo, JAPAN, 27 Nov - 1 Dec 2000 **Tdoc S5B000083**

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32.015	CR	016	Current Version:	V.3.3.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	SA#10	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)* (U)SIM [ ] ME [ ] UTRAN / Radio [ ] Core Network [X]

Source: SA5#16 **Date:** 01/12/2000

Subject: Alignment of ASN.1 for QoS attributes

Work item: OAM-CH

Category: *(only one category shall be marked with an X)*

F	Correction	X	**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: The QoS profile and its encoding is currently not aligned with 29.060.

As in 29.060, the pre-Release99 QoS profile and its encoding is maintained for backward compatibility reasons.

Clauses affected: 6.1.6.20 and 8.1

Other specs affected:

Other 3G core specifications		→ List of CRs:	
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments: 3GPP TS 29.060 is based on 23.060, 24.008, and 23.107.

6.1.6.20 QoS Requested/QoS Negotiated

Quality of Service Requested contains the QoS wanted by MS at PDP context activation. QoS Negotiated indicates the applied QoS accepted by the network.

If a pre-Release '99 only capable terminal is served~~In GSM~~, the QoS profile consists of 5 attributes: reliability, delay, precedence, peak throughput and mean throughput. ~~See 3GPP TS 24.008 [13] for more details~~The encoding of this QoS profile shall be in accordance with GSM TS 12.15.

In ~~3G~~Release 99, the QoS profile consists of the above 2G parameters plus the following UMTS attributes: Traffic class ('conversational', 'streaming', 'interactive', 'background'), Maximum bitrate (kbps), Delivery order (y/n), Maximum SDU size (octets), SDU error ratio, Residual bit error ratio, Delivery of erroneous SDUs (y/n/-), Transfer delay (ms), Traffic handling priority, Allocation/Retention Priority. ~~See 3GPP TS 24.008 [13] for more details.~~This QoS profile shall be encoded according to the "Quality of Service (QoS) Profile" parameter specified in 3GPP TS 29.060 [22].

8 Charging Data Record Structure

8.1 ASN.1 definitions for CDR information

Within the current GSM 12-series of specifications the ASN.1 definitions are based on ISO8824 (90) / X.208 (88) [40], which has been superseded by ISO8824-1 (94) / X.680 (94). This newer version not only includes new features but also removes some that were present in ISO8824 (90) / X.208 (88) [40].
Where possible, the GPRS work would be based on those ASN.1 features to both. However, where necessary, the new features in ISO8824-1 (94) / X.680 (94) [41] be used in some places.
ISO8824 (90) / X.208 (88) [40] features that are no longer in ISO8824-1 (94) / X.680 (94) [41] will not be used.

```
.....

QoSInformation  ::= CHOICE
{
    gsmQosInformation       [0] GSMQoSInformation,
    umtsQosInformation      [1] OCTET STRING (SIZE (~~11~~12))}
--
-- The "GSMQoSInformation corresponds to the encoding specified in GSM TS 12.15, and shall be used
for pre-Release 99 terminals only.  The umtsQosInformation octet string is a 1:1 copy of the
contents (i.e. starting with octet ~~3~~4) of the "Quality of service Profile" information element
specified in 3GPP TS ~~24~~29.~~008~~060 [22].
}
```

3GPP TSG-SA5 (Telecom Management)
Meeting #15, Girdwood, Alaska, USA, 16 - 20 October 2000

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32.015	CR	017	Current Version:	V.3.3.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	SA#10	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from:* ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

Proposed change affects: (U)SIM [ ] ME [ ] UTRAN / Radio [ ] Core Network [X]
(at least one should be marked with an X)

Source: SA5#15 **Date:** 20/10/2000

Subject: Correction of parameter CallEventRecord

Work item: OAM-CH

Category: *(only one category shall be marked with an X)*

F	Correction	X	**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change:

The ASN.1 decoder is not able to distinguish between CS and PS records with the same global tag of CallEventRecord.

For a common handling of both record types in the same proceeding the subelement record choice of CallEventRecord should be unique.

Clauses affected: 8.1

Other specs affected:

Other 3G core specifications		→ List of CRs:	
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:

8 Charging Data Record Structure

8.1 ASN.1 definitions for CDR information

Within the current GSM 12-series of specifications the ASN.1 definitions are based on ISO8824 (90) / X.208 (88) [40], which has been superseded by ISO8824-1 (94) / X.680 (94). This newer version not only includes new features but also removes some that were present in ISO8824 (90) / X.208 (88) [40].
Where possible, the GPRS work would be based on those ASN.1 features to both. However, where necessary, the new features in ISO8824-1 (94) / X.680 (94) [41] be used in some places.
ISO8824 (90) / X.208 (88) [40] features that are no longer in ISO8824-1 (94) / X.680 (94) [41] will not be used.

```
Changes (enhancements) in GSM1205-DataTypes:

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),
    sgsnPDPRecord           (18),
    ggsnPDPRecord           (19),
    sgsnMMRecord            (20),
    sgsnSMORecord           (21),
    sgsnSMTRecord           (22)

}
GPRS_Charging-DataTypes {... }

DEFINITIONS IMPLICIT TAGS   ::=

BEGIN

-- EXPORTS everything

IMPORTS

CellId, Diagnostics, CallDuration, ManagementExtensions, TimeStamp, MSISDN, LocationAreaCode,
MessageReference, RecordingEntity, SMSResult, LevelOfCAMELService, CalledNumber, CallingNumber
FROM GSM1205-DataTypes{ ccitt (0) identified-organization (4) etsi(0) mobileDomain (0)
gsmOperation-Maintenance (3) moduleId (3) gsm-12-05 (5) InformationModel (0) asn1Module (2) 1 }

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


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
{
-- Record values 0..16 are 3G curcuit switch specific
--
    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
--
    sgsnPDPRecord           [20] SGSNPDPRecord,
    ggsnPDPRecord           [21] GGSNPDPRecord,
    sgsnMMRecord            [22] SGSNMMRecord,
    sgsnSMORecord           [23] SGSNSMORecord,
    sgsnSMTRecord           [24] SGSNSMTRecord
}
```

3GPP TSG-SA5 (Telecom Management)
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CHANGE REQUEST

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32.015	CR	018	Current Version:	V.3.3.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	SA#10	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from:* ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

Proposed change affects: (U)SIM [ ] ME [ ] UTRAN / Radio [ ] Core Network [X]
(at least one should be marked with an X)

Source: SA5#16 **Date:** 01/12/2000

Subject: Correction of parameter Location Area and Cell

Work item: OAM-CH

Category: *(only one category shall be marked with an X)*

F	Correction	X	**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: The description for the parameter Location Area and Cell is not consistent with the location information in 2G and 3G domain. Generally the location identifier for 2G is the Cell Id (refer to TS 24.008) and for 3G the Service Area Code (refer to TS 25.413).

Clauses affected: 2., 3., 6. and 8.1

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

2 References

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

[15] ~~Void~~3G TS 25.413: "UTRAN Iu Interface RANAP Signalling".

3 Definitions, abbreviations and symbols

3.2 Abbreviations

For the purposes of the present document the following abbreviations apply. Additional applicable abbreviations can be found in 3G TS 21.905 [1].

SAC Service Area Code

6 Charging Data Collection

6.1 Record contents

Tables 5, 6, 7, 8 and 9 describe the contents of each of the call and event records generated by the GSNs. Each table contains the name of the field, a key indicating whether or not the field is Mandatory (M), and a description of the contents.

The key field has the following meaning:

M This field is Mandatory and always present. Any exceptions to this rule are explicitly described.

C This field is only available under certain Conditions. If available the field is present.

The Conditions under which the field is available are individually described.

O This field is Optional and configurable either via additional TMN management functions or manufacturer specific means. For the avoidance of doubt, Optional does not mean that the parameter is not supported by the Network Element (NE). Equipment manufacturers shall be capable of providing all of these fields in order to claim conformance with the present document.

The Mandatory (M), Conditional (C) and Optional (O) designations are described at the GSN / CGF interface (see exceptions below) and may be available at the CGF / BS interface to meet the Billing System (BS) requirement.

All the Mandatory or Conditional fields are not required in all CDRs at the GSN / CGF interface in the following cases:

- Each information element is included at least in one record. This applies for situations where partial records are produced between the GSN and CGF, and the information has not changed, e.g. "Network Initiated PDP Context". The following primary identifier fields are however needed in all records: Record Type, Served IMSI, and if the CDR is related to a PDP context (G-CDR and S-CDR), GGSN Address, then also the Charging ID.

- GSNs are configured to produce only part of the described information. This applies for situations where record types are not produced or some functional component is excluded from the records such as whole M-CDR or time based charging in G-CDR.

In the case of a distributed CGF the following charging data records are not applicable at the GSN / CGF interface and proprietary solutions or variations to the present document are allowed. However, the described information content needs to be supported to be able to conform to the requirements towards the BS.

6.1.1 GPRS charging data in SGSN (S-CDR)

If the collection of CDR data is enabled then the following GSM or 3G SGSN data shall be available for each PDP context.

Table 5: GPRS SGSN PDP context data

Field		Description
Record Type	M	GPRS SGSN PDP context record.
Network Initiated PDP Context	C	Present if this is a network initiated PDP context.
System Type	C	Indicates 3G-UMTS System; Not present for GSM GPRS.
Served IMSI	M	IMSI of the served party (if Anonymous Access Indicator is FALSE or not supplied).
Served IMEI	C	The IMEI of the ME, if available.
Served MSISDN	O	The primary MSISDN of the subscriber.
SGSN Address	M	The IP address of the current SGSN.
MS Network Capability	O	The mobile station Network Capability.
Routing Area	O	Routing Area at the time of the record creation.
Local Area Code	O	Location area code at the time of the record creation.
Cell Identifierty	O	Cell identity or Service Area Code at the time of the record creation.
Charging ID	M	PDP context identifier used to identify this PDP context in different records created by GSNs
GGSN Address Used	M	The IP address of the GGSN currently used. The GGSN address is always the same for an activated PDP.
Access Point Name Network Identifier	M	The logical name of the connected access point to the external packet data network (network identifier part of APN).
APN Selection Mode	O	An index indicating how the APN was selected.
PDP Type	M	PDP type, i.e. IP, PPP, IHOSS:OSP
Served PDP Address	M	PDP address of the served IMSI, i.e. IPv4 or IPv6
List of Traffic Data Volumes	M	A list of changes in charging conditions for this PDP context, each time stamped. Charging conditions are used to categorise traffic volumes, such as per QoS/tariff period. Initial and subsequently changed QoS and corresponding data values are listed. In GSM, data volumes are in Octets above the SNDCP layer and are separated for uplink and downlink traffic. In 3G, data volumes are in octets above the GTP-U layer and are separated for uplink and downlink traffic.
Record Opening Time	M	Time stamp when PDP context activation is created in this SGSN or record opening time on following partial records
Duration	M	Duration of this record in the SGSN.
SGSN Change	C	Present if this is first record after SGSN change.
Cause for Record Closing	M	The reason for the release of record from this SGSN.
Diagnostics	O	A more detailed reason for the release of the connection.
Record Sequence Number	C	Partial record sequence number in this SGSN. Only present in case of partial records.
Node ID	O	Name of the recording entity
Record Extensions	O	A set of network/ manufacturer specific extensions to the record.
Local Record Sequence Number	O	Consecutive record number created by this node. The number is allocated sequentially including all CDR types.
Access Point Name Operator Identifier	M	The Operator Identifier part of the APN.
RNC Unsent Downlink Volume	C	The downlink data volume which the RNC has not sent to MS.
CAMEL Information	C	Set of CAMEL information related to PDP context. For more information see Description of Record Fields.
Charging Characteristics	C	The Charging Characteristics flag retrieved from subscriber's data as described in subclause 6.1.6.2a.

6.1.3 GPRS mobile station mobility management data in SGSN (M-CDR)

If the collection of MS mobility management data is enabled then GSM or 3G SGSN shall start collecting information each time the mobile is attached to the SGSN.

Table 7: GPRS SGSN Mobile Station mobility management data

Field		Description
Record Type	M	GPRS SGSN mobility management record.
Served IMSI	M	IMSI of the MS.
Served IMEI	C	The IMEI of the ME, if available.
Served MSISDN	O	The primary MSISDN of the subscriber.
SGSN Address	M	The IP address of the current SGSN.
MS Network Capability	O	The mobile station network capability.
Routing Area	O	Routing Area at the time of the record creation..
Local Area Code	O	Location Area Code at the time of record creation.
Cell Identifier~~ty~~	O	The Cell ~~i~~Identity or Service Area Code at the time of the record creation.
Change of Location	O	A list of changes in Routing Area Identity, each time stamped.
Record Opening Time	M	Timestamp when this record was opened.
Duration	O	Duration of this record.
SGSN Change	C	Present if this is first record after SGSN change.
Cause for Record Closing	M	The reason for the release of the record in this SGSN.
Diagnostics	O	A more detailed reason for the release of the connection.
Record Sequence Number	C	Partial record sequence number in this SGSN; only present in case of partial records.
Node ID	O	Name of the recording entity.
Record Extensions	O	A set of network/ manufacturer specific extensions to the record.
Local Record Sequence Number	O	Consecutive record number created by this node. The number is allocated sequentially including all CDR types.
Charging Characteristics	C	The Charging Characteristics flag set used by the SGSN.
System Type	C	Indicates 3G-UMTS System; Not present for GSM GPRS.
CAMEL Information	C	Set of CAMEL related to Attach/Detach session. For more information see Description of Record Fields.

6.1.4 GPRS MO SMS data in SGSN (S-SMO-CDR)

If enabled, an S-SMO-CDR SGSN Mobile originated SMS record shall be produced for each short message sent by a mobile subscriber via the SGSN.

Table 8: SGSN Mobile originated SMS record

Field		Description
Record Type	M	SGSN Mobile Originated SMS.
Served IMSI	M	The IMSI of the subscriber.
Served IMEI	O	The IMEI of the ME, if available.
Served MSISDN	O	The primary MSISDN of the subscriber.
MS Network Capability	M	The mobile station network capability.
Service Centre	M	The address (E.164) of the SMS-service centre.
Recording Entity	M	The E.164 number of the SGSN.
Location Area Code	O	The Location Area Code from which the message originated.
Routing Area Code	O	The Routing Area Code from which the message originated.
Cell Identifierty	O	The Cell Identity or Service Area Code from which the message originated.
Event Time Stamp	M	The time at which the message was received by the SGSN from the subscriber.
Message Reference	M	A reference provided by the MS uniquely identifying this message.
SMS Result	C	The result of the attempted delivery if unsuccessful.
Record Extensions	O	A set of network/ manufacturer specific extensions to the record.
Node ID	O	Name of the recording entity.
Local Record Sequence Number	O	Consecutive record number created by this node. The number is allocated sequentially including all CDR types.
Charging Characteristics	C	The Charging Characteristics flag set used by the SGSN.
System Type	C	Indicates 3G-UMTS System; Not present for GSM GPRS.
Destination Number	O	The destination short message subscriber number.
CAMEL Information	C	Set of CAMEL information related to SMS session. For more information see Description of Record Fields.

6.1.5 GPRS MT SMS data in SGSN (S-SMT-CDR)

If enabled, an SGSN Mobile terminated SMS record shall be produced for each short message received by a mobile subscriber via the SGSN.

Table 9: SGSN Mobile terminated SMS record

Field		Description
Record Type	M	SGSN Mobile terminated SMS.
Served IMSI	M	The IMSI of the subscriber.
Served IMEI	O	The IMEI of the ME, if available.
Served MSISDN	O	The primary MSISDN of the subscriber.
MS Network Capability	M	The mobile station network capability
Service Centre	M	The address (E.164) of the SMS-service centre.
Recording Entity	M	The E.164 number of the SGSN.
Location Area Code	O	The Location Area Code to which the message was delivered.
Routing Area Code	O	The Routing Area Code to which the message was delivered.
Cell Identifierty	O	The Cell Identity or Service Area Code to which the message was delivered.
Event Time Stamp	M	Delivery time stamp, time at which message was sent to the MS by the SGSN.
SMS Result	C	The result of the attempted delivery if unsuccessful.
Record Extensions	O	A set of network/ manufacturer specific extensions to the record.
Node ID	O	Name of the recording entity.
Local Record Sequence Number	O	Consecutive record number created by this node. The number is allocated sequentially including all CDR types.
Charging Characteristics	C	The Charging Characteristics flag set used by the SGSN.
System Type	C	Indicates 3G-UMTS System; Not present for GSM GPRS.

6.1.6 Description of Record Fields

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

6.1.6.27 Routing Area Code/Cell Identifierty/Change of location

The location information contains a combination of the Routing Area Code (RAC) and an optionally Cell Identifierty (CI) of the routing area and cell in which the served party is currently located. In 2G domain the cell identifier is defined by the Cell Identity (CI) and in 3G domain by the Service Area Code (SAC). Any change of location (i.e. Routing Area change) 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 RAC and (optionally) CI are coded according to 3G TS 24.008 [13] and the SAC according 3G TS 25.413[15].

8 Charging Data Record Structure

8.1 ASN.1 definitions for CDR information

Within the current GSM 12-series of specifications the ASN.1 definitions are based on ISO8824 (90) / X.208 (88) [40], which has been superseded by ISO8824-1 (94) / X.680 (94). This newer version not only includes new features but also removes some that were present in ISO8824 (90) / X.208 (88) [40].
Where possible, the GPRS work would be based on those ASN.1 features to both. However, where necessary, the new features in ISO8824-1 (94) / X.680 (94) [41] be used in some places.
ISO8824 (90) / X.208 (88) [40] features that are no longer in ISO8824-1 (94) / X.680 (94) [41] will not be used.

```
Changes (enhancements) in GSM1205-DataTypes:

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),
    sgsnPDPRecord           (18),
    ggsnPDPRecord           (19),
    sgsnMMRecord            (20),
    sgsnSMORecord           (21),
    sgsnSMTRecord           (22)

}
GPRS_Charging-DataTypes {... }

DEFINITIONS IMPLICIT TAGS   ::=

BEGIN

-- EXPORTS everything

IMPORTS

CellId, Diagnostics, CallDuration, ManagementExtensions, TimeStamp, MSISDN, LocationAreaCode,
MessageReference, RecordingEntity, SMSResult, LevelOfCAMELService, CalledNumber, CallingNumber

FROM GSM1205-DataTypes{ ccitt (0) identified-organization (4) etsi(0) mobileDomain (0)
gsmOperation-Maintenance (3) moduleId (3) gsm-12-05 (5) InformationModel (0) asn1Module (2) 1 }

AddressString, ISDN-AddressString, IMSI, IMEI, DefaultGPRS-Handling, DefaultSMS-Handling
```

```
FROM MAP-CommonDataTypes { ccitt identified-organization (4) etsi(0) mobileDomain (0) gsmNetworkId
(1) moduleId (3) map-CommonDataTypes (18) version2 (2) }


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
{
    sgsnPDPRecord           [0] SGSNPDPRecord,
    ggsnPDPRecord           [1] GGSNPDPRecord,
    sgsnMMRecord            [2] SGSNMMRecord,
    sgsnSMORecord           [3] SGSNSMORecord,
    sgsnSMTRecord           [4] SGSNSMTRecord
}

GGSNPDPRecord   ::= SET
{
    recordType              [0] CallEventRecordType,
    networkInitiation       [1] NetworkInitiatedPDPContext OPTIONAL,
    servedIMSI              [3] IMSI,
    ggsnAddress             [4] GSNAddress,
    chargingID              [5] ChargingID,
    sgsnAddress             [6] SEQUENCE OF GSNAddress,
    accessPointNameNI       [7] AccessPointNameNI,
    pdpType                 [8] PDPType,
    servedPDPAddress        [9] PDPAddress,
    dynamicAddressFlag      [11] DynamicAddressFlag OPTIONAL,
    listOfTrafficVolumes    [12] SEQUENCE OF ChangeOfCharCondition,
    recordOpeningTime       [13] TimeStamp,
    duration                [14] CallDuration,
    causeForRecClosing      [15] CauseForRecClosing,
    diagnostics             [16] Diagnostics OPTIONAL,
    recordSequenceNumber    [17] INTEGER OPTIONAL,
    nodeID                  [18] NodeID OPTIONAL,
    recordExtensions        [19] ManagementExtensions OPTIONAL,
    localSequenceNumber     [20] LocalSequenceNumber OPTIONAL,
    apnSelectionMode        [21] APNSelectionMode OPTIONAL,
    servedMSISDN            [22] MSISDN OPTIONAL,
    chargingCharacteristics [23] ChargingCharacteristics OPTIONAL
}

SGSNMMRecord    ::= SET
{
    recordType              [0] CallEventRecordType,
    servedIMSI              [1] IMSI,
    servedIMEI              [2] IMEI OPTIONAL,
    sgsnAddress             [3] GSNAddress,
    msNetworkCapability     [4] MSNetworkCapability OPTIONAL,
    routingArea             [5] RoutingAreaCode OPTIONAL,
    locationAreaCode        [6] LocationAreaCode OPTIONAL,
    cellIdentifierty        [7] CellId OPTIONAL,
    changeLocation          [8] SEQUENCE OF ChangeLocation OPTIONAL,
    recordOpeningTime       [9] TimeStamp,
    duration                [10] CallDuration OPTIONAL,
    sgsnChange              [11] SGSNChange OPTIONAL,
    causeForRecClosing      [12] CauseForRecClosing,
    diagnostics             [13] Diagnostics OPTIONAL,
    recordSequenceNumber    [14] INTEGER OPTIONAL,
    nodeID                  [15] NodeID OPTIONAL,
    recordExtensions        [16] ManagementExtensions OPTIONAL,
    localSequenceNumber     [17] LocalSequenceNumber OPTIONAL,
    servedMSISDN            [18] MSISDN OPTIONAL,
    chargingCharacteristics [19] ChargingCharacteristics OPTIONAL,
    cAMELInformationMM      [20] CAMELInformationMM OPTIONAL

}

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

```
    networkInitiation       [1] NetworkInitiatedPDPContext OPTIONAL,
    servedIMSI              [3] IMSI,
    servedIMEI              [4] IMEI OPTIONAL,
    sgsnAddress             [5] GSNAddress,
    msNetworkCapability     [6] MSNetworkCapability OPTIONAL,
    routingArea             [7] RoutingAreaCode OPTIONAL,
    locationAreaCode        [8] LocationAreaCode OPTIONAL,
    cellIdentifierty        [9] CellId OPTIONAL,
    chargingID              [10] ChargingID,
    ggsnAddressUsed         [11] GSNAddress,
    accessPointNameNI       [12] AccessPointNameNI,
    pdpType                 [13] PDPType,
    servedPDPAddress        [14] PDPAddress,
    listOfTrafficVolumes    [15] SEQUENCE OF ChangeOfCharCondition,
    recordOpeningTime       [16] TimeStamp,
    duration                [17] CallDuration,
    sgsnChange              [18] SGSNChange OPTIONAL,
    causeForRecClosing      [19] CauseForRecClosing,
    diagnostics             [20] Diagnostics OPTIONAL,
    recordSequenceNumber    [21] INTEGER OPTIONAL,
    nodeID                  [22] NodeID OPTIONAL,
    recordExtensions        [23] ManagementExtensions OPTIONAL,
    localSequenceNumber     [24] LocalSequenceNumber OPTIONAL,
    apnSelectionMode        [25] APNSelectionMode OPTIONAL,
    accessPointNameOI       [26] AccessPointNameOI,
    servedMSISDN            [27] MSISDN OPTIONAL,
    chargingCharacteristics [28] ChargingCharacteristics OPTIONAL,
    systemType              [29] SystemType OPTIONAL,
    cAMELInformationPDP     [30] CAMELInformationPDP OPTIONAL,
    rNCUnsentDownlinkVolume [31] DataVolumeGPRS OPTIONAL,
}

SGSNSMORecord   ::= SET
{
    recordType              [0] CallEventRecordType,
    servedIMSI              [1] IMSI,
    servedIMEI              [2] IMEI OPTIONAL,
    servedMSISDN            [3] MSISDN OPTIONAL,
    msNetworkCapability     [4] MSNetworkCapability,
    serviceCentre           [5] AddressString,
    recordingEntity         [6] RecordingEntity,
    locationArea            [7] LocationAreaCode OPTIONAL,
    routingArea             [8] RoutingAreaCode OPTIONAL,
    cellIdentifierty        [9] CellId OPTIONAL,
    messageReference        [10] MessageReference,
    originationTime         [11] TimeStamp,
    smsResult               [12] SMSResult OPTIONAL,
    recordExtensions        [13] ManagementExtensions OPTIONAL,
    nodeID                  [14] NodeID OPTIONAL,
    localSequenceNumber     [15] LocalSequenceNumber OPTIONAL,
    chargingCharacteristics [16] ChargingCharacteristics OPTIONAL,
    systemType              [17] SystemType OPTIONAL
    destinationNumber       [18] CalledNumber OPTIONAL,
    cAMELInformationSMS     [19] CAMELInformationSMS OPTIONAL
}

SGSNSMTRecord   ::= SET
{
    recordType              [0] CallEventRecordType,
    servedIMSI              [1] IMSI,
    servedIMEI              [2] IMEI OPTIONAL,
    servedMSISDN            [3] MSISDN OPTIONAL,
    msNetworkCapability     [4] MSNetworkCapability,
    serviceCentre           [5] AddressString,
    recordingEntity         [6] RecordingEntity,
    locationArea            [7] LocationAreaCode OPTIONAL,
    routingArea             [8] RoutingAreaCode OPTIONAL,
    cellIdentifierty        [9] CellId OPTIONAL,
    originationTime         [10] TimeStamp,
    smsResult               [11] SMSResult OPTIONAL,
    recordExtensions        [12] ManagementExtensions OPTIONAL,
    nodeID                  [13] NodeID OPTIONAL,
    localSequenceNumber     [14] LocalSequenceNumber OPTIONAL,
    chargingCharacteristics [15] ChargingCharacteristics OPTIONAL,
    systemType              [16] SystemType OPTIONAL

}
```

3GPP TSG- SA5 Meeting #16
Tokyo, Japan, November 2000

SA5#16(00)0534
Tdoc S5B000092

CR-Form-v3

CHANGE REQUEST

⌘ **32.015** **CR** **019** ⌘ rev **-** ⌘ Current version: **3.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Correction of ASN.1 errors
Source:	⌘	**SA5#16**
Work item code:	⌘	OAM-CH
Date:	⌘	**01/12/2000**
Category:	⌘	**F**
Release:	⌘	R99

Use one of the following categories:
- ***F*** *(essential correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(Addition of feature),*
- ***C*** *(Functional modification of feature)*
- ***D*** *(Editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	Eliminate ASN.1 errors for processing CDRs
Summary of change:	⌘	Replace errors in Chapter 8 with correct syntax
Consequences if not approved:	⌘	Results in CDR errors

Clauses affected:	⌘	8
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications
	⌘	
Other comments:	⌘	

8 Charging Data Record Structure

8.1 ASN.1 definitions for CDR information

Within the current GSM 12-series of specifications the ASN.1 definitions are based on ISO8824 (90) / X.208 (88) [40], which has been superseded by ISO8824-1 (94) / X.680 (94). This newer version not only includes new features but also removes some that were present in ISO8824 (90) / X.208 (88) [40].
Where possible, the GPRS work would be based on those ASN.1 features to both. However, where necessary, the new features in ISO8824-1 (94) / X.680 (94) [41] be used in some places.
ISO8824 (90) / X.208 (88) [40] features that are no longer in ISO8824-1 (94) / X.680 (94) [41] will not be used.

```
Changes (enhancements) in GSM1205-DataTypes:

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),
    sgsnPDPRecord           (18),
    ggsnPDPRecord           (19),
    sgsnMMRecord            (20),
    sgsnSMORecord           (21),
    sgsnSMTRecord           (22)

}
GPRS-Charging-DataTypes {... }

DEFINITIONS IMPLICIT TAGS   ::=

BEGIN

-- EXPORTS everything

IMPORTS

CellId, Diagnostics, CallDuration, ManagementExtensions, TimeStamp, MSISDN, LocationAreaCode,
MessageReference, RecordingEntity, SMSResult, LevelOfCAMELService, CalledNumber, CallingNumber
FROM GSM1205-DataTypes{ ccitt (0) identified-organization (4) etsi(0) mobileDomain (0) gsm-
Operation-Maintenance (3) moduleId (3) gsm-12-05 (5) informationModel (0) asn1Module (2) 1 }

AddressString, ISDN-AddressString, IMSI, IMEI, DefaultGPRS-Handling, DefaultSMS-Handling, ServiceKey
FROM MAP-CommonDataTypes { ccitt identified-organization (4) etsi(0) mobileDomain (0) gsmNetworkId
(1) moduleId (3) map-CommonDataTypes (18) version25 (25) }


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
{
    sgsnPDPRecord           [0] SGSNPDPRecord,
    ggsnPDPRecord           [1] GGSNPDPRecord,
    sgsnMMRecord            [2] SGSNMMRecord,
    sgsnSMORecord           [3] SGSNSMORecord,
    sgsnSMTRecord           [4] SGSNSMTRecord
}

GGSNPDPRecord   ::= SET
{
    recordType              [0] CallEventRecordType,
    networkInitiation       [1] NetworkInitiatedPDPContext OPTIONAL,
    servedIMSI              [3] IMSI,
    ggsnAddress             [4] GSNAddress,
    chargingID              [5] ChargingID,
    sgsnAddress             [6] SEQUENCE OF GSNAddress,
    accessPointNameNI       [7] AccessPointNameNI,
    pdpType                 [8] PDPType,
    servedPDPAddress        [9] PDPAddress,
    dynamicAddressFlag      [11] DynamicAddressFlag OPTIONAL,
    listOfTrafficVolumes    [12] SEQUENCE OF ChangeOfCharCondition,
    recordOpeningTime       [13] TimeStamp,
    duration                [14] CallDuration,
    causeForRecClosing      [15] CauseForRecClosing,
    diagnostics             [16] Diagnostics OPTIONAL,
    recordSequenceNumber    [17] INTEGER OPTIONAL,
    nodeID                  [18] NodeID OPTIONAL,
    recordExtensions        [19] ManagementExtensions OPTIONAL,
    localSequenceNumber     [20] LocalSequenceNumber OPTIONAL,
    apnSelectionMode        [21] APNSelectionMode OPTIONAL,
    servedMSISDN            [22] MSISDN OPTIONAL,
    chargingCharacteristics [23] ChargingCharacteristics OPTIONAL
}

SGSNMMRecord    ::= SET
{
    recordType              [0] CallEventRecordType,
    servedIMSI              [1] IMSI,
    servedIMEI              [2] IMEI OPTIONAL,
    sgsnAddress             [3] GSNAddress,
    msNetworkCapability     [4] MSNetworkCapability OPTIONAL,
    routingArea             [5] RoutingAreaCode OPTIONAL,
    locationAreaCode        [6] LocationAreaCode OPTIONAL,
    cellIdentity            [7] CellId OPTIONAL,
    changeLocation          [8] SEQUENCE OF ChangeLocation OPTIONAL,
    recordOpeningTime       [9] TimeStamp,
    duration                [10] CallDuration OPTIONAL,
    sgsnChange              [11] SGSNChange OPTIONAL,
    causeForRecClosing      [12] CauseForRecClosing,
    diagnostics             [13] Diagnostics OPTIONAL,
    recordSequenceNumber    [14] INTEGER OPTIONAL,
    nodeID                  [15] NodeID OPTIONAL,
    recordExtensions        [16] ManagementExtensions OPTIONAL,
    localSequenceNumber     [17] LocalSequenceNumber OPTIONAL,
    servedMSISDN            [18] MSISDN OPTIONAL,
    chargingCharacteristics [19] ChargingCharacteristics OPTIONAL,
    cAMELInformationMM      [20] CAMELInformationMM OPTIONAL

}

SGSNPDPRecord   ::= SET
{
    recordType              [0] CallEventRecordType,
    networkInitiation       [1] NetworkInitiatedPDPContext OPTIONAL,
    servedIMSI              [3] IMSI,
    servedIMEI              [4] IMEI OPTIONAL,
    sgsnAddress             [5] GSNAddress,
    msNetworkCapability     [6] MSNetworkCapability OPTIONAL,
    routingArea             [7] RoutingAreaCode OPTIONAL,
    locationAreaCode        [8] LocationAreaCode OPTIONAL,
    cellIdentity            [9] CellId OPTIONAL,
```

```
        chargingID              [10] ChargingID,
        ggsnAddressUsed         [11] GSNAddress,
        accessPointNameNI       [12] AccessPointNameNI,
        pdpType                 [13] PDPType,
        servedPDPAddress        [14] PDPAddress,
        listOfTrafficVolumes    [15] SEQUENCE OF ChangeOfCharCondition,
        recordOpeningTime       [16] TimeStamp,
        duration                [17] CallDuration,
        sgsnChange              [18] SGSNChange OPTIONAL,
        causeForRecClosing      [19] CauseForRecClosing,
        diagnostics             [20] Diagnostics OPTIONAL,
        recordSequenceNumber    [21] INTEGER OPTIONAL,
        nodeID                  [22] NodeID OPTIONAL,
        recordExtensions        [23] ManagementExtensions OPTIONAL,
        localSequenceNumber     [24] LocalSequenceNumber OPTIONAL,
        apnSelectionMode        [25] APNSelectionMode OPTIONAL,
        accessPointNameOI       [26] AccessPointNameOI,
        servedMSISDN            [27] MSISDN OPTIONAL,
        chargingCharacteristics [28] ChargingCharacteristics OPTIONAL,
        systemType              [29] SystemType OPTIONAL,
        cAMELInformationPDP     [30] CAMELInformationPDP OPTIONAL,
        rNCUnsentDownlinkVolume [31] DataVolumeGPRS OPTIONAL,
    }

    SGSNSMORecord   ::= SET
    {
        recordType              [0] CallEventRecordType,
        servedIMSI              [1] IMSI,
        servedIMEI              [2] IMEI OPTIONAL,
        servedMSISDN            [3] MSISDN OPTIONAL,
        msNetworkCapability     [4] MSNetworkCapability,
        serviceCentre           [5] AddressString,
        recordingEntity         [6] RecordingEntity,
        locationArea            [7] LocationAreaCode OPTIONAL,
        routingArea             [8] RoutingAreaCode OPTIONAL,
        cellIdentity            [9] CellId OPTIONAL,
        messageReference        [10] MessageReference,
        originationTime         [11] TimeStamp,
        smsResult               [12] SMSResult OPTIONAL,
        recordExtensions        [13] ManagementExtensions OPTIONAL,
        nodeID                  [14] NodeID OPTIONAL,
        localSequenceNumber     [15] LocalSequenceNumber OPTIONAL,
        chargingCharacteristics [16] ChargingCharacteristics OPTIONAL,
        systemType              [17] SystemType OPTIONAL,
        destinationNumber       [18] CalledNumber OPTIONAL,
        cAMELInformationSMS     [19] CAMELInformationSMS OPTIONAL
    }

    SGSNSMTRecord   ::= SET
    {
        recordType              [0] CallEventRecordType,
        servedIMSI              [1] IMSI,
        servedIMEI              [2] IMEI OPTIONAL,
        servedMSISDN            [3] MSISDN OPTIONAL,
        msNetworkCapability     [4] MSNetworkCapability,
        serviceCentre           [5] AddressString,
        recordingEntity         [6] RecordingEntity,
        locationArea            [7] LocationAreaCode OPTIONAL,
        routingArea             [8] RoutingAreaCode OPTIONAL,
        cellIdentity            [9] CellId OPTIONAL,
        originationTime         [10] TimeStamp,
        smsResult               [11] SMSResult OPTIONAL,
        recordExtensions        [12] ManagementExtensions OPTIONAL,
        nodeID                  [13] NodeID OPTIONAL,
        localSequenceNumber     [14] LocalSequenceNumber OPTIONAL,
        chargingCharacteristics [15] ChargingCharacteristics OPTIONAL,
        systemType              [16] SystemType OPTIONAL

    }

    -------------------------------------------------------------------------------
    --
    --  OBJECT IDENTIFIERS
    --
    -------------------------------------------------------------------------------

    gsm1205InformationModel  OBJECT IDENTIFIER  ::=
        { ccitt (0) identified-organization (4) etsi (0) mobileDomain (0)
```

```
226         gsm-Operation-Maintenance (3) gsm-12-05 (5) informationModel (0) }
227
228     gsm1205ASN1Module   OBJECT IDENTIFIER   ::=
229         { gsm1205InformationModel asn1Module(2) }
230
231     -------------------------------------------------------------------------------
232     --
233     --  COMMON DATA TYPES
234     --
235     -------------------------------------------------------------------------------
236
237     AccessPointNameNI   ::= IA5String (SIZE(1..63))
238         --
239         -- Network Identifier part of APN in "dot" representation
240         -- see TS 23.003
241         --
242
243     AccessPointNameOI   ::= IA5String (SIZE(1..37))
244         --
245         -- Operator Identifier part of APN in dot representation
246         -- see TS 23.003
247         --
248
249     APNSelectionMode::= ENUMERATED
250     {
251         --
252         -- See Information Elements TS 29.060
253         --
254         MmSorNetworkProvidedSubscriptionVerified              (0),
255         MmSProvidedSubscriptionNotVerified                (1),
256         NnetworkProvidedSubscriptionNotVerified           (2)
257     }
258
259     CAMELAccessPointNameNI  ::= AccessPointNameNI
260
261     CAMELAccessPointNameOI  ::= AccessPointNameOI
262
263     CAMELInformationMM      ::= SET
264     {
265         sCFAddress                      [1] SCFAddress OPTIONAL,
266         serviceKey                      [2] ServiceKey OPTIONAL,
267         defaultTransactionHandling      [3] DefaultGPRS-Handling OPTIONAL,
268         numberOfDPEncountered           [4] NumberOfDPEncountered OPTIONAL,
269         levelOfCAMELService             [5] LevelOfCAMELService OPTIONAL,
270         freeFormatData                  [6] FreeFormatData OPTIONAL,
271         fFDAppendIndicator              [7] FreeFormatDataAppendIndicator OPTIONAL
272     }
273
274     CAMELInformationPDP ::= SET
275     {
276         sCFAddress                      [1] SCFAddress OPTIONAL,
277         serviceKey                      [2] ServiceKey OPTIONAL,
278         defaultTransactionHandling      [3] DefaultGPRS-Handling OPTIONAL,
279         cAMELAccessPointNameNI          [4] CAMELAccessPointNameNI OPTIONAL,
280         cAMELAccessPointNameOI          [5] CAMELAccessPointNameOI OPTIONAL,
281         numberOfDPEncountered           [6] NumberOfDPEncountered OPTIONAL,
282         levelOfCAMELService             [7] LevelOfCAMELService OPTIONAL,
283         freeFormatData                  [8] FreeFormatData OPTIONAL,
284         fFDAppendIndicator              [9] FreeFormatDataAppendIndicator OPTIONAL
285     }
286
287     CAMELInformationSMS     ::= SET
288     {
289         sCFAddress                      [1] SCFAddress OPTIONAL,
290         serviceKey                      [2] ServiceKey OPTIONAL,
291         defaultSMSHandling              [3] DefaultSMS-Handling OPTIONAL,
292         cAMELCallingPartyNumber         [4] CallingNumber OPTIONAL,
293         cAMELDestinationSubscriberNumber[5] CalledNumber OPTIONAL,
294         cAMELSMSCAddress                [6] AddressString OPTIONAL,
295         freeFormatData                  [7] FreeFormatData OPTIONAL
296     }
297
298     CauseForRecClosing  ::= INTEGER
299     {
300         --
301         -- in GGSN the value sGSNChange should be used for partial record
302         -- generation due to SGSN Address List Overflow
303         --
```

```
    -- cause codes 0 to 15 are defined in GSM12.05 as 'CauseForTerm' (cause for termination)
    --
    normalRelease           (0),
    abnormalRelease         (4),
    cAMELInitCallRelease    (5),
    volumeLimit             (16),
    timeLimit               (17),
    sGSNChange              (18),
    maxChangeCond           (19),
    managementIntervention  (20)
}

ChangeCondition ::= ENUMERATED
{
    qoSChange               (0),
    tariffTime              (1),
    recordClosure           (2)
}

ChangeOfCharCondition   ::= SEQUENCE
    --
    -- used in PDP context record only
    --
{
    qosRequested            [1] QoSInformation OPTIONAL,
    qosNegotiated           [2] QoSInformation OPTIONAL,
    dataVolumeGPRSUplink    [3] DataVolumeGPRS,
    dataVolumeGPRSDownlink  [4] DataVolumeGPRS,
    changeCondition         [5] ChangeCondition,
    changeTime              [6] TimeStamp
}

ChangeLocation  ::= SEQUENCE
    --
    -- used in SGSNMMRecord only
    --
{
    locationAreaCode        [0] LocationAreaCode,
    routingAreaCode         [1] RoutingAreaCode,
    cellId                  [2] CellIDd OPTIONAL,
    changeTime              [3] TimeStamp
}

ChargingCharacteristics ::= OCTET STRING (SIZE(1))
    --
    --  Descriptions for the bits of the flag set:
    --
    --  Bit 1: H (Hot billing)          := '00000001'B
    --  Bit 2: F (Flat rate)            := '00000010'B
    --  Bit 3: P (Prepaid service)      := '00000100'B
    --  Bit 4: N (Normal billing)       := '00001000'B
    --  Bit 5: - (Reserved, set to 0)   := '00010000'B
    --  Bit 6: - (Reserved, set to 0)   := '00100000'B
    --  Bit 7: - (Reserved, set to 0)   := '01000000'B
    --  Bit 8: - (Reserved, set to 0)   := '10000000'B
    --

ChargingID  ::= INTEGER (0..4294967295)
    --
    -- generated in GGSN, part of PDP context, see TS 23.060
    -- 0..4294967295 is equivalent to 0..2**32-1

DataVolumeGPRS  ::= INTEGER
    --
    -- The volume of data transferred in octets.
    --

DynamicAddressFlag  ::= BOOLEAN

ETSIAddress ::= AddressString
    --
    --first octet for nature of address, and numbering plan indicator (3 for X.121)
    --other octets TBCD
    -- See TS 29.002
    --

FFDAppendIndicator  ::= BOOLEAN
```

```
FreeFormatData  ::= OCTET STRING (SIZE(1..160))
    --
    -- Free formated data as sent in the FurnishChargingInformationGPRS
    -- see TS 29.00278
    --

GSNAddress  ::= IPAddress

GSMQoSInformation   ::=SEQUENCE
{
    reliability             [0] QoSReliability,
    delay                   [1] QoSDelay,
    precedence              [2] QoSPrecedence,
    peakThroughput          [3] QoSPeakThroughput,
    meanThroughput          [4] QoSMeanThroughput
}

IPAddress   ::= CHOICE
{
    iPBinaryAddress  IPBinaryAddress,
    iPTextRepresentedAddress     IPTextRepresentedAddress
}

IPBinaryAddress ::= CHOICE
{
    iPBinV4Address          [0] OCTET STRING (SIZE(4)),
    iPBinV6Address          [1] OCTET STRING (SIZE(16))
}

IPTextRepresentedAddress    ::= CHOICE
{   --
    -- IP address in the familiar "dot" notation
    --
    iPTextV4Address         [2] IA5String (SIZE(7..15)),
    iPTextV6Address         [3] IA5String (SIZE(15..45))
}

LocalSequenceNumber ::= INTEGER (0..4294967295)
    --
    -- Sequence number of the record in this node
    -- 0.. 4294967295 is equivalent to 0..2**32-1, unsigned integer in four octets

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

NetworkInitiatedPDPContext  ::= BOOLEAN
    --
    -- Set to true if PDP context was initiated from network side
    --

NodeID  ::= IA5-sString (SIZE(1..20))

PDPAddress  ::= CHOICE
{
    iPAddress               [0] IPAddress,
    eTSIAddress             [1] ETSIAddress
}

PDPType     ::= OCTET STRING (SIZE(2))
    --
    --OCTET 1: PDP Type Organization
    --OCTET 2: PDP Type Number
    -- See TS 29.060
    --
QoSAllocRetenPriority   ::= ENUMERATED
{
    --
    -- See Quality of service TS 24.008
    --

    priorityLevel-1     (1),
    priorityLevel-2     (2),
    priorityLevel-3     (3)
}

QoSDelay        ::= ENUMERATED
{
    --
    -- See Quality of service TS 24.008
```

```
460         --
461         delayClass1             (1),
462         delayClass2             (2),
463         delayClass3             (3),
464         delayClass4             (4)
465     }
466
467     QoSDeliveryOrder    ::= ENUMERATED
468     {
469         --
470         -- See Quality of service TS 24.008
471         --
472
473         withDeliveryOrder       (1),
474         withoutDeliveryOrder    (2)
475     }
476
477     QoSErroneousSDUs    ::= ENUMERATED
478     {
479         --
480         -- See Quality of service TS 24.008
481         --
482
483         noDetect        (1),
484         delivered       (2),
485         notDelivered    (3)
486     }
487
488     QosHandlingPriority     ::= ENUMERATED
489     {
490         --
491         -- See Quality of service TS 24.008
492         --
493
494         priorityLevel–1     (1),
495         priorityLevel–2     (2),
496         priorityLevel–3     (3)
497     }
498
499     QoSInformation  ::= CHOICE
500     {
501         gsmQosInformation       [0] GSMQoSInformation,
502         umtsQosInformation      [1] OCTET STRING (SIZE(11))
503     }
504
505
506
507     QoSMeanThroughput   ::= ENUMERATED
508     {
509         --
510         -- See Quality of service TS 24.008
511         --
512         bestEffort              (0),
513         mean100octetPh          (1),
514         mean200octetPh          (2),
515         mean500octetPh          (3),
516         mean1000octetPh         (4),
517         mean2000octetPh         (5),
518         mean5000octetPh         (6),
519         mean10000octetPh        (7),
520         mean20000octetPh        (8),
521         mean50000octetPh        (9),
522         mean100000octetPh       (10),
523         mean200000octetPh       (11),
524         mean500000octetPh       (12),
525         mean1000000octetPh      (13),
526         mean2000000octetPh      (14),
527         mean5000000octetPh      (15),
528         mean10000000octetPh     (16),
529         mean20000000octetPh     (17),
530         mean50000000octetPh     (18)
531     }
532
533     QoSPeakThroughput   ::= ENUMERATED
534     {
535         --
536         -- See Quality of service TS 24.008
537         --
```

```
538         unspecified             (0),
539         upTo1000octetPs     (1),
540         upTo2000octetPs     (2),
541         upTo4000octetPs     (3),
542         upTo8000octetPs     (4),
543         upTo16000octetPs        (5),
544         upTo32000octetPs        (6),
545         upTo64000octetPs        (7),
546         upTo128000octetPs       (8),
547         upTo256000octetPs       (9)
548     }
549
550     QoSPrecedence   ::= ENUMERATED
551     {
552         --
553         -- See Quality of service TS 24.008
554         --
555         unspecified             (0),
556         highPriority            (1),
557         normalPriority          (2),
558         lowPriority             (3)
559     }
560
561     QoSReliability  ::= ENUMERATED
562     {
563         --
564         -- See Quality of service TS 24.008
565         --
566         unspecifiedReliability  (0),
567         acknowledgedGTP         (1),
568         unackGTPAcknowLLC       (2),
569         unackGTPLLCAcknowRLC    (3),
570         unackGTPLLCRLC          (4),
571         unacknowUnprotectedData (5)
572     }
573
574
575     RoutingAreaCode ::= OCTET STRING (SIZE(1))
576         --
577         -- See TS 24.008    --
578         --
579
580     SCFAddress  ::= AddressString
581         --
582         -- See TS 29.002    --
583         --
584
585
586     NumberOfDPEncountered  ::= INTEGER
587     --
588     --
589
590     SGSNChange  ::= BOOLEAN
591         --
592         -- present if first record after inter SGSN routing area update
593         -- in new SGSN
594         --
595
596     SystemType  ::= ENUMERATED
597     {
598
599         umtsRel99           (1)
600     }
601
602
603     END
604
```